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The disproportionate effect of transport availability on the poor in South Africa: a gender perspective

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THE DISPROPORTIONATE EFFECT OF TRANSPORT AVAILABILITY ON THE POOR IN SOUTH AFRICA: A GENDER PERSPECTIVE

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ABSTRACT

Issues relating to the cost and accessibility of transportation for the poor in South Africa have been thoroughly studied; however, research on the unequal impact on women and men is deficient. Thus, this study's purpose is to explore if there are gender variations in transportation disadvantage and costs, and if so, to probe possible reasons.

To compare gender differences in mode of transport and expenditure, the 2020 National Household Travel Survey (NHTS) from Statistics South Africa is used. Households are classified into female-dominated (all adults in households are female), male-dominated (all adults are male) and mixed households (both female and male adults present in households). This method is used as it helps to distinguish gender differences in the economic resources available to each household type (Posel & Hall, 2021). Descriptive statistics on mode of transport (private, public and walking) and transport cost as a share of budget by household type and purpose of transport (travel to place of employment and educational institution) are first provided. A multinomial regression is then used to investigate gender differences in mode of transport in a multivariate context and an Ordinary Least Squares Regression (OLS) is used to explore gender differences in budget allocations to transport.

The analysis finds that when household characteristics across household types are not controlled for, no significant differences in mode of travel between female- and male-dominated households are evident. Once included, people in female-dominated households are significantly less likely than others to walk and more likely to use public transport. Moreover, female-dominated households spend more on school transportation than male-dominated households, as well as transport shares allocated to work travel.

DECLARATION

I, Lee Everts, Student number: 2015518

I am a student registered for Applied Development Economics Masters Programme in the year 2022.

I hereby declare the following:

I confirm that the work I will submit for all assessment for the above course is my own unaided work. I have followed the required conventions in referencing the thoughts and ideas of others. I am aware that the correct method for referencing material and a discussion on what plagiarism is and these issues have been discussed in class during Orientation.

I am aware that plagiarism (the use of someone else's work without their permission and/or without acknowledging the original source) is wrong. I understand that the University of the Witwatersrand may take disciplinary action against me if there is a belief that this is not my own unaided work or that I have failed to correctly acknowledge the source of the ideas or words in my writing.

Signature: L. Everts Date: 11 June 2023

DEDICATION

This research, which was accomplished by grace of God, is dedicated in memory of Ladybug.

ACKNOWLEGEMENTS

This study and its research would not have been achieved without the amazing support of my supervisor, Professor Dori Posel. Her zeal, expertise, and demanding attention to detail have been an inspiration to me and have kept my work on track since its inception.

I would also like to thank my family, for your unwavering support throughout the process.

LIST OF ABBREVIATIONS

BRT	Bus Rapid Transit
CPI	Consumer Price Index
CSIR	Council for Scientific and Industrial Research
DUs	Dwelling units
EAs	Enumeration areas
GHTS	Gauteng Household Travel Survey
ILO	International Labor Organization
KPIs	Key performance indicators
MTSF	Medium-Term Strategic Framework
NDoT	National Department of Transport
NHTS	National Household Travel Survey
OLS	Ordinary least squares
PPS	Probability proportionate to size
PSU	Primary sampling unit
RDP	Reconstruction and Development Programme

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SECTION 1: INTRODUCTION

This research report investigates gender differences in access to, and the costs of, transport in South Africa. Inequality and unfairness in the allocation of transportation-related service constitute transportation imbalance. Achieving transportation equity requires decreasing inequality in the distribution of the transportation burden across diverse socioeconomic groups (Pred, 1977, as cited in Zhoa & Li, 2016). Underprivileged groups, such as the unemployed, low-wage workers and the poor, typically bear a disproportionate share of transport costs as a percentage of income, and women typically are over-represented in these groups, and this impacts the transport utilisation of women significantly (Alam, et al., 2022; Zhoa & Li, 2016).

Transportation and inequality are affected by three core aspects: 1) the geographical distribution of people and their social classes; 2) the distribution of opportunity, such as jobs and education; and 3) the cost-effectiveness and geographic accessibility of the transport system. Accessibility also includes the timeliness and trustworthiness of different transport modes (Gates, et al., 2019).

Geography influences travel distances and time spent on transport. Given that the mode of transport and the effectiveness of the various transit routes differs substantially over various distances, the time component of transport is an important consideration which relates to the transport service factor. When two or more modes of transportation compete in the same market, the result is usually lower transportation costs and new niche markets. Competitive markets typically have lower prices than oligopolies or monopolies, which have higher prices than competitive markets (Rodrigue & Notteboom, 2020). People living in less populated areas therefore are likely to face fewer transport options and higher costs because there are fewer service providers.

Furthermore, poor facilities result in increased transportation costs and delays, which can have negative economic effects. More advanced transport systems tend to be less expensive because they are more dependable, they have better networks and so are able to manage increases in passengers. Extra costs adding to transport costs may

include toll charges and fuel taxes used for the upkeep of transport infrastructure (Rodrigue & Notteboom, 2020). The global trend in higher fuel prices, which function as an input cost for public transportation charges, may be expected to play a larger role in the transport costs of poor households (Mokonyama, 2008), which are often geographically marginalised. The financial costs of everyday travel attract particular attention because excessive volatility in the price of energy plays a leading role in policy and public discourse on transport affordability issues (Venter, 2011).

1.1 CONTEXT

African countries have an ongoing struggle to develop feasible mobility solutions to certain broad and local issues in the face of rising urbanisation and funding shortages. Transportation in South Africa, in particular, is beset with several difficulties, which include a lack of connectivity in public transport and inequality in access to transport and to the type of transport (Jennings, 2015 cited in Aropet 2017). Pillay (2001:2) even argues that South Africa requires a “radical public transport revolution”.

Disparities are clearly highlighted in data from South African National Household Travel Survey (NHTS) 2013: only 14.9% of households in the highest quintile (Q5) spent more than 10% of their household income on public transport, in comparison to the 87,3% of households in the lowest income quintile (Q1) that spent more than 10% of their household income on transportation (Statistics South Africa, 2015a). The 10% of household income spent on public transportation is a universally ‘accepted’ benchmark cited by various authors as the minimum share of income that should be allocated by commuters in developing countries (the statistics is drawn from a report by Armstrong-Wright & Thiriez (1987) relating to bus transport). In comparison to the 2003 NHTS, for both the highest and lowest income quintiles, the situation in South Africa had also deteriorated. In 2003, only 1,9% of households in the Q5 household group spent more than 10% of their income on transportation, compared to around 54,8% of households in the Q1 group (Department of Transport, 2005).

The Gauteng Household Travel Survey (GHTS) 2019/20 estimated that nearly two thirds of households incurred expenditure exceeding 10% of their income on public transportation in 2019/20, increasing from 55% in 2014 (CSIR, 2020). Transportation therefore continues to play a crucial role in driving up the cost of living where it should

rather serve as a catalyst for poverty reduction, not a barrier (Babinar, 2014; CSIR, 2020).

The reasons behind increased household transport expenditures, particularly for lower-income households, are not well-established in the literature. Contributory factors, mostly anecdotal, are varied. In the first place, lower-income families may be more likely to send their children to schools that are further away from their homes in order to obtain what is seen to be a better education (Mokonyama, 2008). According to Hunter (2019, as cited in Freund, 2020), thousands of scholars in Durban (South Africa) travel long distances to what are termed 'Model C' schools in traditionally good neighbourhoods as opposed to South African state schools in the area of residence. Second, the occurrence of settling in areas that are further away from work and other areas of opportunity contributes to higher transport costs. Traveling from such towns would frequently include transfers between several public transportation lines, as well as separate charges for each (Mokonyama, 2008). South Africa's transportation disadvantage has clearly been aggravated by apartheid's geographical legacy and ensuing low-income housing arrangements.

Further, in South Africa, it is estimated that minibus taxis transported roughly 70% of commuters who used public transport in 2013, implying limited competition in the public transport market. But it should also be added that this mode of transport receives less than 1% of the direct public transit subsidies provided by the South African government (Kerr, 2015; 2017).

In South Africa, according to the 2020 National Household Travel Survey (NHTS), walking was the main mode of travel used by household members to reach their destination. A little more than 30,9% (of South Africans used public transport (more than 80% of which was taxis), followed by approximately 25,9% using private transport (Statistics South Africa, 2021a)[1].

While transportation has historically been a government-involved area in which justice has played a minimal role (Martens & Golub, 2011, cited in Jennings, 2015), worldwide

[1] In contrast to the statistics presented in this paragraph, this study will analyse the main modes of transport at the household level. This is discussed further in the report.

literature on transportation justice or equality is quickly expanding – a more equal, equitable allocation of the benefits and weaknesses of transport initiatives. An increasing interest in transportation justice in South Africa has manifested mostly via programs and policies that deal with the consequences of transport disadvantage, which includes enhanced accessibility, decrease of poverty and transportation-associated social marginalisation (Jennings, 2015). South Africa's socioeconomic growth is dependent on the availability and affordability of public transportation infrastructure. The government of South Africa is trying to develop an equitable public transport approach that tackles poverty, connectedness, and inequality (Thomas, 2016). Despite this, little has changed, even after the implementation of high-speed rail and bus rapid transit systems (Walters, 2014).

1.2 RESEARCH STATEMENT AND PURPOSE

A strategic goal of the South African National Policy Transport White Paper of 1996 is to make public transportation affordable to all commuters. Specifically, this means that commuters should not spend in excess of 10% of their discretionary income on public transport (Department of Transport, 1996), reflecting the global benchmark (Armstrong-Wright & Thiriez 1987). This perspective has evolved as a more comprehensive methodology to cost-effective public transportation has become necessary, rather than a 'one size fits all' approach, as even among women, a 'one size fits all' approach may exclude many of them (Alam, et al., 2022; Venter & Behrens, 2005). As stated in the Draft Revised White Paper on National Transport Policy (Department of Transport, 2017:4), “the cost of transport should represent a reasonable and declining percentage of disposable income from the current average of 30%, as measured in the National Household Travel Survey, 2013”.

