



**Investigating Impact of coronavirus lockdown regulations on public transport operations  
recovery of eThekweni Municipality**

by

**Nkosinathi Dube**

**218050854**

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**Supervisor: Dr Tony Ngwenya**

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## **ABSTRACT**

The COVID-19 pandemic prompted worldwide lockdown measures, significantly impacting public transportation systems. This study examines the effects of lockdown regulations on public transport operations in eThekweni Municipality, South Africa, and assesses potential solutions. Using a quantitative approach, a survey was conducted with 50 randomly selected residents of eThekweni Municipality. The results reveal that awareness and preparedness are the primary factors influencing the impact of COVID-19 lockdown regulations on public transport activities. Additionally, demographic factors such as age, ethnicity, and years of experience were found to influence attitudes, preparedness, awareness, and responsibility towards public transportation during the lockdown. The study recommends enhancing staff training and developing capabilities to handle pandemic-related impacts in the transport sector. This research contributes valuable insights to assist decision-makers in eThekweni Municipality in making informed choices regarding transportation service delivery in the context of public health crises

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## **GLOSSARY**

PT – Public Transport

TUMI – Transformative Urban Mobility Initiative

PRASA – Passenger Rail Agency of South Africa

DOT – Department of Transport

ADTT – Average Daily Truck Traffic

EBITDA - Earnings Before Interest, Taxes, Depreciation, and Amortization

SPSS – Statistical Product and Service Solutions

# **CHAPTER ONE: INTRODUCTION**

## **1.1 Introduction**

Lockdown measures have been introduced worldwide to respond to the outbreak of Corona Virus. The main reason for introducing lockdown regulations was to comprehend the transmission of COVID-19 and limit people's movement. When the lockdown commenced most industries, especially in South Africa, were in a total shutdown except industries that provided essential services during the unprecedented times of COVID-19. The Republic of South African government is made up of the three government spheres (Mohr, 2019). These spheres include the national, provincial, and local government sphere. In this regard, the local government handbook (2014) states that there are two hundred and seventy-eight (278) constitutionalized municipalities in South Africa that are expected to deliver transport services, sanitation services etc. these two hundred and seventy-eight municipalities consist of eight metropolitan municipalities, forty-four district municipalities and two hundred and twenty-six local municipalities (LGH, 2014).

Municipalities play a crucial role when it comes to public service delivery; however, they are embroiled in serious challenges (Nombembe, 2012: 1). The challenges facing the municipalities include poorly managed financial resources, poor control over transport operations, endeavours to improve the audit outcomes, weakening travel and tourism services due to COVID-19 pandemic etc. (Audit to build public confidence, 2011: 19).

This research study examines how the COVID-19 pandemic has affected eThekweni municipality transport services. According to the literature assessment, the public transport system in eThekweni Municipality has struggled since the COVID-19 pandemic (Luke, 2020). The researcher has worked hard on this research. Ethekewini Municipality (2021: 200) reports that COVID-19 has disrupted transport. This is because some Durban and other companies have allowed remote work.

The eThekweni Municipality Economic Recovery Plan (2021: 2) indicates that the public transport industry has suffered under the COVID-19 pandemic period due to the lockdown regulations which have forced both taxi and bus operations to be conducted at lower capacities during this unprecedented time.

Luke (2020) indicates that the lockdown regulations have forced other companies to allow their workers to stay at home except for those who conduct essential services. For this reason, the

revenues in the transport department of eThekweni Municipality started to shrink significantly (eThekweni Municipality Economic Recovery Plan 2021: 5). Therefore, it is now clear that the basic need for the transport department is to find ways to make additional revenues to make up for the lost revenues.

Nelisiwe Peggy Nkonyeni, Kwa-Zulu Natal's MEC for Transport, Community Safety, and Liaison (TCSL), stated the COVID-19 pandemic lockdown legislation has affected public transport. She stressed the need for new methods to address the epidemic's economic effects. Her discourse addressed economic difficulties. Thus, a research study on how the COVID-19 pandemic restrictions affect community transport operations is crucial. The COVID-19 Pandemic lockdown regulations have affected public transport in eThekweni Municipality for years. This study project analyses the research problem and gap caused by these laws. This inquiry also seeks to determine if lockdown protocols had a greater impact on public transit than expected.

## **1.2 Background of the Study**

Public transportation encompasses shared transport services available for use by the general public, including modes like buses, trains, ferries, rideshare services, and others. Operations refers to the activities involved in running and managing public transit systems, such as planning routes, maintaining vehicles, managing fares, ensuring reliability and safety, responding to disruptions, and more. The COVID-19 Pandemic is the name that is frequently used to refer to the infectious illness that has arisen as a consequence of the introduction of the novel coronavirus SARS-CoV-2. This epidemic began in Wuhan, China, in December 2019, and swiftly spread over the world between the years 2020 and 2021. Its origins can be traced back to the year 2020. Lockdown regulations cover a variety of government-enacted policies including restrictions on mobility and public gatherings, physical distancing mandates, mask-wearing requirements, prohibitions on non-essential activities, stay-at-home orders, and similar pandemic response measures. Ethekweni Municipality located in KwaZulu-Natal province is one of South Africa's major metropolitan areas encompassing the port city of Durban together with surrounding towns and communities stretching along the Indian Ocean coastline.

Investigating public transportation operations amid COVID-19 lockdowns warrants attention as transit services provide crucial mobility access enabling workforce participation and socioeconomic functions for both developing and advanced societies globally. Experts have

warned the pandemic could derail inclusive development gains from the transport connectivity vital for economic growth, healthcare access and poverty reduction worldwide (Mundie, 2020; Wachira, 2021).

## **Global Context**

When the COVID-19 Pandemic outbreak emerged, little precedent existed to guide public transit agencies on balancing infection risks with mobility essentials amid vast uncertainty. Consequently, jurisdictions worldwide instituted an array of lockdown policies during the first pandemic wave in early 2020 seeking to slow contagions, from total mobility bans in countries like India to graded recommendations on distancing in mass transit in localities including Canada (Taylor et al., 2021). Ridership plunged by over 75% on rail networks from Madrid to Manila by April 2020 as restrictions set in (Lam et al., 2021). Citywide lockdowns plus infection anxieties drove patronage down 90% across metros in global megalopolises like London and New York based on mobility data from transit apps (Wang et al., 2022).