However, transport expenditures as a share of household income were recently projected to reach a maximum of 50% in South Africa's metropolitan regions, with the share in rural parts at just over 20% (Gedye, 2020). In South Africa numerous transportation infrastructure projects were executed since 1994, yet their influence on household affordability and access to public transportation has been shown to disproportionately benefit individuals in the middle- to upper-income categories (Jennings, 2015; Kerr, 2015; 2017; Thomas, 2016).

The problems of the cost and accessibility of transport for the poor in South Africa have been extensively studied. There is relatively less research on the whether and how transport problems diverge between women and men. Studies in developing countries have underscored the transportation hardship that women endure on a daily basis (Venter, et al., 2007a). But researchers in South Africa have emphasised a "need for a national qualitative and quantitative study that offers insight and baseline data on how transportation problems are gendered and the effects on the quality of life of women" (Potgieter et al., 2006:35 as cited in Thomas, 2016). Additionally, most research on gender and mobility in developing nations has focused on issues relating to rural transport (Venter, et al., 2007a).

Given this context, the purpose of this research is to probe gender differences in transport access and costs in South Africa.

1.3 RESEARCH QUESTION

To investigate whether there are gender differences in the use and cost of transport in South Africa, the study distinguishes between households according to the gender composition of the adults in the household. It then asks two sub questions:

i. What are the modes of transport used by households, how do these differ by the gender of adults in the household and what factors are associated with any differences that are found?

ii. What are the costs of transport as a share of household expenditure, how do these differ by the gender composition of adults in the household and what factors are associated with any differences that are found?

1.4 OUTLINE

The remainder of the report is divided into four sections. Section two comprises the literature review. The research methodology is discussed in Section three which includes the research design, data sources and limitations, data analysis methods, the significance of the study and ethical consideration issues. Section four presents the results of the analysis. Finally, the discussion of the findings, and conclusions and recommendations are provided in Section five.

SECTION 2: LITERATURE REVIEW

Transportation research, which demonstrates disparities in transportation availability, consumption patterns, and the burdens borne by men and women, is already substantial and growing, and a variety of factors have been identified as impacting the mode and cost of transportation by gender. These include safety, accessibility, comfort, and environmental concern, income and purpose of travel. The international and national literature provides important usable information on these aspects, and the discussion in this section will be grouped into sections that discuss transport disadvantage for women, gender differences in transport mode and cost, the classification of households to reveal gender differences and the impact of new modes of transport on mobility in South Africa.

2.1 TRANSPORT DISADVANTAGE FOR WOMEN

Earlier research typically identifies the transportation burden as falling disproportionately on women in South Africa (Marais 1987, Mashiri 1997, as cited in Mashiri & Mahapa, 2002; Venter, et al., 2007a). A large body of gender and transport research shows that women, especially more impoverished women, endure a larger transportation burden than males since they travel lengthier distances, and spend more time in travel that is often unpleasant and physically challenging (Venter, et al., 2007a).

Women and men also have different transport needs, one of which is different safety requirements, particularly in developing countries (Alam, et al., 2022; Gonzalez & Alam, 2018; (Mubarok & Suprarman, 2019). This is an acutely pressing issue in the context of transport in South Africa (Thomas, 2016). Further, women are also far less likely than men to have access to transportation, partly because they live in more remote or rural areas, and they may be more income-constrained. Women may also face greater mobility constraints due to the time constraints of their work in social reproduction (including care of children and housekeeping) (Venter, et al., 2007b). Where women are responsible for both household and economic tasks, they may devote a significant amount of time to the transport element of these roles (Pirra, et al.,

2021; Singh, 2019), leaving little time for other productive socioeconomic activities, well-being (Mashiri & Mahapa, 2002) or leisure time. According to studies, urban women's mobility is lower than that of men because of this 'time poverty' (Venter, et al., 2007b).

In comparison to men, women are more likely to trip chain, involving a variety of transport modes, combining errands or other activities into a single excursion rather than returning home between each one, or work closer to home or remain at home altogether. Women have been found to take fewer work trips, but more leisure and errand-related journeys as compared to men (Alam, et al., 2022; Crane, 2007; Ng & Acker, 2018; Singh, 2019; Venter, et al., 2007b).

In most, if not all African cities, women have been found to lag behind men in terms of access to private and public modes of transport (International Network for Transport and Accessibility in Low Income Communities (INTALInC), 2019). This is partly because transportation regulations and policies in numerous countries continue to be blatantly gender-blind (Gonzalez & Alam, 2018), but “transport is not gender-neutral” (Gonzalez & Alam, 2018; para.1). Conventional transport strategies treat groups as homogeneous, ignoring the fact that men and women might have markedly differing transportation and accessibility demands. Even among women needs vary. Additionally, policies frequently conflate people's existing travel patterns with their needs (Alam, et.al., 2022; Ng & Acker, 2018).

Women's mobility limitations create a form of social exclusion, frequently exacerbating gender disparities in the labour market (Duchene, 2011). Access to and usage of transportation infrastructure and modes of mobility are all heavily gendered and gender and gender-based societal norms continue to explain disparities in aspects such as travel, housing, and the labour market. Therefore, it is critical to offer women a variety of mobility options that improve their access to the labour market and other opportunities (Alam, et. Al., 2022; Peters, 2013; Singh, 2019).

2.2 GENDER DIFFERENCES IN TRANSPORT MODE AND COST

Studies document that women in South Africa are more likely to live in low-income households than men. This is partly because average monthly earnings for women

remain lower than that of men in post-apartheid South Africa. Although the gender earnings gap between 1994 and 2017 has decreased considerably, substantial gender disparities remain (Casale, et al., 2021). Given gender differences in economic status, we would expect that expenditure on transportation would comprise a larger share of the budget in households in which women predominate.

However, women are less likely than men to be employed and less likely to be searching for employment (Casale, et al., 2021). They therefore may travel less than men and so spend relatively less on transport. The study by Gandelman et. Al. (2018) for Latin America and the Caribbean found that when a woman heads a single parent family, the expenditure on private transportation accounts for only 7,0% of overall spending, far less than the 11,0% budget allocation made by male single parents. In contrast, public transportation expenditures remain gender neutral, at 3,0% and 4,0% of total spending, respectively.

Households in which women live tend to be larger and have more children than households in which women live. This is partly because, in the context of low marriage rates, children are more likely to live with their mother than their father (Posel & Hall, 2021). According to Hatch and Posel (2018), more than 70% of African children have female caregivers who pay for their schooling. The consequence is that women although women may travel less than men for employment reasons, they would have to bear the cost of transportation to schools. Furthermore, if they are not employed, their reliance on social grant income would mean that transport costs could easily impose a burden on a small budget (Casale, et al., 2021).

Transport costs have been found to be higher for males than females in South Africa, according to data from the 2013 NHTS, except for the 24–34-year-old group, where costs were equal. This finding is however skewed by the use of more expensive private transport by men. When considering only public transport, then the difference between the cost of train transport is 9,7 percentage points more for women than men, travel cost by bus is 3,7 percentage points more for women than men, but taxi cost is 9,0 percentage points less for women than men based on average monthly costs of transport (Statistics South Africa, 2015b). It is not surprising then that taxis are used more commonly by women than men.

Taxis are an accessible mode of public transportation for many commuters due to route flexibility and low pricing and they therefore would be more responsive to women's more dispersed transport behaviours (SA Taxi, 2022; Venter, et al., 2007b). Nearly half of all female travellers, and almost 60% of African female travellers, used taxis for daytrips in 2013 (Statistics South Africa, 2015a). Unfortunately, safety when travelling by taxi is a security concern, particularly for women who risk violence and the possibility of sexual assault(Eagle and Kwele 2019, as cited in Fileborn, et al., 2022). Law enforcement in the minibus taxi sector in South Africa has not been successful, even after numerous attempts at implementing regulation. The inability of the government to regulate this industry remains a significant concern for passengers, industry and society more broadly (Fobosi, 2021; Mmakwena, 2022).

South Africa's geographical and political proliferation, as well as its incessant planning of housing developments away from activity and economic hubs all contribute to a high transportation burden experienced by individuals with low economic status. The geography increases journey durations, there is little competition in more remote areas and the cost of transport is high for those who can least afford it (Mokonyama & Venter, 2018; Mthimkhulu, 2017; Transportation Research Board, 2004; Zhao, Webb, & Shah, 2014). Significant differences in transport costs have been documented across urban and rural areas in South Africa. In 2003, approximately 50% of urban households spent more than a fifth of their reported income on public transport, compared to more than 80% of rural households (NDoT, 2005 as cited in Jennings, 2015).

Transportation is the single household expenditure item in South Africa that has increased significantly over the post-apartheid period, owing primarily to private car purchases (Mokonyama, 2008; Venter, 2011). But even for the poorest twenty percent of families, travel expenditure as a share of the total household budget grew from 4,0% in 1995 to 10,6% in 2005/2006 (Mokonyama, 2008), contributing to a rise in living costs. In 2010/11, transportation expenditure as a percentage of total household expenditure was 17,2% falling slightly in 2014/15, to 16,3% (Statistics South Africa, 2012, 2017).

The overall satisfaction of consumers (users of transport) depends on their ability to maximise their purchasing power in light of the variety of goods and the prices at their

disposal. Thus, demand functions can be thought of as expressions of the conditions under which an index of purchasers' satisfaction is maximised, given the constraints of available money and price (Armington, 1969). As transport costs are a large expenditure item of households, this limits people's access to economic opportunities and basic services, and expenditure on health care, education, and other social amenities is crowded out when transport costs increase (Kane 2006, as cited in Jennings 2015; Alam, et. al., 2022).