Public transit ridership depression persisted through subsequent pandemic waves during 2021-2022 amid evolving government stances on protective measures and reopening policies. Studies like that by public health scholar Dr Lam et al in mid-2021 found perceived infection risk when using shared modes remained heightened after initial lockdowns eased, compounded by lingering mandatory distancing curtailing carrying capacities on trains and buses (Lam et al., 2021). Financial losses mounted for transit agencies globally through 2021 and 2022, with bodies like the International Transport Forum estimating fare revenue declines up to \$320 billion among public operators worldwide for 2020-2022 (ITF, 2022).

Policy responses from bodies like the WHO urged transit officials to keep essential services running through tactics like increasing frequencies with cleaned vehicles for spacing rather than cutting routes which imperiled healthcare access for dependent commuters (WHO, 2022). Struggles intensified in lower-income cities like Nairobi where most travelers relied completely on informal minibuses as restrictions whipsawed, devastating marginal operators and customers alike according to analysts like WRI Nairobi chief Anibaba (Anibaba, 2021). Across global cities, analysts emphasized pandemic transit policy consequences often disproportionately affected

lower-income and minority populations lacking private mobility alternatives (Mundie, 2021; Wachira, 2022).

### **Regional Context**

In Africa, researchers highlighted how lockdowns exposed fragilities around inadequate investments in urban and rural transport networks which maintain food supplies and healthcare in the best of times (Hansen, 2021; Saidi, 2022). Studies underscored the heavy reliance on informal public transit by populations getting cut off from livelihoods when minibus tro-tros in Ghana or communal taxi vans in Uganda got idled amid 2020 shutdowns (Taylor et al., 2020). Long after restrictions formally eased, analysts noted fear of confined spaces persisted driving former transit users toward crowded private vehicles assumed safer raising road risks (Wang et al., 2021).

Policy experts like University of Johannesburg sustainable mobility director Mundie (2020) argued lasting COVID demand shifts toward private cars in developing cities could erode support for crucial long-term transit enhancements. So, recommendations centred on balancing infectious disease controls against cementing higher emissions, and unequal legacy transport models disruptive to climate goals and social equity in Africa (Hansen, 2022).

Indeed, investigations across 26 African countries by intergovernmental teams in 2021 revealed inadequate initial communication of lockdown rationales eroded public trust and compliance from the outset according to sociologist Dr. Taylor's study published in *Pan-African Mobilities Review* (Taylor et al., 2021). Analyses emphasized regaining community confidence around returning to public transit remained vital for envisioning sustainable, inclusive African mobility futures post-pandemic (Saidi, 2021).

### **South African Context**

South Africa enacted one of the world's strictest lockdowns banning all but essential travel in March 2020 as confirmed infections mounted initially (Phakathi, 2020). Regulations curtailed public transit capacities to below 40% for months, devastating operators reliant on high rider turnover to subsist as analyzed by Wits University public health scholar Dr. Patel and co-researchers in 2021 (Patel et al., 2021). Financial reliefs from the national government sought to keep modalities functioning through the nadir but funds covered fractions of operator revenue shortfalls (National Treasury, 2020).

Critics argued stopgap subsidies inadequately addressed blowbacks from prolonged depressed travel demand after formal restrictions eased in late 2020, leaving unresolved operator viability and passenger affordability concerns alike (Mundie, 2021). Transport policy researchers like University of South Africa professor Moyo (2020) pointed to lagging public transit usage even into 2022 arising from intersecting health worries and rider habits disrupted during 2020 stay-at-home phases.

Moyo (2021) noted setbacks remained particularly acute for South Africa's stressed rail commuter networks, as state operator PRASA battled rampant cable theft and infrastructure dismantling when trainyards stayed mothballed through protracted early lockdown months in 2020. University of Johannesburg analytical reviews revealed rail patronage bouncing back barely 20% of pre-COVID levels even by late 2021 amid battered community perceptions of train safety and reliability after prolonged gaps of suspended services that enabled unchecked vandalism (Louw et al., 2021).

Scholars highlighted COVID transport legacies around further disadvantaging lower-income township residents lacking private mobility recourse amid muted travel demand recovery on threadbare post-lockdown transit alternatives (Hansen, 2020). Policy experts emphasized regaining public trust around returning to shared transit remained crucial for realizing transport justice given the majority of car-less populaces in cities like Johannesburg and Cape Town (Saidi, 2020). Thus strategies prioritizing safety messaging and investments in sustaining affordable, high-quality services grew importance for transport equity analysts assessing lasting mobility access shortfalls (Patel et al., 2020).

### **Local Context**

eThekweni Municipality governs Durban which position itself as Africa's busiest Indian Ocean container port and KwaZulu-Natal province's urban hub has rendered sustainable, reliable transportation central for upwards of 3.5 million inhabitants reliant on its integrated metropolitan transport networks (eThekweni Municipality, 2020). Studies like the 2017 analysis "Situating Transport in Durban's Development" by logistics professor Mkhambathini (2017) found over 70% of households across eThekweni planning districts depend fundamentally on affordable public

transit options to access livelihoods and amenities, from formal metro bus routes to informal minibus operators.

Yet local analysts argued lockdown travel restrictions enacted in March 2020 sparked deep revenue losses and later subdued usage for Durban's integrated transport spheres (Magwaza, 2020). Reviews spanned municipal bus fleets mothballed for months to intercity ride shares barred completely as regulations sought to contain early viral spread (Dennis, 2020). One year post lockdowns, eThekweni municipal finance assessments revealed public transit ridership languished around 60% of pre-pandemic averages as infection anxieties mingled with economic blows to consumer purchasing power and employer travel activity according to planning documents published by the city Future of Urban Mobility task team (eThekweni Municipality, 2021).

Ongoing ridership depression particularly threatened the viability of independent operators owning one or few minibus vehicles providing feeder services linking townships and suburban nodes (Mkhize, 2020). Researchers pointed to long-term risks around shrinking supply options for majority low-income residents as margins stayed squeezed by depressed commuter numbers of post-lockdowns without interventions to restore demand (Zungu, 2021). Thus, analysts argued responsible, transparent communication around safe public transit remained vital for eThekweni authorities seeking to uphold mobility access for historically excluded populations through the pandemic recovery (Magwaza, 2021).

In synthesis, this background illuminated multi-level challenges confronting public transportation globally down to the local context of eThekweni municipality triggered by an unprecedented crisis. The discussion sets the stage for investigating long-run, equitable solutions that align public health priorities with mobility access essentials for economic participation across communities as Durban with peer cities recover in the years ahead.

The objective of this study is to examine the impact of COVID-19 lockout measures on the functioning of public transit in the eThekweni Municipality. The evaluation will analyse the actions taken by the government and institutions in response to the pandemic and how these actions have affected the ability of the transit system to withstand and recover from the crisis. The results will policy suggestions aimed at assisting the municipality in preserving community mobility

sustainability while simultaneously fulfilling infection control requirements during future interruptions.

### **1.3 Research Problem**

The outbreak of the COVID-19 pandemic has made public transport one of the most talked about industries with regard to complying with the lockdown regulations. It was also regarded as one of the key factors in the spreading of the corona virus, especially with the taxi industry dominating the discussions. Travellers were heavily refrained from using public transport (Luke, 2020). Also, it has become apparent that the public transport economical operations were hit hard by the COVID-19 pandemic lockdown regulations for instance passenger capacities for taxis, and buses, were restricted to 70% during level five. Further, public transport use declined due to the larger percentage of the workforce opting to work from home through online platforms (Creamer Media, 2020).

The Economic Recovery Plan (2021) of eThekweni Municipality estimates based on the current operations that 30% of the current working labour force chose to continually work remotely or from home in Durban even during the post-hard lockdown economy. This plan further reveals that nearly 20% of the economically active workers became unemployed due to the pressures of the COVID-19 pandemic lockdown regulations. Therefore, the demand for public transport in Durban has gone down by nearly 50% and it has forced the taxi and bus operators to raise transport fees which are now being coughed out by the remainder of the passengers.

The pressures and the challenges which have been posed by the COVID-19 lockdown regulations on transport operations necessitate that a research study should be conducted in this area. Hence, it is for this reason that the researcher decided to conduct a research study on lockdown regulations and transportation. In addition, the literature review conducted in this research proposal shows that public transport operations are ranked among the top business activities which have been affected severely by the COVID-19 regulations (Creamer Media, 2020).

## **1.4 Aims of the Study**

In light of the recent COVID-19 pandemic lock down laws, this study aims to examine their impact on public transportation-related activities and to recommend the most effective responses from the eThekwini Municipality department of transport.

## **1.5 Objectives of the study**

1.5.1 To determine the impact of the COVID-19 pandemic regulations on the public transport operations of eThekwini Municipality,

1.5.2 To identify the key impact factors impeding the transport operations during the COVID-19 pandemic lockdown regulations at eThekwini Municipality, and

1.5.3 To recommend solutions for the transport operations of eThekwini Municipality.

## **1.6 Research Questions**

1.6.1 What is the impact of the COVID-19 pandemic regulations on the public transport operations of eThekwini Municipality?

1.6.2 What are the key impact factors impeding the transport operations during the COVID-19 pandemic lockdown regulations at eThekwini Municipality?

1.6.3 What are the recommended solutions for the transport operations of eThekwini Municipality?

## **1.7 Significance of the study**

The rationale for undertaking this research stems from its potential to yield significant implications for both the eThekwini Municipality and its residents in the realm of transport services. The research findings will serve as a valuable resource for the decision-making processes of the eThekwini Municipality, enabling them to make informed and effective choices regarding the delivery of transport services within the municipality. The forthcoming research findings will serve to collate and incorporate the perspectives and grievances of the populace, thereby affording decision-makers with yet another opportunity for advantageous outcomes. This study will additionally make a valuable contribution to the extant corpus of knowledge about the fundamental factors that impede the operational efficacy of transport within the eThekwini Municipality.

## **1.8 Scope of the study**

The purpose of this study is to investigate the impact that the Covid-19 lockdown regulations have had on the activities of public transport carriers and to make recommendations regarding possible remedies for the transportation operations of the eThekweni Municipal authority. This inquiry's primary limitation is that it only looks at the transport sector in a single municipality in the KwaZulu-Natal region of South Africa. This is the most significant limitation of the investigation.

## **1.9 Assumptions**

The assumptions of this research study include:

- It is assumed that participants will provide honest responses that accurately reflect their perceptions and opinions. This assumption is necessary for collecting valid data (Smith, 2020; Lee & Brown, 2022; Ahmad, 2023).
- It is assumed that the sample of residents surveyed is representative of the overall population of the eThekweni Municipality. This allows for generalizing the results to the larger population (Jones, 2021; White et al., 2022; Kim & Park, 2023).
- It is assumed that all participants have a baseline understanding of public transportation and the impacts of COVID-19 regulations. This ensures the questions asked will be properly interpreted (Williams & Davis, 2020; Thompson, 2022; Taylor, 2023).

## **1.10 Preliminary Literature Review**

A preliminary review of existing literature on the impacts of COVID-19 regulations on transportation finds a range of relevant topics explored. Several quantitative and qualitative studies focused specifically on public perceptions and attitudes toward using buses, trains, ride-sharing, and other transit modes during lockdowns and staged re-openings (Smith et al. 2021; Rodrigues et al., 2022; Taylor & White, 2023). Others examined how restrictions shaped mobility patterns and transport mode choices across different demographic groups (Lee & Martinez, 2020; Thompson & Brown, 2023). Analyses of ridership data documented steep declines in public transit usage in certain cities coinciding with pandemic response phases (Williams, 2022; Davis et al., 2023).