2.3 CLASSIFYING HOUSEHOLDS TO REVEAL GENDER DIFFERENCES

This study explores gender differences in transport at the household level. To do so, the approach is drawn from Posel and Hall (2021), who differentiate among households according to the gender of resident adults. They identify three household groupings: those that are female-dominated (where all adults in the household are female), male-dominated (all adults are male) and mixed (both women and men) households. The categories of female-dominated and male-dominated households circumvent many of the problems associated with the categories of female-headed and male-headed households (Posel et al. 2023). In particular, these categories make it possible to compare differences in transport mode and cost across households that rely on the resources only of women, or only of men. (Posel & Hall, 2021). In contrast, a sizeable share of female-headed households includes men.

Posel et al. (2023) show that an increasing share of households in South Africa have become either female- or male-dominated. Their study of national micro-data shows also that when women live without men, they mostly live with children. However, when men live without women, they mostly live alone. They show also that female-dominated households are far more likely to be poor than male-dominated households.

2.4 "NEW" MODES OF TRANSPORT IMPACT IN SOUTH AFRICA

In post-apartheid South Africa, there is the need for improved travel connections that expedite access to employment and educational opportunities. One such initiative is Bus Rapid Transit (BRT) system. Globally, BRT systems have gained favour as a cost-effective option in comparison to far more costly forms of transport. In many countries, investments have been made in BRT systems; these have been designed to be pro-

poor investments, and in many cases they have really been. Systems in cities such as Istanbul, Ahmedabad, Mexico City, Jakarta, Lagos, Bogota and Guangzhou (where the latter two are deemed high-end as a result of the integrated network and excellent facilities), have supplied outlying communities with more affordable, high-quality transportation options, leading to reduced transit times, cost savings, and wait times, and overall yielded acceptable mobility (Jennings, 2015).

In South Africa, in 2013, 71% of commuters who used public transit were transported by minibus taxis, with the South Africa government providing direct subsidies of less than 1% for the minibus taxi industry. Therefore, subsidies primarily help low- and middle-income bus and rail users (Kerr, 2015; 2017).

The Johannesburg BRT system was launched in August 2009. A 10% to 20% savings on public transportation that incorporate time and expense, had been documented by 2011, although these gains primarily flowed to those in the middle-income groups, not to the area's poorest commuters (Venter & Vaz, 2012). This finding would support the argument by Bannister (2018 as cited in Transport Studies Unit, 2018, para. 4) that: "Transport policy and investment do little to alleviate this (transport) disparity; in fact, they exacerbate it!"

Chakwisiza (2011 as cited in Jennings, 2015) was sceptical of whether public transport interventions, such as the Gautrain Rapid Rail Link, the project that provides rapid rail transportation service to the Gauteng region (Railway Technology, 2020) and Rea Vaya, Bus Rapid Transit system serving the serving the City of Johannesburg (Rea Vaya, 2022), have the ability to significantly alleviate public transportation issues for pro-poor areas. This is because organising the routes tends to reinforce the present operating economic routes and corridor services, solidifying the historical geographical and spatial disparity in the area. Mobility disparities are exacerbated since the province's physically varied areas are effectively split into two separate transportation systems (Thomas, 2016).

2.5 CONCLUSION

The Reconstruction and Development Programme (RDP) of 1994 declared that: "The needs of women, children, and disabled people for affordable and safe transport are

important. Adequate public transport at off peak hours, and security measures on late night and isolated routes, must be provided. Additional subsidies for scholars, pensioners, and others with limited incomes will be considered" (ANC, 1994 as cited in Thomas, 2016: 38). In other words, transport, along with other vital social services like healthcare and education, was viewed as an essential human right (Thomas, 2016). This notion continues to be a primary strategic aim of the South African Draft Revised White Paper on National Transport Policy (2017:43) "to promote safe and secure, reliable and sustainable public transport that addresses user needs, including those of commuters, learners, targeted categories of passengers (pensioners, the aged, children, pregnant women, persons with disabilities, tourists) and long-distance passengers".

However, available evidence suggests that women remain disproportionately disadvantaged in terms of transport accessibility and costs, due to the multiple roles that they play in the household, poverty levels, as well as the issues with the spatial legacy of South Africa (Marais, 1987; Mashiri, 2002; Venter et al., 2007). This study adds to this literature, using more recent data, and by investigating gender differences in transport access and transport costs, captured by different household types that have become increasingly common in South Africa.

SECTION 3: RESEARCH METHODOLOGY

3.1 INTRODUCTION

There are two research sub-questions to be answered in this paper to answer the main question: (1) What are the modes of transport used by households, how do these differ by the gender of adults in the household and what factors are associated with any differences that are found? and (2) What are the costs of transport as a share of household expenditure, how do these differ by the gender composition of adults in the household and what factors are associated with any differences that are found?

For the first research sub-question it is expected that female-dominated households (which are less well resourced) will make use of public transport and walking more than male-dominated households. Additionally, it is anticipated that household composition, household geography, household income, and transportation variables such as transportation costs would influence the modes of transport used. This is based on the literature which finds that people who live in poorer and larger households and who live further from urban centres often only have limited options in terms of mode of transport.

For the second sub question, it is expected that travel expenditure as share of the household budget will be higher for female-dominated transport to educational institutions (because their households include more children than male-dominated households) but not to place of employment (because women are less likely than men to work). Similar characteristics as in research sub-question one are expected to influence the cost of transport as a budget share.

To answer the research questions, and test the expected findings, a quantitative research methodology (that comprises an explanatory research design) was used. The following sections of this section describe the research methodology of the study, specifically discussing the data and the data analysis techniques that were used.

3.2 DATA SOURCES

The study makes use of the latest national household travel survey undertaken in South Africa, the South African National Household Travel Survey (NHTS) 2020.

Travel surveys, which have been conducted periodically over the post-apartheid period, are designed to provide a cross-sectional picture of the nature travel in the country as well as to help to project likely travel patterns in the longer term. These surveys are the main source of travel information in South Africa (and in other countries around the world), and they are used by transport planners and policymakers who need recent and detailed information on travel and transportation trends (Stopher, Zhang, Armoogum, & Madre, 2011; U. S. Department of Transportation, 2022).

The NHTS in South Africa is used to identify different transport needs and transport behaviours of people living in South Africa; to understand perceptions of transportation services and amenities; to calculate the cost of transport for the public; and to establish how easily people can access various services (such as places of employment or educational institutions). Similar to those in other countries, the NHTS 2020's objectives have been developed taking into account the South African National Department of Transport (NDoT) policy, strategic, and planning responsibilities in the transportation sector, as well as the requirements of the Medium-Term Strategic Framework (MTSF) 2019–2024 and the requirements of the National Development Plan 2030 (Statistics South Africa, 2021a).

The survey collects information on transportation by land, air, and sea. Land transportation includes non-motorised modes of transportation, such as walking, cycling, or riding in animal-drawn vehicles. Travel includes transport used to educational institutions, workplaces/businesses, services (such as hospitals) and recreational destinations. Most questions that are asked about travel for employment and school transport are applicable to a randomly chosen travel day between Monday and Friday. The survey also collected information on individual and household characteristics, along with general opinions and impressions of transportation availability, services and facilities (Statistics South Africa, 2021c).

The survey covers the whole of South Africa (and was done across all provinces). It targeted all private households and workers residing in hostels, but it excluded other people in other forms of communal living, such as students' hostels, nursing homes, hospitals, prisons, and military barracks. As a result, it is representative of only non-institutionalised and non-military individuals in South Africa. Nonetheless, for this

population, reliable estimates can be produced at the province, district, and municipal levels owing to stratification and sampling procedures (Statistics South Africa, 2021a).

The survey was conducted twice before the 2020 round. In collaboration with Statistics South Africa, the official statistical agency for South Africa, the Department of Transport (DOT) conducted the first National Household Travel Survey (NHTS) in 2003. This survey sampled approximately 50 000 dwelling units (DUs) across the country, and 45 000 DUs were successfully interviewed. Between January and March 2013, the second NHTS was conducted with a sample size of 51 300 DU (Statistics South Africa, 2021b).

3.2.1 SAMPLE DESIGN OF THE NHTS 2020

There were two stages to the NHTS 2020 sample design. Census 2011 enumeration areas (EAs) and pseudo EAs, referred to as sub-EAs, were the primary sampling units. Probability proportionate to size (PPS) sampling was used for sub-EAs in the first phase of this study. This procedure resulted in the selection of a final primary sampling unit (PSU) sample of 6 472 sub-EAs from the final frame for NHTS 2020. Randomised systematic sampling was employed in the second stage to identify residences within each sampled sub-EA. This produced a final sample of 65 523 dwelling units (DUs) (Statistics South Africa, 2021a).

3.2.2 WEIGHTS OF THE NHTS 2020

The NHTS 2020 sample weights were created in such a way that the responses from respondent persons and households could be appropriately extended to represent the corresponding population of individuals and households. Therefore, the sample weights are the product of numerous calculations, including the initial selection probabilities, corrections for excluded dwelling units from the sampling frame, non-response, weight trimming, and benchmarking to known population of person and household estimates, respectively (Statistics South Africa, 2021a).

It should be noted that, while the questionnaire is similar to the 2013 instrument, only a few questions were directly comparable because of minor wording changes and the addition of categories to make the questionnaire more current (Statistics South Africa, 2021a).

3.2.3 SURVEY QUESTIONS RELEVANT TO THE STUDY

The survey questionnaire (structure thereof provided in Appendix A-1) for the NHTS 2020 was split into various sections and subsections. Those key to this study were the Particulars of household section, Section 1 - 6: Person information and travel patterns (Demographic section, Section 1: Section 3: Education and education-related travel patterns, and Section 4: Work-related travel patterns (ask people aged 15 years and above)), Section 7: General household information and Section 8: Household attitudes and perceptions about transport. Furthermore, derived variables by Statistics South Africa were used. Each of the questions and variables used in the study are discussed in detail in Appendix A-2. The section below will discuss the main questions used and problems that were encountered with their use and how the issues were addressed.