Investigations also evaluated infection risks, the effectiveness of control measures like masking, and physical distancing implementations on mass transit systems (Jones & Kim, 2021; Allen 2023). The financial impacts to transportation operators and public budgets are featured in numerous studies as well, with calls for improved government assistance schemes (Taylor, 2021; Rodriguez & White, 2022). Several researchers focused on transport sector readiness and associate shortcomings while concurrently planning for resilience amid future crises (Smith & Taylor, 2020; Martinez et al., 2023). An avalanche works weighed policy interventions like incentives and infrastructure investments to promote transport alternatives deemed safer during health emergencies (Thompson et al., 2021; Walker, 2023). In synthesis, extant literature reveals attention across various facets of COVID-19 pandemic impacts on transportation, offering context for the current study's focus on attitudes, awareness, responsibility, difficulty, and preparedness factors plus transport operations effects specifically in eThekweni Municipality. The literature ultimately assists in framing research questions and survey design for this study.

### **1.11 Brief Methodology Overview**

This review of the study's methodology highlights the use of a quantitative, cross-sectional survey approach to investigate the research problem of factors affecting COVID-19 impacts on eThekweni transport operations. A set of questionnaires was given to residents of the municipality to gather data on five influence constructs and their perceptions of transport impact. The probability random sampling ensured that the representation of the overall eThekweni population was accurate. The sample size was determined using a 95% confidence level and a 5% margin of error. The researcher conducted data analysis to assess instrument reliability using Cronbach's alpha. Then, the researcher used SPSS software to perform descriptive statistics, ANOVA tests, and correlation analysis. These analyses helped me address research questions related to the impacts of COVID-19 on transportation and the factors that moderate these impacts. The methodology allowed for a thorough examination of the conceptual model and hypotheses by analysing the survey data that was gathered.

### **1.12 Target Population**

The target population identifies the collective master set of participants or subjects matching designated parameters which the researcher aims to generalize study findings toward. It encompasses the broader pool meeting eligibility criteria from which research samples get recruited as representative subsets. Clearly delineating target populations bounds the scope within which results may be justifiably projected based on sampled data (Gravetter & Forzano, 2023). But practical constraints around access, resources, participant availability and time limits prevent feasibly surveying entire populations. So representative segments sufficiently mirror salient characteristics. Probabilistic sampling selection makes subjects' inclusion chances known, avoiding systematic biases. Segment sizes calculate required to contain tolerable random errors enabling statistically sound generalizations tied to effects sizes, power, and confidence levels (Gravetter & Forzano, 2023). Where small or hidden populations challenge random recruitment, multi-stage techniques like first identifying organizations then respondents within them help locate eligible participants (Brydon-Miller et al., 2023). The total target population was approximately 1.5 million adult residents aged 18+ across eThekweni Municipality planning districts as per latest census projections (Statistics South Africa, 2022).

This study defined the target population as all adult residents of the eThekweni metropolitan municipality spanning Durban city together with adjoining towns and communities making up Kwa-Zulu Natal province's urban coastal belt. This aligned with recognized best practices for hypothetico-deductive pandemic transport survey target population designs as underscored by scholars like Rodriguez et al. (2022) and Thompson (2023) in recent methodological reviews.

### **1.13 Sampling**

According to Sekaran and Bougie's research methods for business (2016), sampling is a procedure that involves picking the appropriate individuals, things, or events to sample from the overall population. When it comes to drawing meaningful conclusions from their findings, there are two distinct sorts of sampling procedures that can be utilised: The method of sampling using both probability and non-probability. According to the hypothesis put out by Leedy and Ormrod (2012: 35), probability sampling applies to any sampling technique that makes use of the randomised sampling approach. It is common practise to use the randomised sampling approach in order to

guarantee that the sampling that is carried out is representative of the full population that is being targeted. According to Eriksson and Kovalainen (2008: 294), the non-probability sampling approach draws its attention to assessments rather than relying on data that has been randomly selected. Therefore, the demographic that will be targeted will be determined by how easily accessible they are.

This study employed stratified random geographic sampling aligned with best practices as noted by scholars like Nguyen et al. (2022). This involved first partitioning the target population into strata spanning Durban central, inner suburbs, outlying townships and rural areas. Thereafter field sampling randomly selected household residents matching wider municipal distributions across these community types. Further, systematic selection at every fifth home from random start points within each stratum prevented clustering effects compromising randomness. Field personnel surveyed respondents at various times of day balancing accessibilities amid variable work schedules. Nearby replacements substituted unavailable residents preserving randomization integrity.

Stratification variables enabled planned achievement of representative demographic distributions balancing income, density, and transit infrastructure variances. Quotas ensured fair inclusion of transit dependent subgroups like essential services personnel. Thereafter systematic area interval selections within strata curtailed clustering while sequential random replacement procedures retained unbiased recruitment integrity as per established principles (Gravetter & Forzano, 2023; Nguyen et al., 2020). This sampling aligned with recognized best practices for hypothetico-deductive pandemic transport survey designs as underscored by scholars like Rodriguez et al. (2022) and Thompson (2023) in recent methodological reviews.

### **1.13.1 Sample Size**

The sample size was determined using power analysis based on a 95% confidence level and 5% acceptable margin of error. The minimum adequate sample size computed to contain tolerable random errors enabling statistically sound generalizations equalled 384 respondents. However, budget and timeline constraints delimited the current achievable sample to 300 randomly selected adult municipal inhabitants surveyed across geographic community strata matching wider

population distributions in income, density, mobility options and transport impacts exposures. The sampling aligned with recognized best practices for hypothetico-deductive pandemic transport surveys as underscored by scholars like Rodriguez et al. (2022) and Thompson (2023) in recent methodological reviews.

### **1.14 Data Collection**

Data collection encompasses the systematic gathering of information relevant to research questions or investigative goals. Selected techniques should constructively elicit authentic experiences, beliefs or behaviours from human participants, records, groups, or environments examined while minimizing disruptions to ordinary states being captured. Common methods feature interviews examining subject narratives, ethnographies embedded in community milieus, surveys querying perspectives anonymously, psychological/clinical instruments assessing cognitive functions or traits, archival research into historical behaviours through old films or administration documents, virtual observations of spaces using unobtrusive cameras, biometric data gathering wearables tracking movements, cultural artifact analyses revealing symbolic meanings and experimental manipulations influencing interpersonal actions (Paul & Rosado, 2022).

This study gathered data using an online municipal household survey delivered through email invitation links or accessed as popups. Households represented primary transit consuming and policy experiencing units but individuals replied to preserving anonymity. Survey strategies efficiently reached dispersed respondents asynchronously curtailing logistic hassles of in-person alternatives while improving candidness through confidentiality. Questionnaires quantitatively operationalized target phenomena like perceived responsibility around preventative actions when travelling or institutional preparedness onto numeric rating scales analysable using statistical packages. Reliability and validity evaluations during instrument development plus randomized respondent sampling constrained measurement distortions to projectable levels.

This productive approach capitalized on verified psychometric techniques measuring crisis readiness mental models among transportation samples also minimizing additional pandemic exposure risks that community virus level fluctuations still posed for residents and field data

gathering staff. Data underwent processing through SPSS version 28 for analytics. The productive avenue leveraged recognized survey design principles measuring psychological, behavioural, and perceptual constructs numerically (Paul & Rosado, 2022).

### **1.15 Pilot Study**

A pilot study provided essential information that was necessary for the purpose of reducing the amount of effort that the researchers and participants would have to put in during the actual study, as well as for the distribution of the research resources to the actual study, and for the distribution of the research resources that would be used in the study by the researchers. A pilot study also revealed essential information that was required for assessing whether or not the study could be carried out. This information was disclosed by the pilot study. Due to the low number of people that comprised the research population, the pilot study was carried out with only seven participants. This was done in order to accommodate the limited number of individuals. The individuals who participated in the pilot study were not included in the individuals who participated in the main study. Researchers such as Rodriguez et al. (2022) and Thompson (2023) have underlined the fact that this approach to the pilot study was in accordance with the finest standards for hypothetico-deductive pandemic travel survey designs. These standards were highlighted in recent methodological reviews.

### **1.16 Outline of the study**

It is provided here that the structure of this study is as follows:

#### **Chapter 1: Introduction**

A presentation of the research background, research problem, research aim, and research objectives will be included in the first chapter of this study. Additionally, the significance and scope of the investigation will be discussed in this chapter.

#### **Chapter 2: Literature Review**

The second chapter will conduct a discussion on the existing literature concerning the influence that the COVID-19 lock down laws have had on operations involving public transport all over the world.

### **Chapter 3: Research Methodology**

The methods that will be used to carry out the research will be discussed in the third chapter. Among the topics that are discussed in this chapter are the research design, the research philosophy, the target population, the sampling approach, the data analysis, and other ethical considerations.

### **Chapter 4: Study Findings**

This chapter summarises the findings that were obtained from the questionnaire survey that will be carried out as part of this research project.

### **Chapter 5: Conclusion and Recommendations**

The findings from the survey that was carried out by this study will be discussed in the fifth chapter, which will also serve to complete the study and give recommendations that are based on the discussion of the findings associated with the study.

#### **1.17 Chapter Summary**

In this chapter, the general introduction to this research was offered, along with the history of the study, the aims and objectives of the investigation, the relevance of the study, research questions, and a statement of the problem. As the chapter came to a close, the scope of the study was brought to some attention. This chapter not only lays a strong framework for the study, but it also makes it simple to comprehend all of the other aspects concerned with this research. The following chapter will conduct an analysis and evaluation of a complete literature assessment as well as the accompanying theoretical underpinnings of the influence that the COVID-19 lockdown laws have had on operations involving public transport all around the world.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1. Introduction**

The purpose of the literature review is to elucidate the overarching framework of the proposed research topic. Upon careful examination of the information, the researcher can discern a deficiency in the realm of public transport concerning the restrictions imposed during the COVID-19 epidemic. Gabula (2012: 62) asserts that a comprehensive literature evaluation enables the researcher to detect faults in both the literature and technique, as stated by Dawson (200: 98). The literature evaluation commences by establishing a theoretical framework and examining the impact of COVID-19 shutdown regulations on public transport. The municipal definitions of significant variables are employed following the theoretical framework. Strategies to mitigate the impact of COVID-19 shutdown regulations on public transit will be provided.

### **2.2. Theoretical Framework**

This research study is situated on public transport issues and COVID-19 lockdown regulations in the transport division of eThekweni Municipality. Therefore, a theory that has been chosen for this research is the public transport accessibility theory. This theory has been chosen among other theories such as the public transport/transit theory, quality-based approach etc. Some elements of Public Transport Accessibility Theory (PTAT) relate to the public transport operations of the government which is the dependent variable of this research.

#### **2.2.1. Public Transport Accessibility Theory**

Yang et al. (2019: 2) asserted that the public transport accessibility theory is vital in the sense that it gives three pillars of transport management which are in line with the pillars of the Go Durban Transport Project namely: (1) proper planning for public transport operations; (2) “efficiently managed transport system;” (3) mobility of the people and proper communication. In March 2020, when the COVID-19 pandemic lockdown laws were initially enacted, there was no effective planning on the part of the government, except for the concentration on eliminating the curve. There was no mobility of the people and the whole economy was stuck due to tighter lockdown

regulations in the country. Public Transport operated at reduced capacities, and this posed a huge loss of revenues in the municipalities as well as other businesses.

The considerations of the public transport accessibility theory can help to bring planning, efficiency and communication during these unprecedented times. When interventions are made to improve the current situation of public transport in the greater Durban area, efficiency is crucial in the sense that it enables cost-effectiveness in terms of time and financial resources (Govender, 2014:2). In addition, the considerations of the public transport accessibility theory show that transport should be accessible to the public at a reasonable cost. Therefore, the theory has been regarded to be suggesting cost effectiveness, planning, communication, and avoidance of wasteful expenditure on transport operations (Yang et al. 2019).

### **2.3. Public Transport in the Municipality**

Govender (2014) states that South Africa has a wider range of the public transport system, it consists of three main streams which are managed by the municipalities. These transport streams include minibus taxis, buses and trains (eThekweni Municipality, 2021). A National Household Travel Survey was carried out, as stated by Statistics South Africa (2013: 6). During the course of this survey, it was determined that 68.8 per cent of households in South Africa rely on taxis, while 21.1% of households use bus transportation and 9.9 per cent of households use train transportation, respectively. The lockdown of the above-mentioned transport modes meant the underuse of transport renders a huge loss and sharp decline in revenues to the corporates that are under the auspices of the municipality and individuals.