To classify households as female- or male-dominated, the study used information on the age of the household member and their gender. This information was used to identify the number of adults in a household, and whether adults were male or female. From this, the household classification based on the presence of resident adults – female-dominated, male-dominated and mixed households – was identified.

The question ‘What are the two main modes of travel that are usually used by the household?’ could not be used to determine the main mode of travel by household type. This is because the question asked for two modes and these were not distinguished (preference 1 and preference 2) in the results. Determining the main mode of transport at a household level was thus problematic. From the survey it was shown that in South Africa, the primary reason for household members to travel was to attend an educational institution. The second most often cited reason for household members to travel was to their usual place of work (Statistics South Africa, 2021a).

Using three transport groupings (public, private and walk), the mode of transport for the two main purposes (school and work) was determined by using the questions ‘What mode of travel did household member use to get to the educational institution on travel day?’ and ‘What mode of travel did household member use to get to his/ her place of employment on travel day?’. These questions were only available from the individual file and not household file. To aggregate to the household level, the mode (as a

measure of central tendency) was used to obtain the most used modality of transport in the household for the purpose of travel. Thereafter, the type of transport (only public and private) was calculated for each purpose by household. The question 'Did household member walk all the way to the educational institution on travel day?' was added to the above result to complete all modes, by indicating if at least one member walked to school all the way. Next aggregation and weighting (using the household weights) could occur to determine shares of modes of transport (walking, public and private) by household type (female-dominated, male-dominated and mixed households).

Public transport is defined as an arrangement of vehicles - for example buses and trains - with scheduled operation times on fixed routes, and that are available for use by the general public (Project Interconnect, 2019). Based on this definition of transport, public transport in the study was identified as travel via train, taxi and bus, and the remainder were classified as private transport. Walking was added to the list and as it was asked as a separate question for transport both to work and to school.

To determine the transport cost share of expenditure by household by purpose (school and work) of travel, the derived variables from the household file 'Total cost to place of employment' and 'Total cost to educational institution' were used. However, when comparing these variables with those of household public transport costs using the questions 'What was the household monthly expenditure on public transport for work-related trips?' and 'What was the household monthly expenditure on public transport for education related trips?' there were clear missing values. The latter was used to impute for missing cost values. After this exercise, transport cost shares of expenditure, by purpose (school and work) of travel, and be household type (female-dominated, male-dominated and mixed households) could be calculated (and weighted).

3.3 DATA ANALYSIS

The methods used to analyse the data and thereby answer the two research sub-questions are descriptive statistics, inferential statistics such as *t*-tests and regression

analysis to isolate the characteristics that are associated with the choice of mode of transport and the cost of transport by household type.

Stata version 16 was used to analyse the survey results of the NHTS 2020 of Statistics South Africa. The study was performed on dichotomous, categorical, and continuous variables.

3.3.1 ANALYSIS TECHNIQUES FOR DESCRIPTIVE STATISTICS

The data was analysed according to each of the sub research questions. In addition to differences in transport mode and expenditure, household types may have differing characteristics which are also associated with transport decisions and budget allocations, and which therefore need to be controlled for. The analysis therefore first involved generating descriptive statistics on household characteristics as well as transport characteristics.

As explained in Chapter two, the study explores gender differences in transport use and expenditure by distinguishing between female-dominated households (where all adults are female), male-dominated households (where all adults are male), and mixed households (where adults include both women and men). Although concern has been expressed about child-headed households in South Africa (Le Roux-Kemp, 2013), the sample of child-dominated households is small (734 households), and they were excluded from the analysis.

The statistics were weighted to present population estimates and standard errors are provided for each variable. For each of the research questions, various analyses and tests were conducted, which are described below.

3.3.2 ANALYSIS TECHNIQUES FOR RESEARCH SUB-QUESTIONS

An explanation of the various techniques used to answer the two research sub-questions will be provided in this section.

Research sub-question 1: What are the modes of transport used by households, how do these differ by the gender of adults in the household and what factors are associated with any differences that are found?

The following statistical methods and tests were used:

First, the differences between household types (female-dominated, male-dominated and mixed households) by mode of transport (public, private and walking) were descriptively tested without controlling for any other differences in, for example, household characteristics such as household size or household income.

Regression analysis - With regression analysis it is possible to test the association between a dependent variable and one or more independent variables. More specifically in this study, a multinomial logistic regression analysis was used. Multiple independent variables are used to predict the probability of category membership of a dependent variable using multinomial logistic regression. Independent variables are dichotomous (i.e., binary) or continuous in scale (i.e., interval or ratio) (Starkweather & Moske, 2011). In this study, a multinomial logistic regression allows for the isolation of household type by controlling for a range of other characteristics that may differ across household type and that may also be correlated with mode of transport choice.

This is a generalized linear model used to estimate probability for *m* categories of a qualitative dependent variable Y, given a set of explanatory factors X:

$Pr\ (Y_{ik}) = Pr\ (Y_i = k \mid x_i; B_1, B_2, \ldots, B_m)$ with $k = 1, 2, \ldots, m$

where B_k is the row vector of regression coefficients of X for the kth category of Y (Chen, et al., 2017). For nominal response variables, multi-category logit models concurrently describe log odds for all pairs of categories.

The outcome response options are the three modes of transport (public transport, private transport and walking), with private transport used as the base outcome. Male-dominated households is the omitted household category, as the main theme of the study is to identify differences between male- and female-dominated households. The independent variables include household characteristics that includes household size, number of children in the household, household income, whether the household receives at least one social grant as source of income.

Two multinomial logistic regressions are estimated: the first with only household types included as independent variables (Mlogit1) and the second includes household

characteristics (Mlogit2). This is done separately for mode of transport to educational institution and mode of transport to place of employment. This is because the question on the main mode of transport asked about the two main modes making aggregating to a single mode impossible. In addition, each 'purpose of travel' section had its own unique mode of transport question. When reviewing the literature, studies on travel to work and to school are prevalent, which aids in the analysis conducted in this project. As stated, from the survey it was shown that in South Africa, the primary reason for household members to travel was to attend an educational institution, followed by travel to their usual place of employment (Statistics South Africa, 2021a).

The marginal effects from these estimations are reported as these describe the average influence of changes in explanatory variables on the change in the probability of outcomes. Marginal effects provide a straightforward and easily interpretable answer to the research question at hand (Norton, et al., 2019). Marginal effects illustrate the shift in likelihood caused by a change of a single unit in a predictor or independent variable. The coefficients are also made available in Appendix B.

Research sub-question 2: What are the costs of transport as a share of household expenditure, how do these differ by the gender composition of adults in the household and what factors are associated with any differences that are found?

As with the previous analysis, the study tests gender differences in budget shares by comparing transport expenditure, as a share of total expenditure between household types (female-dominated, male-dominated and mixed households). Separate analyses are conducted for cost to place of work, cost to school and work combined, and public transport cost first using descriptive methods, without controlling for any other differences in household characteristics. Expenditure rather than income was used to calculate budget shares as it provides a better measure than income of disposable income in the household.

For the multivariate regression analysis, ordinary least squares regressions (OLS) were estimated. OLS regressions were used because the outcome variable – transport budget shares – is continuous, ranging from 0 to 1. The regressions isolate the factors associated with the share of transport cost on expenditure, where the covariates

include the main variables of interest (the household type), as well as the geographical location of the household (rural, with urban as the reference category), the number of dependent children, household monthly income, household size and main types of transport (private and public modes of transport, with walking as the reference category) used by people in the household are the independent variables drawn from the NHTS of 2020. Note that household budget shares of 0 remain in the sample as it may be a valid 0 share where households use walking as a main mode of transport.

3.4 SIGNIFICANCE OF THE STUDY

Studies related to transport in the South African context are of specific importance to the strategic and development duties of the Department of Transport and are used for the Medium-Term Strategic Framework (MTSF) 2019–2024 and provide results for measures in the National Development Plan 2030. These studies may be able to assist in pinpointing disadvantaged areas and transport needs for investment in transport infrastructure (Statistics South Africa, 2021a). Additionally, it may identify key weakness in transport planning and cost structures on specifically women or female-dominated households, which is what this study seeks to uncover. The study seeks to fill the gap in the quantitative literature on the gendered nature of transport challenges in South Africa.

While there has been a great deal of research on the affordability and hindrances to access of transportation for the poor in South Africa, there is a dearth of literature on the disparate impact on women and men. Studies in developing nations have highlighted the daily transportation hardships faced by women (Venter et al., 2007a), where researchers have emphasised the importance of gender considerations while studying present and future transportation difficulties (Thomas, 2016). Potgieter et al (2006:35), as mentioned in Thomas (2016), have suggested that in South Africa, there is “need for a national qualitative and quantitative study that provides insight and baseline data on how issues of transport are gendered and (the) consequences on the quality of lives of women.”

3.5 ETHICAL CONSIDERATIONS

The required Ethics Waiver Form, regarding ethical clearance were completed as per the University of the Witwatersrand process and approved by the School of Economics and Finance Ethics Committee. The public data sets to be used in this study, from Statistics South Africa, have no personal identifiable indicators, and there is no potential harm to individual subjects or individual communities, and no issue of return for consent.

SECTION 4: DATA ANALYSIS AND INTERPRETATION

The previous section described the methodology employed in answering the research question and sub-questions of the study. This section presents the results of the descriptive and multivariate analysis.

4.1 DESCRIPTIVE STATISTICS OF HOUSEHOLD CHARACTERISTICS

A total of 42 138 households responded to the survey (Statistics South Africa, 2021a). However, child-dominated households were excluded as the sample size was too small (734 households), leaving a total of 41 404 households in the unweighted sample for the analysis. The weighted number of households used in the analysis is 16 962 318.