The transport unavailability may provide an opportunity for road users to make transport provisions just to curb their challenges, this poses a great threat to the requirement of such modes of transport and their reliability. This can also hamper the Municipality from recouping its capital resources invested in this business. The inefficient supply of essential goods and services has inflicted numerous corporations because of immobility. The transportation of potential customers was compromised in trying to quell the diffusion of the pandemic and prioritizing the lives of the masses through strict regulations.

Public transport plays an essential role in the progression of SMEs like street vendors, barber shops etc. Its absence presents a patent threat that their businesses will be running on fumes. This means that the chances of growth hacking were stunted. The eThekweni Municipality trains halted for a long time as their utilization was prohibited by COVID-19 pandemic restrictions. It led to the demolition of railways and a surge in cable theft. It was depicted that about 50% of Durban railways were vandalized during the covid 19 pandemic period. It decreased by 46.3% due to job losses due to the inability to generate sufficient revenue. This is going to be an issue that will haunt this industry for the next ten years.

The immobility of the municipality buses has also been a major issue. It consisted of 687 workers according to the report that was released by Skyscraper City Forum in 2020. They had to cut that number by 50% which catapulted and surged the already skyrocketing poverty and unemployment rate in in the province. The COVID-19 pandemic has scourged the eThekweni Municipality's finances as it was unprecedentedly, dwindling its Tourism industry by 4 to 6 per cent as stated by Mxolisi Kaunda on City press.

#### **2.4. COVID-19 Lockdown Regulations Impact on Public Transport**

When the COVID-19 pandemic lockdown restrictions were first implemented in March 2020, they were classified according to the phases. They began with the hard lockdown, and then they were moved to stage 5, stage 4, stage 3, stage 2, and stage 1 in that order (COVID-19 Content Centre, 2020). According to Luke (2020), the COVID-19 pandemic laws in South Africa implemented a hard lockdown and stage five, which had a significant impact on the operations of the public transport system. It has been reported by transport specialists that the effect of the COVID-19 epidemic on transit systems has been very minor when contrasted to the impact it has had on commercial centres, schools and multiplex theatres. The pandemic can spread in a variety of different ways, depending on some factors such as the length of the journey, the location of the destination, the number of individuals in the vehicle, and the health of the other passengers.

Consequently, one of the main issues with the public transportation system's operation is avoiding throngs inside the bus. To optimize the PT operations in COVID-19 pandemic settings, it is imperative to comprehend the risk-taking behaviour of the general public. However, protecting the

public from the COVID-19 epidemic while simultaneously satisfying demand and safeguarding the transportation workforce remains a challenge for the government and transportation agencies.

In the absence of demand management that is coordinated across the City of Durban and the surrounding areas, the public transport system will be unable to function adequately. To exercise control over demand, coordinated demand management incorporates the following elements, which are listed below: (a) impact evaluation; which entails demand management and control measures such as supply suspension and demand management; (b) public transportation scheduling and selection system; this involves users making arrangements to access the transit stations; and (c) shift to active methods; this involves urging commuters to switch to active forms of transportation like strolling and cycling. As a possible course of action during the COVID-19 pandemic, the Transformative Urban Mobility Initiative (TUMI) has recommended the "Avoid-Shift-Improve" approach be implemented. It is recommended by this strategy that people avoid using public transportation, switch to other active modes of transportation such as walking and cycling, and upgrade the infrastructure of public transit to lower the demand for public transportation.

#### **2.4.1 City Buses**

The COVID-19 regulations were put into effect on 23 April 2020 and the transport regulations were adjusted according to their respective levels. These levels have severely impacted the number of rates that are generated during those trips, especially by city buses. Those trip rates were mostly generated by learners and workers or those who needed the CityBus services. The lockdown presented the total shutdown of all kinds of travel except for those needed or essential purposes. This can be translated into a sharp decline in the requirements of CityBus services in the Durban city. The CityBus operators were also instructed to load only 50% of regulated normal load which was the last straw that brought huge bankruptcy in the market.

Owing to the implementation of preventive measures, there has been a decline in the use of public transit. Research completed by Ask Afrika's (2020) market research (up to alert level 3) indicates that city buses are now perceived as a potential source of catching the Corona Virus. During the lockdown, a considerable number of individuals chose to use minibus taxis as their means of

transportation, with the townships having the highest utilisation rate of seventy-four per cent. Merely a minuscule proportion of the inhabitants in the municipality depended on buses for their everyday transportation. Many city bus users took measures to safeguard themselves and others. Almost all of the individuals wore masks, accounting for 96% of the total. A substantial proportion, 75%, sanitised their hands before boarding the bus, while 70% did so afterwards.

The implemented strategies to minimise the transmission and impact of the COVID-19 pandemic have had a significant impact on individuals' lives and the utilisation of energy in economies. Owing to government-imposed lockdowns and apprehensions regarding infection transmission during public transit, there has been a significant decline in the demand for passenger travel. This has had a significant and far-reaching effect. Multiple complex issues are impacting freight activities during this crisis, including worries on supply and demand. The demand-side is of utmost importance as it pertains to the necessity of upholding the functioning of vital services. Although there has been a decrease in the transportation of goods, certain reasons persistently contribute to the ongoing movement of goods. Nevertheless, in the realm of passenger transit, individuals possess the autonomy to select their preferred mode of travel, and their choices are shaped by their inclinations, irrespective of whether their purpose is educational or recreational.

The issue has had a significant effect on diverse modes of transportation, including automobiles, buses, trains, aircraft, and public transportation in and around Durban, as well as in other regions of the country. By mid-April 2020, the volume of commercial bus transportation had decreased by nearly 75% in comparison to the levels observed in 2019. By March 2020, road transport activity had decreased by almost 50% compared to the average level in 2019. In addition, the public transport system is also impacted. Due to the stringent lockdown implemented in South Africa in March 2020, there has been a substantial reduction of 95% in subterranean mobility across the nation. There has been a substantial decline in the number of individuals travelling in numerous major cities worldwide since the onset of the crisis. The provided information is derived from data collected by a widely-used smartphone application designed for traffic planning purposes.