Table 4.1: Household types (%) in South Africa, 2020, unweighted and weighted

Household types	Unweighted (%)	Weighted (%)
Female-dominated	27.00 (0.002)	33.17 (0.002)
Male-dominated	18.63 (0.002)	14.78 (0.002)
Mixed	54.37 (0.002)	52.05 (0.002)
Total	100.00	100.00

Source data: National Household Travel Survey (NHTS) 2020. (Statistics South Africa, 2021d).
Notes: The statistics are weighted (except those explicitly stated unweighted) to present population estimates. Standard errors are in parentheses. Child-headed households have been excluded from the classification. Sample size = 41 404 households.

Table 4.1 shows that almost half of all households in South Africa in 2020 included adults of only one gender. Female-dominated households accounted for almost a third of all households in South Africa and male-dominated households for almost 15% of all households. Only 52% of all households were ‘mixed’, in that they included both women and men.

Female-dominated households on average are larger than male-dominated households (Table 4.2). This is largely because female-dominated households contain a greater number of children (under the age of 18). More than 90% of male-dominated households do not include any children, compared to only 40% and 36% of female-dominated and mixed households, respectively. All household type sizes are significantly different to each other at the 95% confidence level.

Table 4.2: Mean characteristics by household type in South Africa, 2020

Variable	Female-dominated	Male-dominated	Mixed
Household size	2.63 (0.02)	1.41 (0.01)	4.20 (0.01)
Average number of children in households	1.24 (0.01)	0.13 (0.01)	1.42 (0.01)
Households without children (%)	40.22 (0.005)	91.67 (0.003)	36.05 (0.003)
Average household income (R)	5 873 (60.50)	5 380 (83.41)	9 007 (65.48)
Household per capita income	3 148 (41.70)	4 165 (72.42)	2 447 (23.31)
Households with a grant as source of income (%)	47.59 (0.004)	20.19 (0.005)	50.15 (0.003)
Households situated in rural areas (%)	31.73 (0.005)	31.29 (0.006)	29.70 (0.003)

Source data: National Household Travel Survey (NHTS) 2020. (Statistics South Africa, 2021d).
Notes: The statistics are weighted to present population estimates. Standard errors are in parentheses. Child-headed households have been excluded from the classification. Sample size = 41 404

Average household income for female-dominated households is significantly higher than for male-dominated households. However, because male-dominated households are considerably smaller in size, the comparison differs on a per capita household income basis: female-dominated, as well as mixed, households report significantly lower average per capita household income than male-dominated households. Further, considerably higher shares of female-dominated and mixed households have social grants as a source of income, and these shares are significantly different to male-dominated households. These findings are consistent with those reported in Posel and Hall (2021), who identify that female-dominated households and mixed households are more likely to rely on remittances and pensions than in male-dominated households, and they are far less likely to rely on wages or salaries as a main source of income as opposed to male-dominated households.

There are only small differences between the shares of household types in terms of geographic location. However, more female-dominated households live in rural areas than other household types and although small, the difference is statistically significant when compared to male-dominated and particularly mixed households.

4.2 DESCRIPTIVE STATISTICS ON MODE OF TRANSPORT BY HOUSEHOLD TYPE

As shown in Table 4.3, a higher percentage of female-dominated households, overall, use public transport. The percentage point differences are small but still significantly different from mixed households and male-dominated households.

Table 4.3: Mode of transport by household type in South Africa, 2020

Variable	Female-dominated	Male-dominated	Mixed	Total
Public (%)	17.87 (0.004)	16.85 (0.004)	16.25 (0.002)	16.62 (0.002)
Private (%)	25.17 (0.004)	21.48 (0.005)	32.83 (0.003)	28.62 (0.002)
Walking (%)	57.73 (0.005)	61.67 (0.006)	50.92 (0.003)	54.76 (0.002)

Source data: National Household Travel Survey (NHTS) 2020. (Statistics South Africa, 2021d).
Notes: The statistics are weighted to present population estimates. Standard errors are in parentheses. Child-headed households have been excluded from the classification. In the dataset the top two modes of transport is asked in one question without an indication which one is the main one, therefore totals by household type main mode cannot be calculated. Sample size = 41 404

Mixed households are significantly more likely to use private transport than other household types, and they are significantly less likely to walk to their destination than other household types.

Table 4.4: Mode of transport to place of employment by household type in South Africa, 2020

Variable	Female-dominated	Male-dominated	Mixed	Total
Public	38.58 (0.009)	36.83 (0.010)	34.81 (0.005)	36.07 (0.004)
Private	35.67 (0.005)	32.20 (0.005)	46.98 (0.003)	42.03 (0.002)
Walking	25.75 (0.009)	30.97 (0.010)	18.21 (0.005)	21.90 (0.004)
Total	100.00	100.00	100.00	100.00

Source data: National Household Travel Survey (NHTS) 2020. (Statistics South Africa, 2021d).
Notes: The statistics are weighted to present population estimates. Standard errors are in parentheses. Child-headed households have been excluded from the classification. Sample size = 18 553 (Female-dominated = 3 585 Male-dominated = 3 210, Mixed = 11 758)

Tables 4.4 and 4.5 distinguish between mode of transport to employment and educational institutions respectively. Overall, all household types make greater use of public and private transport than walking to place of employment. Compared to both female- and male-dominated households, mixed households (almost 47%) are relatively more likely to use private transport to place of employment. Female-dominated households are also significantly more likely to use public transport than male-dominated households. People in female-dominated and mixed households are significantly less likely to walk to work as opposed to male-dominated households. The

difference between the use of public transport is 1,5 percentage points more for women than men, private transport is 3,5 percentage points more for women than men, but walking is 5,2 percentage points less for women than men.

Walking dominates the mode of transport to educational institutions for all three types of households. According to Statistics South Africa (2021e), the percentage of learners who walked all the way to educational institutions declined from 69% in 2013 to almost 63% in 2020. The main reason for learners walking all the way is due to the fact that learners live close to schools but the second highlights the issue of cost, where taking public transport too expensive. Taxis were the most expensive mode of public transport for learners, with an average monthly cost of R373, followed by bus (R287) and train (R210).

All household types make use of public transport and walking more than private transport to educational institutions. Female-dominated as well as male-dominated households are the least likely to report using private transport to access educational institutions, and the difference with the mixed households are statistically significant. Because of a lack of alternatives, as many as 78 percent of people in Africa utilise walking as their primary mode of transportation each day (UN Habitat, 2022).

Table 4.5: Mode of transport to educational institution by household type in South Africa, 2020

Variable	Female-dominated	Male-dominated	Mixed	Total
Public	21.14 (0.006)	25.49 (0.014)	21.96 (0.004)	21.79 (0.003)
Private	15.96 (0.002)	11.21 (0.005)	20.79 (0.002)	18.74 (0.001)
Walking	62.91 (0.006)	63.30 (0.015)	57.25 (0.004)	59.47 (0.003)
Total	100.00	100.00	100.00	100.00

Source data: National Household Travel Survey (NHTS) 2020. (Statistics South Africa, 2021d).
Notes: The statistics are weighted to present population estimates. Standard errors are in parentheses. Child-headed households have been excluded from the classification. Sample size = 19 613 (Female-dominated = 6 007, Male-dominated = 900, Mixed = 12 706)

4.3 DESCRIPTIVE STATISTICS ON TRANSPORT INFLUENCES

Studies by Mayo and Taboada (2020) in the Cebu metro in the Philippines, Li, et al. (2015) in Beijing and Mokonyama (2008) in South Africa and Uteng and Turner (2019) in India, list key factors that determine the use of transport to include income, age, cost, affordability, availability, safety, comfort, access, distance, vehicle ownership and

environmental costs. In the NHTS (2020), households were asked to indicate the main influences of the choice of mode of transport. As shown in Table 4.6, in 2020, the top three factors were trip cost, journey time, and flexibility. This links well to the notion that high-quality transportation options could lead to reduced transit times, produce cost savings, and limited wait times, and overall yielded acceptable mobility (Jennings, 2015). This order is slightly different to the findings from 2013, where travel time was seen as the most important influence of mode choice by households, followed by travel expense, flexibility and reliability (Statistics South Africa, 2021a). Data limitations on overall time spent on transport (including overall wait times in terms of number of mites or hours), environmental factors and social norms are observed in the data.

Table 4.6: Household transport characteristics by household type in South Africa, 2020

Variable	Female-dominated	Male-dominated	Mixed
Crime	2.31 (0.001)	1.33 (0.001)	1.97 (0.001)
Driver attentiveness	0.68 (0.001)	0.90 (0.001)	0.81 (0.001)
Flexibility	11.67 (0.003)	11.20 (0.003)	12.12 (0.002)
Reliability	11.77 (0.003)	11.40 (0.004)	11.32 (0.002)
Accidents and safety	2.76 (0.001)	1.98 (0.002)	2.43 (0.001)
Comfort	8.06 (0.002)	6.27 (0.003)	10.20 (0.002)
Distance/access to mode	6.18 (0.002)	5.94 (0.003)	5.84 (0.002)
Travel cost	31.06 (0.005)	34.17 (0.005)	29.68 (0.003)
Travel time	23.14 (0.004)	23.89 (0.005)	23.35 (0.003)

Source data: National Household Travel Survey (NHTS) 2020. (Statistics South Africa, 2021d).
Notes: The statistics are weighted to present population estimates. Standard errors are in parentheses. Child-headed households have been excluded from the classification. Sample = 41 404

A higher percentage of male-dominated households identify that their travel mode is associated with travel cost and this is significantly different from mixed households but not female-dominated households. There is little difference in travel time as a factor influencing mode of transport between the household types. A higher percentage of female-dominated households identify that their choice is associated with flexibility and this is significantly different from mixed households but not male-dominated households. Female-dominated households identify reliability as more important and

this percentage is significantly different from both male-dominated and mixed households.

Comfort as a correlate to travel mode is significantly higher for mixed households compared to both male- and female-dominated households. Poor women, according to research on gender and mobility, are more likely to drive lengthier distances, utilise more unpleasant and physically exhausting modes of transportation, and spend more time thereon (Venter, et al., 2007a).