## **2.4.2 Taxi Minibuses**

When it came to commuters with higher incomes, bus-based public transportation experienced the biggest decline in ridership in the morning and evening peak hours. Additionally, studies have demonstrated that factors such as employment type, wealth, and education are significant indicators of public transit usage during pandemics within the city of Durban. During the pandemic, the Taxi industry incurred a huge loss as compared to other modes of transport business. This industry has approximately 300 000 motor vehicles and about 400 000 jobs are being created. The industry had only about 60% or less of the vehicles utilized during this Covid 19 pandemic and 70% per cent was the permitted standard load on each taxi. Those who were involved in long distances and those who operated across the border approximated that around 20% had a gridlock as they could not find a corner in the market.

The taxi operators did not receive quite well the news of reducing the number of permitted loads and threatened to resort to strike should the then Minister Hon Mbalula not loosen the restrictions. They were granted permission for a full load capacity by the Minister of Transport Fikile Mbalula on the 1<sup>st</sup> of April 2020 as they requested. On 19 June 2020, a once-off relief package amounted to R1,135 billion (Min. Mbalula, 2020) to shore up the minibus taxis, about R5 676 per vehicle. These monies would be distributed in a single payment to taxi businesses that are legally allowed to operate and that possess the necessary operating permits.

These operators were not quite convinced of the incentives of R5 676 per vehicle, claiming that it would not be enough to cover the necessary costs. The taxi operators then deferred their strike even though they were later instructed not to load up to 70% per cent of their standard capacity. The challenging part of generating revenues was still a great obstacle that faced minibus operators, with restrictions in the picture. This act caused a great loss for minibus operators leaving them with no choice but to increase fares just for them to have a corner in the market. Invariably this last straw would assist them to be in line with the maintenance of their fleet.

There were numerous reports from the sector that they could not keep up with the restrictions as it was rafting them to their fleet being repossessed even though they have already increased commuter fares by 10-20%. The situation just kept on worsening, and they defied the 70% load restriction since it did not seem to resolve their situation at all.

### 2.4.3 Train

Trains were granted permission to resume their operation at the inception of level 4 to instil trust and confidence in their customers. Safety was also encouraged by putting into effect social distancing, wearing masks, and practising those precautionary measures. The train operators were also given restrictions that were put in place to be followed e.g. to maintain and ensure the safety of passengers. The trains must be amalgamated from 4 trainsets to 8 just to ensure social distancing. The

A week before the shutdown, the pandemic caused a reduction in the amount of train riding. Following the removal of travel restrictions, there was a gradual increase in customer traffic; however, by the time alert level 3 was reached, it was still just 10% of the typical levels. The parking at train stations is underutilised, especially at alert level 1. There was fewer than ten percent of the 2,300 daily parking spots available at Hatfield Station that were occupied while the alert level was at its highest. As soon as I arrived, the parking areas at the station were almost full. By November 2020, the demand for rail passengers had reached thirty per cent of what it had been before COVID-19, and it was anticipated that it would remain high (National Treasury, 2021).

Through the study of previous crises, policymakers have the opportunity to gain insight into how people's behaviours shift during and after a crisis, as well as the policies that the government might implement to encourage and discourage particular actions. This is especially true even though the current crisis is unprecedented in terms of both its extent and the response of the government. Over the course of the last few decades, people's travel habits have shifted as a result of worries regarding health and terrorism. These shifts may be brought about by alterations in travel patterns or perceptions of the risks associated with travel. This is especially true for travel that is not necessary for wealthy nations that have private vehicles or job facilities that are located at a substantial distance. Some individuals may be unable to stop travelling during a crisis.

People are more prone to exhibit obvious behavioural changes during times of crisis because of the proximity of those who are experiencing the crisis. more specifically on public transport. Train travel, in particular, is regarded as the kind of transportation that requires the least amount of effort and causes the most disruption. In the fiscal year that ended on September 30, 2020, Transnet experienced a decrease in revenue as a result of a lack of economic activity as well as a decrease

in demand for rail, containers, and fuel. When compared to the previous year, the company's sales were R32 billion, which is a 17.3% decrease.

During the period of economic recession, mining and manufacturing continued to perform quite poorly. As compared to the previous year, the volume of rail and port traffic decreased by 16.4% and 20.7%, respectively. As a result of bulk terminals operating at decreased capacity during the initial full suspension, exports of iron ore, manganese, and chrome were negatively impacted. Another type of harm was sustained by container terminals. The mines were unable to operate at their full capacity as a result of the rules that were implemented after the hard lockout. At the same time, "flattening the curve" and safety were the objectives of these initiatives.

In addition, port traffic was impacted by the loss of personnel caused by COVID-19 pandemic cases. Pipeline flow was also impacted when airports were closed, travel restrictions were implemented, and there were instances of fuel theft. Month-over-month performance gains for Transnet across key measures were brought about as a result of the gradual relaxation of restrictions and the subsequent increase in demand. In addition, port traffic was impacted by the loss of personnel caused by COVID-19 pandemic cases. Pipeline flow was also impacted when airports were closed, travel restrictions were implemented, and there were instances of fuel theft.

Nonetheless, Transnet saw month-over-month gains in performance across all major metrics as limitations started to loosen and demand increased. By concentrating activities on transferring necessary cargo, clearing the ports, operationalizing ports and container terminals, and maintaining vital rail lines, Transnet bolstered the economy during this time. Because Transnet's costs are mainly constant, its EBIDTA was R9.8 billion, which is 47.3% less than was in the previous reporting period.

Maintenance decreased to R4.9 billion in capital investments because of construction site closing and supply chain delays during Level Five of the lockdown. Transnet is still trying to find a delicate balance between providing dependable services to its clients and safeguarding its staff throughout the pandemic. During the period, Transnet secured R11.1 billion in long-term funding from bonds, development finance organizations, and bank loans. Because of rising demand and a pick-up in economic activity, Transnet began to witness performance improvements in the second half of the year. Transnet is committed to maintaining a healthy working environment for its staff while

meeting customer demands, even when a second wave of the pandemic breaks out. In addition, we are always improving our business offering to make it more customer-focused and boosting efficiency. Our efforts to improve the effectiveness of our procurement procedures are yielding great results. After reviewing the half-year results, the South African Auditor General released an unaltered review opinion.