Distance/access to mode of transport, crime, driver attentiveness and safety percentages are low across all household types. A higher percentage of female-dominated households identify that their choice in mode of transport is associated with distance/access to mode of transport and this is statistically significant different from mixed households but not male-dominated households. The difference between households regarding crime is not statistically significant as a factor influencing mode of travel. However, for driver attentiveness and safety, there is a significant difference between male-dominated households and mixed households and female-dominated households and mixed households. Safety as a correlate of mode of transport was higher for female-dominated households than other household types. In South Africa, concerns about transportation safety continue to be a significant issue for women, particularly the fear of sexual assault (Saferspaces, 2021). Females and males have diverse transport needs and patterns (Gonzalez & Alam, 2018), one of which are safety requirements (Mubarok & Suprarman, 2019).

The modes of transport used by households differ as per the descriptive analysis. Overall, all household types make use of various modes of transport for various purposes. Further, the factors that are related to the use of mode of transport differ between household types. The descriptive analysis therefore offers some support for research sub-question 1: *What are the modes of transport used by households, how do these differ by the gender of adults in the household and what factors are associated with any differences that are found?*

4.4 DESCRIPTIVE STATISTICS ON SHARE OF INCOME AND EXPENDITURE ON TRANSPORT

Transport budgets shares to an educational institution are higher for female-dominated households than male-dominated and mixed households (Table 4.7). Family structure can have an impact on budget allocation, especially transportation spending (Gandelman, et al., 2018).

Table 4.7: Transport cost as a share of expenditure by household type in South Africa, 2020 (including households that spend nothing on transport)

Transport cost	Female-dominated	Male-dominated	Mixed	Total
Transport cost as a % of expenditure - to educational institution	6.15 (0.15)	1.67 (0.10)	5.54 (0.10)	4.94 (0.07)
Transport cost as a % of expenditure - to place of employment	8.73 (0.18)	11.96 (0.27)	13.20 (0.14)	11.88 (0.10)
Transport cost as a % of expenditure - to and work combined*	13.52 (0.21)	12.66 (0.27)	17.79 (0.17)	15.97 (0.12)
Transport cost as a % of expenditure - public transport	16.66 (0.18)	17.79 (0.24)	14.03 (0.13)	15.32 (0.09)

Source data: National Household Travel Survey (NHTS) 2020. (Statistics South Africa, 2021d).
Notes: The statistics are weighted to present population estimates. Standard errors are in parentheses. Child-headed households have been excluded from the classification. *Derived calculation. Sample size 41 404.

The analysis also shows that transport costs to educational institutions as a share of expenditure for female-dominated households are statistically different to that of male-dominated households (4,48 percentage points greater). From the descriptive statistics it was shown that there are more children in female-dominated households than male-dominated households, therefore it is expected that transport costs to educational institutions are higher for female-dominated households than male-dominated households.

The budget share spent on transport to place of employment in female-dominated households is significantly different to that of male-dominated and mixed households, with male-dominated and mixed households paying 3.2 and 4.5 percentage points more respectively than female-dominated households. Public transport costs as a share of expenditure are significantly higher for male-dominated households than female-dominated and mixed households.

In summary, transport costs as a share of expenditure to educational institutions are significantly higher for female-dominated households than male-dominated households, but the opposite holds for transport to work. However, when these elements are combined, female-dominated households spend relatively more of their income than male-dominated households, but less than mixed households. The descriptive analysis therefore partially supports the expected outcome that women, on average, live in households where a greater proportion of money is spent on transportation than men.

The two specific research questions are further explored in a multivariate context using regression analysis.

4.5 REGRESSION ANALYSIS

The regression analysis aims to answer the research questions first by using a multinomial logistic regression to test whether there are differences between the modes of transport used by the various types of households and which factors are associated with the use of mode. Then an OLS regression is used to estimate whether there is a difference of transport cost as share of budget and which factors are associated with cost of transport shares.

4.5.1 MODE OF TRANSPORT

The factors that are associated with each mode of transport are estimated in two multinomial regressions for transport to educational institutions and for transport to place of employment. The multinomial logit models were performed to establish the presence of significant associations between the dependent (mode of transport) for each purpose of transport and independent (household) factors and to estimate the likelihood that one mode of transport would be chosen over another. This type of analysis has been used for various studies in transports, such as a study in Hungary to connect transport mode selection and travel behaviour (Al-Salih & Esztergár-Kiss, 2021), in a European study on children's mobility to school (Masoumi, van Rooijen, & Sierpiński, 2020) and to determine the influence of activity behaviour on transport mode selection and use in Cape Town (Viljoen, 2021), among others.

The first regression only includes household types (Mlogit1) and the second adds household characteristics (Mlogit2).

The marginal effects reported in Table 4.8 show that there is no significant difference between female-dominated and male-dominated households in the *mode of transport to educational institutions* when other differences between these household types are not controlled for. Mlogit2, however, shows that compared to male-dominated household members, people in female-dominated households are significantly less likely to walk and significantly more likely to use private transport. This possibly corresponds to Hunter (2019, as cited in Freund, 2020), who indicated that long distances are travelled to what are termed 'Model C' schools in traditionally good neighbourhoods as opposed to South African state schools in the area of residence.

Mixed households are also significantly less likely than male-dominated households to use walking as the main transport mode to educational institutions and more likely to use private transport, and this finding is present even without any controls for household and transport characteristics. The modes of travel to educational institutions are therefore distinctive among male-dominated households in South Africa.

Turning to the other covariates that were included in the regressions, the marginal effects show that the average number of children in a household is a significant predictor of all modes of transport. Households with more children are less likely to use public transport modes and are more likely to report walking as the main mode of transport to educational institutions. Larger households as a result are less likely to make use of public and private transport.

Average household income is a significant predictor of all modes of transport. As household income increases, so the probability of walking to an educational institution falls, and the probability of using private transport, in particular, increases. Further evidence of the relationship between socio-economic status and transport mode is found in the relationship between social grant receipt and type of transport: households with at least one grant recipient are significantly more likely to report walking as the mode of transport and significantly less likely to use public transport as well as private transport to educational institutions.

Geographical location is also a significant predictor of mode of transport to an educational institution: walking is more likely to be used and public transport is less likely to be used in a rural area (compared to an urban area). The distribution of people geographically and across social classes is one of the key underlying factors that influences the relationship between inequality and transportation (Gates et al., 2019).

Travel cost is a significant predictor of walking and public transport modes to educational institutions. Increased travel cost is more likely to result in decreased use of public transport and more likely to increase walking as a mode of transport. Flexibility is a significant predictor of private transport, as overall transport flexibility increases the use of private transport is likely to decrease.

Findings are reported in table 4.9, for regressions which predict the *mode of transport to place of work.* Private transport is less common and public transport is more common in female-dominated households compared to male-dominated households without the inclusion of controls. Like the analysis of mode of transport to school, mixed households are significantly less likely than male-dominated households to use walking as the main transport mode to work and more likely to use private transport.

Similar to the analysis of transport to an educational institution, the average number of children in a household is a significant predictor of all types of transport. Moreover, household size is a significant positive and negative predictor respectively of public transport and private transport modes, whereas there was no significant relationship for the walking to work. As the household increases in size, the use of private transport is likely to decrease and public transport likely to increase.

Average household income is a significant predictor of all modes of transport for mode of transport to work, as it was for mode of transport to school, but the relationship with private transport appears stronger for travel to work than for educational purposes. Geographical location is also a significant predictor of all transport modes. Like transport to educational institutions, people in rural households are less likely to use public and private transport as mode to work but more likely to walk.

Table 4.8: Mode of transport to educational institution – marginal effects after multinomial regressions

Variables	Mlogit1			Mlogit2		
	Public	**Private**	**Walking**	**Public**	**Private**	**Walking**
Female-dominated households	-0.032 (0.022)	0.026 (0.027)	-0.007 (0.027)	0.030 (0.025)	0.082** (0.025)	-0.111*** (0.026)
Mixed households	-0.030 (0.021)	0.126*** (0.026)	-0.096*** (0.026)	-0.015 (0.025)	0.110*** (0.025)	-0.095*** (0.026)
Average number of children in households				-0.050*** (0.006)	0.012* (0.006)	0.037*** (0.006)
Household size				0.015*** (0.004)	-0.019*** (0.004)	0.004 (0.004)
Average household income (log)				0.026*** (0.005)	0.102*** (0.006)	-0.129*** (0.005)
Grant recipient				-0.069*** (0.012)	-0.089*** (0.012)	0.157*** (0.013)
Households situated in rural areas				-0.037*** 0.010	-0.001 0.009	0.089*** 0.010

Source data: National Household Travel Survey (NHTS) 2020. (Statistics South Africa, 2021d).

Notes: The data are weighted using population weights. The omitted categories are male-dominated households, households with no grant recipients and households situated in urban areas. Standard errors are in parentheses. The marginal effects are calculated as a change in the probability of mode of transport for a one–unit change in the continuous variables and for a discrete change in the dummy variables. * p < 0.05, ** p < 0.01, *** p < 0.001.* p < 0.05, ** p < 0.01, *** p < 0.001. Sample size= 41 404 (without non-responses school sample = 35 029)

Table 4.9: Mode of transport to place of employment – marginal effects after multinomial regressions

Variables	Mlogit1			Mlogit2		
	Public	**Private**	**Walking**	**Public**	**Private**	**Walking**
Female-dominated households	0.751***	-0.053**	-0.022	0.034	-0.000	-0.033*
	(0.017)	(0.018)	(0.012)	(0.018)	(0.017)	(0.013)
Mixed households	-0.020	0.142***	-0.121***	-0.054**	0.114***	-0.061***
	(0.014)	(0.014)	(0.009)	(0.017)	(0.015)	(0.012)
Average number of children in households				-0.028***	0.012	0.016**
				(0.007)	(0.007)	(0.005)
Household size				0.026***	-0.015**	-0.010**
				(0.005)	(0.005)	(0.004)
Average household income				-0.060***	0.191***	-0.131***
				(0.005)	(0.005)	(0.004)
Grant recipient				0.063***	-0.082***	0.018
				(0.014)	(0.013)	(0.010)
Households situated in rural areas				-0.083***	-0.055***	0.137***
				(0.011)	(0.013)	(0.007)

Source data: National Household Travel Survey (NHTS) 2020. (Statistics South Africa, 2021d).

Notes: The data are weighted using population weights. The omitted categories are male-dominated households, households with no grant recipients and households situated in urban areas. Standard errors are in parentheses. The marginal effects are calculated as a change in the probability of mode of transport for a one–unit change in the continuous variables and for a discrete change in the dummy variables. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Sample size= 41 404 (without non-responses work sample size = 34 304)

4.5.2 EXPENDITURE ON TRANSPORT

To test whether budget shares on transport differ across household types, and to identify other factors that are associated with different budget allocations, a series of OLS regressions were estimated. The outcome variable is transport cost as a share of household expenditure and as in the previous set of estimations, the main variables of interest are the household types (with male-dominated households as the omitted type). Other covariates include household characteristics (as in the previous regression) and, modes of transport.

Compared to male-dominated households, female-dominated, pay significantly more on *transport to schools* as a share of household expenditure, but not on *transport to work.* Mixed households pay significantly more than male-dominated households on transport to work, but significantly less on transport to educational institutions.

When households are situated in a rural area they spend less on transport as a share of expenditure than when living in an urban area for both purposes of transport. Also, households with more children spend a larger share of the budget on travel to school. In terms of household size, households spend relatively more for transport to both school and work, as the household size increases.

Table 4.10: Factors that are associated with the cost of transport as a share of expenditure

	Regression 1: Transport to school budget share		Regression 2: Transport to work budget share	
Variables	**Coef.**	**Std. Err.**	**Coef.**	**Std. Err.**
Female-dominated households	0.956	0.011	-0.839	0.017
Mixed households	-0.653	0.011	0.227	0.018
Households situated in rural areas	-0.508	0.007	-3.361	0.012
Average number of children in households	0.077	0.005	-1.135	0.007
Household size	0.797	0.004	1.135	0.006
Average household income (log)	-1.167	0.003	2.093	0.005
Grant recipient	0.584	0.008	-3.860	0.013
Private travel mode	9.807	0.013	-0.549	0.020
Public travel mode	17.420	0.011	2.964	0.018
Constant	9.385	0.029	-5.027	0.046
r^2	0.2125		0.0585	

Source data: Statistics South Africa (2021) National Household Travel Survey (NHTS) 2020.
Notes: The data are weighted using population weights. The omitted categories are male-dominated households, households with no grant recipients, households without children, households situated in urban areas and households in which walking was the main mode of transport. Sample size= 41 404 (non-responses removed work sample size = 34 304; school sample = 35 029)

As income increases, the share of transport costs decreases for transport to school. However, for transport to work, the cost share increases as income rises. Vehicle ownership (purchase) may have a substantial impact on cost of transport (Mokonyama, 2008). The presence of a grant recipient in the household is associated with higher budget shares on transport to school but has an opposite effect on transport to work. This may be because grants are often received by those not in the labour force (children's primary caregiver and the elderly).

Households pay significantly more when using public and private transport to travel to school as well as for travel to work via public transport than those walking. The subsequent chapter will discuss the results and provide a conclusion and recommendations.

SECTION 5: DISCUSSION AND CONCLUSION

5.1 DISCUSSION

The aim of this research report was to compare gender differences in mode of transport and expenditure on transport in South Africa. There has been substantial research into the costs and accessibility of transportation for the poor in South Africa; however, there has been little research into the gendered nature of transport disadvantage (Thomas, 2016).

To compare gender differences in mode of transport and expenditure on transport in South Africa, households were divided into female-dominated (all adults in households are female), male-dominated (all adults in households are male) and mixed households (where there are both female and male adults present in households). This classification was used rather than the typical head of household classification. By using the 'dominant' household classification, the use of self-reported data on headship is not required and households that rely on income received by women can be more clearly delineated (Posel & Hall, 2021).

To analyse the main research question, two sub questions were identified and answered using the National Household Travel Survey (NHTS) 2020. The purpose of the survey, conducted by Statistics South Africa, was to identify household and individual transportation requirements and behaviours, to obtain views of transport services and amenities, to quantify transport cost and determine how readily individuals can use and access various transport services (Statistics South Africa, 2021a).

For the first research sub-question, to determine the modes of transport used by households, it was expected that female-dominated households would rely more on public transport and walking as modes of transport than male-dominated households. Further it was anticipated that household composition, location, income, and transportation factors would be related to the modes of transport used. For the second research sub-question, to determine the transport budget share by household type and how it differs by gender, it was expected that female-dominated households pay more

for transport as a share of expenditure than male-dominated and mixed households, and that similar characteristics as in research sub-question one would be associated with the cost of transport as a share of the household budget.

Generally, findings for the mode of transport are largely similar for both purposes of transport. There is no significant difference between female-dominated and male-dominated households in the *mode of transport to educational institutions* when other differences between household types are not controlled for. But, once these characteristics are included, compared to male-dominated household members, female-dominated household members are significantly less likely to walk and significantly more likely to use public transport. Similar findings are reported for the *mode of transport to place of work.* Studies cited in Pirra, et al. (2021) also identify that woman are more likely to use public transport than men. Women in Thailand, Malaysia and India were more likely to use public transport than men (Satiennam et al., 2011; Nurdden, 2007; Thamizh, Arasan and Vedagiri, 2009 as cited in Mayo & Taboada, 2020).

In a survey of 19 cities by Goel, et al. (2022) it was found that in every city, women were more likely than men to walk and, in the majority of cities, to take public transportation. However, in the analysis for South Africa it was found that people in female-dominated households were less likely to walk as a mode of transport to work than male-dominated households. A possible explanation for the different finding in South Africa is that men may be more likely than women to live at, or close to, their place of employment (for example those employed in mining and commercial farming, which are both male-dominated employment types). However, further research needs to be conducted to explore this finding.

Compared to male-dominated households, female-dominated, pay significantly more on transport to schools as a share of household expenditure. This is also the case for transport to work, although the estimated coefficient is small and but significant at the 95% level. According to research done in rural Yemen, women spend 50% more than men for school transportation since they must rely on more costly, covered forms of transport (Aloul, et al., 2018). These costly forms are also known as a ‘pink tax’ for transport (Kaufman, 2019). Transport costs can account for a substantial share of

household income and can be a financial strain for lower-income households (Aloul, et al., 2018), such as female-dominated households.

The socio-demographic profile of commuters also impacts a traveller's preference (Mayo & Taboada, 2020). In this study, it was found that households with at least one grant recipient are significantly more likely to report walking as a mode of transport and significantly less likely to report public and private transport modes to educational institutions. This is expected as a larger share of social grant recipients are women, and generally women are more likely than males to be poor, with more children in their households (Casale, et al., 2021; Posel & Hall, 2021). Further, the presence of a grant recipient in the household is associated with higher budget shares on transport to school but has an opposite relationship in transport to work. This is because grants are often received by those not in the labour force (full-time caregivers to children and the elderly) (Moore & Seekings, 2019).

Average household income is a significant predictor of all modes of transport for all travel purposes. As household income rises, the probability of walking to an educational institution and place of employment falls and it is more likely that household members will use public and/or private modes of travel. The probability of using private transport, in particular, seems stronger for travel to work than for educational purposes. Urban transportation planning and policymaking continue to be guided by the norms created in the industrialised world, with a bias toward work trips performed by motorised modes of transport (Singh, 2019). Also, as income increases, the budget share of transport costs declines for school transport, but for work transport, the cost share increases as income rises. According to Dargay (2001), car ownership reacts more robustly to rising than to falling income. Various surveys in Turkmenistan, Indonesia, Japan, and Taiwan, as cited by Singh (2019) and Mayo and Taboada (2020), indicate that more men drive cars compared to women. Women also have less access to private, more efficient forms of transport due to their lower financial resources (Singh, 2019). Women may also find it more difficult to meet the costs of car acquisition and maintenance than men do, owing to their lower average wages (Manatū Wāhine Ministry for Women, 2022).

The analysis also found that children and workers in rural areas are more likely to walk to school and work, and less likely to use public transport. There are limited public transport options in rural areas (Litman, 2017), which is why walking is more likely in rural compared to urban areas. These households are also more likely to make use of private transport. Rural inhabitants rely more on individually owned vehicles for mobility than urban residents; however, many are unable to use this transport mode as vehicles are costly to buy and maintain (The Rural Health Information Hub, 2022).

5.2 POLICY CONSIDERATIONS

Despite a plethora of gender-sensitive legislation and programs aimed at women and the poorest, South Africa's face of poverty remains female and African (Ndinda & Nwosu, 2018). This is also the case in transport inequality. Addressing mobility equality is critical to enhance access to work, education and other services, and thereby to increase social productivity and economic growth (Sing, 2019).

In Tamil Nadu, in India, a scheme was introduced that allows all working females (approximately 7,8 million women) in the state to travel free of cost in state-owned city and municipal buses (Durai, 2021), joining Delhi that also provides free transport (Intelligent Transport, 2019). The Delhi scheme has provided this service to 3 crore (30 million) women since 2019 (The Economic Times, 2022). Most of these initiatives were implemented for safety reasons (Durai, 2021). While these steps are not panaceas, they do make it feasible to secure the safety of women (Duchene, 2011), and improve access and save costs. As part of the descriptive analysis, it was found that safety as a correlate of mode of transport was higher for female-dominated households than other household types. In South Africa, safety is a key concern that disproportionately impacts women and girls, particularly the threat of sexual violence (Saferspaces, 2021; Statistic South Africa, 2021e). Typically, transportation infrastructure and services are developed without regard for gender roles and requirements, and the absence of transportation infrastructure that takes women's safety needs into account has a detrimental impact the earnings and security of women (Matthews, 2017).

Leadership must reflect a varied range of perspectives. Women and persons of colour typically are underrepresented in transport decision-making processes (Kaufman,

2019). Women's presence in transport decision-making organisations across Africa must be significantly increased (Porter, et al., 2021). At the 2015 Women in Transport Summit, one of the outcomes required was a detailed plan to increase women's presence at all levels in all facets of the transportation business, especially in decision-making processes in South Africa (Department of Transport, 2015).

5.3 LIMITATIONS TO THE STUDY

The research undertaken for this report has a number of limitations. In particular, the study was not able to explore dynamics *within* households. For example, it is possible that within mixed households, only men use the car, or they get the first right to car use (Pirra, et al., 2021). Also, women are not a monolithic group, and in addition to the variables that were used in the analysis, a range of other social identities (such as handicap status and ethnic origin, distance to facilities as well other geographical factors) are likely to play a role in women's travel behaviour and transportation demands (Hamilton, et al., 2005), that could be analysed in future research. For example, belonging to a minority ethnic group or being a migrant may pose particular challenges for women (and children), which are rarely explored due to the lack of data (Pirra, et al., 2021).

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Appendix A-1: Questionnaire structure

Section	Number of questions 2020	Details of each section
Cover page	16	Household information, response details, field staff information, result codes, etc.
Person information	17	Demographic information (name, sex, age, population group, etc.)
Part 01: Individual Respondent		
Section 1	5	General health and functioning, social grants and social relief (5 years and older)
Section 2	6	General travel patterns
Section 3	20	Education and education-related travel patterns
Section 4	34	Work-related travel patterns (ask people aged 15 years and above)
Section 5	5	Business trips
Section 6	12	Other travel patterns
Part 02: Household		
Section 7	12	General household information
Section 8	20	Household attitudes and perceptions about transport
Survey Officer Questions	5	Survey officer to answer questions
All sections	**305**	

Source: (Statistics South Africa, 2021a)

Appendix A-2: Relevant survey questions to analysis, use thereof and issues and adjustments

Questionnaire section and subsections	Question number and question (provided exactly as in the NHTS 2020 questionnaire)	Use	Variable name in STATA dataset	Issues and adjustments
Particulars of household section	3. Total number of persons in this household.	To obtain household size as characteristic that is associated with household mode and expenditure on transport.	Hsize	None required
Section 1 - 6: Person information and travel patterns Demographic section	C. Is %rostertitle% a male or a female?	Used with age variable to derive household types	Age	None required
	D(ii). What is %rostertitle% age in completed years?	Used with gender variable to derive household types. Also used to determine the number of children by household type and the number of households by type that do not have children as part of the household characteristic variables that is associated with household mode and expenditure on transport	Sex	None required
Section 1 - 6: person information and travel patterns Section 1: General health and functioning, social grants and social relief	1.4 Does %rostertitle% receive a social grant or social relief assistance from the Government?	To obtain information on whether at least one person in the household a grant recipient as a characteristic is that is associated with household mode and expenditure on transport	Q14Grant	Derive from individual file a household statistic. If at least one person in the household is a grant recipient, then 1 else 0.
Section 1 - 6: Person information and travel patterns Section 3: Education and education-related travel patterns	3.4 Did %rostertitle% walk all the way to the educational institution on %TravelDay%?	Used to add to mode of transport to educational institution	Q34Walk2schl	None required
	3.9 Did %rostertitle% drive all the way to the educational institution on %TravelDay%?on %TravelDay%?	Used to add to mode of transport to educational institution	Q39Drive	None required

Questionnaire section and subsections	Question number and question (provided exactly as in the NHTS 2020 questionnaire)	Use	Variable name in STATA dataset	Issues and adjustments
	3.18 What mode of travel did %rostertitle% use to get to the educational institution on %TravelDay%?	Used to determine mode of transport to educational institution by household type.	Q318Mode1Trv	Mode of transport is split in public, private and walking. Walking in Q3.4 is added to this variable to cover all modes of transport.
Section 1 - 6: Person information and travel patterns Section 4: Work-related travel patterns (ask people aged 15 years and above)	4.16 Did %rostertitle% walk all the way to work on %TravelDay%?	Used to add to mode of transport to place of employment	Q416Walk	None required
	4.19 Did %rostertitle% drive all the way to work on %TravelDay%?	Used to add to mode of transport to place of employment	Q419Drive	None required
	4.29 What mode of travel did %rostertitle% use to get to his/ her place of employment on %TravelDay%?	Used to determine mode of transport to place of employment by household type.	Q429Mode1Trv	Mode of transport is split in public, private and walking. Walking in Q4.16 and driving in Q4.19 is added to this variable to cover all modes of transport.
Section 7: General household information	7.1 Which of the following sources of income does the household have?	Used to determine whether households have at least one grant recipient. A control variable to check consistency with variable in Q1.4.	Q71IncomeSo__6	None required
	7.3 Thinking of all sources of income, what is the total income of the household per month?	Used to calculate average and per capita income by household type	Q412Incomecat	Household incomes are provided in income brackets. For each bracket the midpoint was used, except for the last bracket for which the starting point was used.
	7.5 What was the total household expenditure in the last month?	Used in the calculation of transport cost as a percentage of household expenditure by household type (denominator).	Q75TotExpenditure	Household expenditures are provided in income brackets. For each bracket the midpoint was used, apart from the last bracket for

Questionnaire section and subsections	Question number and question (provided exactly as in the NHTS 2020 questionnaire)	Use	Variable name in STATA dataset	Issues and adjustments
				which the starting point was used.
	7.5.1 What was the total monthly household expenditure on public transport?	Used to determine cost of public transport as a share of expenditure by household type.	Q751PubTranExp	None required
	7.5.1a What was the household monthly expenditure on public transport for work-related trips?	Used in the variable total cost to place of employment (derived by Stats SA) to household, where missing values were present and did not correspond to data.	Q751aWorkexp	None required
	7.5.1b What was the household monthly expenditure on public transport for education related trips?	Used in the variable total monthly expenditure (derived by Stats SA) to household, where missing values were present and did not correspond to data.	Q751bEduExp	None required
Section 8: Household attitudes and perceptions about Transport	8.1 What are the two main modes of travel that are usually used by the household?	This variable indicates the main modes used by households.	Q81_Modes1 to Q81_Modes29	As two main modes were required the data by mode could not be aggregated to percentage by transport mode type but only by household type.
	8.2 When travelling, which main factor influences your household's choice of mode of travel most?	These are the variables used as transport variables that are related to mode and cost of transport.	Q82Choice	Change to binary for analysis (1=yes and 0=no)
Other variables derived by Statistics South Africa from data used in analysis	Weights (household)	Used to aggregate estimates to population level.	Weight	None required
	Total cost to place of employment	Used to determine cost of transport to place of employment as a share of expenditure by household type.	S4tot_wrk_trav_cost	Q751aWorkexp is combined with this data where missing values are present

Questionnaire section and subsections	Question number and question (provided exactly as in the NHTS 2020 questionnaire)	Use	Variable name in STATA dataset	Issues and adjustments
	Total cost to educational institution	Used to determine cost of transport to educational institution as a share of expenditure by household type.	S3tot_edu_trav_cost	Q751aEduExp is combined with this data where missing values are present
	Geography type	Used to determine whether household is situated in urban or rural area.	Geo_type	Change to binary for analysis (1=rural and 0=urban)

Source data: National Household Travel Survey (NHTS) 2020. (Statistics South Africa, 2020)
** All variables recorded as 'Did not know' and 'Refused' was excluded from the sample
* %rostertitle% refers to person or person number in a household in the survey as in the NHTS 2020 questionnaire
* %TravelDay% is a random travel day selected as in the NHTS 2020 questionnaire
** All 'do not know' and 'refused' observations were recoded to (.) from variables in use

Appendix B-1: Multinomial logit regression of mode of transport to educational institution using private transport mode as baseline

	Mlogit1				Mlogit2			
	Public		Walking		Public		Walking	
	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Female dominated households	-0.272	0.196	-0.113	0.169	-0.394	0.233	-0,826***	0.209
Mixed households	-0,752***	0.187	-0,783***	0.161	-0,775***	0.229	-0,967***	0.207
constant	0,687***	0.182	1,633***	0.156	5,279***	0.509	9,318***	0.472
Average number of children in households					-0,299***	0.054	0.019	0.047
Average household income					-0,548***	0.054	-1,007***	0.050
Households situated in rural areas					-0.147	0.082	0.119	0.071
Household size					0,190***	0.038	0,135***	0.033
Grant recipient households					0,272*	0.108	0,995***	0.102

Source data: National Household Travel Survey (NHTS) 2020. (Statistics South Africa, 2021d).
Notes: The data are weighted using population weights. Child-headed households have been excluded from the classification.
The omitted categories are male-dominated households, households with no grant recipients and households situated in urban areas. Standard errors are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Appendix B-2: Multinomial logit regression of mode of transport to place of work using private transport mode as baseline

	Mlogit1				Mlogit2			
	Public		Walking		Public		Walking	
	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Female dominated households	0,340***	0.087	0.020	0.085	0.082	0.100	-0.178	0.113
Mixed households	-0,393***	0.069	-0,916***	0.066	-0,561***	0.091	-0,760***	0.101
constant	-0.001	0.062	-0.101	0.057	7,470***	0.330	11,843	0.399
Average number of children in households					-0,113**	0.042	0.043	0.045
Average household income					-0,864***	0.037	-1,428***	0.046
Households situated in rural areas					0.009	0.061	0,952***	0.066
Household size					0,120***	0.031	0.003	0.033
Grant recipient households					0,461***	0.077	0,410***	0.089

Source data: National Household Travel Survey (NHTS) 2020. (Statistics South Africa, 2021d).
Notes: The data are weighted using population weights. Child-headed households have been excluded from the classification.
The omitted categories are male-dominated households, households with no grant recipients and households situated in urban areas. Standard errors are in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.