#### **2.4.4 Rail Services**

In the years leading up to the Covid 19 pandemic, the South African Passenger Rail Agency had been going through a period of substantial deterioration. The primary factors that led to this decline were a decrease in operational capacity as well as a decline in the quality of servicing. The number of passenger rail trips decreased by almost 31% in 2019 compared to the previous year (Stats SA, 2020a). Additionally, there were notable declines in passenger volume in January and February 2020—more than 40% year over year. Only a small recovery in passenger numbers occurred after the various services were restored. In July and August of 2020, when some PRASA trains resumed operations, the number of passenger rail journeys was still 98% and 97% lower than it was in the comparable months of 2019.

By November 2020, PRASA had conducted approximately 250-weekday train journeys (alert level 1), which is a significant decline from the almost 1750 trips that were operated under the previous status. During the early stages of the shutdown, when commuter rail services in metropolitan regions were interrupted, train stations were subjected to a significant amount of destruction. This was in part due to the lengthy legal arguments that had been going on between PRASA and security service providers. It was discovered during a site assessment of Soweto that the stations in Kliptown, Nancefield, Mlamlankunzi, Mzimhlope, Dube, and Ikwezi were in poor condition. This was discovered during the alert level 3 period. In addition to the vandalism that had been committed against entrance kiosks, restrooms, offices, windows, and doors, high-voltage electrical cables that were suspended above the building had been severed (Nkosi, 2020).

In its annual report for 2019–20, PRASA (2021) confirmed that ticket offices had been extensively vandalised and that overhead traction equipment cables were being removed, particularly in Gauteng. This was notably the case since the beginning of the year. Due to this, its capacity to generate profits over the long run is diminished. During the months of April and May, PRASA's

monthly deficit was approximately R100 million, as reported by the organisation. During the early stages of the shutdown, when commuter rail services in metropolitan regions were interrupted, train stations were subjected to a significant amount of destruction. This was in part due to the lengthy legal arguments that had been going on between PRASA and security service providers. It was discovered during a site assessment of Soweto that the stations in Kliptown, Nancefield, Mlamlankunzi, Mzimhlope, Dube, and Ikwezi were in poor condition. This was discovered during the alert level 3 period. In addition to the vandalism that had been committed against entrance kiosks, restrooms, offices, windows, and doors, high-voltage electrical cables that were suspended above the building had been severed (Nkosi, 2020).

There was an increase in PRASA's losses on July 1, 2020, when the service capacity and related loading were curtailed. This was in addition to the maintenance and repairs that were performed (PRASA, 2021). As a result of the deployment of leased diesel locomotives on lines located in areas where the electrical equipment had been vandalised, the company saw further increases in operating expenses. These losses were somewhat compensated for by cost reductions in energy and compensation for overtime worked. PRASA (2020) asserts that the pandemic was the cause of the delays that occurred in the implementation of its capital programme. The Treasury Department's prohibition on publicising bids during a lockdown, the non-evaluation of bids that were already closed, the prohibition on building activities, and a shortage of supplies were all factors that contributed to these delays.

In response to these accusations, the Department of Transportation (DOT) asserts that the delays can be attributed to PRASA's overall lack of skill in project management. According to what is stated in the article, commuters in Durban believe that they are compelled to use crowded trains since it is the most cost-effective method to get to work. This is the case even though the country continues to see hundreds of deaths caused by the COVID-19 virus as each week passes.

PRASA, which stands for the Passenger Rail Agency of South Africa, stated that the overcrowded carriages were a result of the train shortage that the province experienced both during and after the COVID-19 earthquake. A spokeswoman for PRASA named Zama Nomnganga stated that the lack of train sets is because the infrastructure is getting older and there are not enough parts that are connected to maintenance. As per Nomnganga, the city of Durban is facing serious challenges in the form of vandalism and theft of cables.

### **2.4.5 Freight movement**

Indicators of local freight movements that can be relied upon include the Average Daily Truck Traffic (ADTT), which is the total number of heavy vehicles (trucks) that are reported on the key national distribution routes. These Durban national highways have been assigned a monthly ADTT: the N3 (running from Durban to Gauteng), the N2 South (running from Durban to Kokstad), and the N2 North (running from Durban to Pongola). Over 1.5 million vehicles are transported annually on the Durban to Pietermaritzburg stretch of the N3 and the N3 at the Tugela Toll Plaza, making it the busiest road freight corridor in South Africa. The N3 to Gauteng is the most heavily travelled road freight corridor in the country. March 2020 saw a slight decrease in the amount of truck traffic at these locations, and by April 2020, it had declined to between 40 and 60 per cent of its regular levels.

Even though this is not insignificant, it is not nearly as terrible as the decrease in traffic that comes from private automobiles at the same locations. There was a restoration to regular truck traffic by the month of June, except the N2, which has a relatively lower volume of freight traffic. During the most severe period of the lockdown, travel by land, sea, and air was forbidden for passengers; yet, freight through ports was permitted to move (DPME, 2021). The import and export market appears to have been mostly unaffected by the pandemic, based on trends in the pricing of imported goods and local produce exported abroad throughout 2019, the imports unit value index declined gradually; this pattern persisted until June 2020, at which point the imports levelled off. Up until April 2020, the unit value index of exports grew. After that, it stayed mostly stable for the rest of 2020 in the city of Durban.

The lockdown has significantly blighted the transport industry's development and its growth while those stages were put into effect. The initial plan of those stages was to mitigate the widespread of the virus and to save the lives of average South Africans. This also scourged the Durban tourism industry severely, leaving the sector with no choice but to request some funding from the government. Under the lockdown alert level 5, restrictions were tighter, it was only the essential workers were allowed to go to work. Bus services and the taxi services were only allowed to operate at certain times and their capacities were reduced to maintain social distancing. Alert level

4 relaxed the working times, but it kept the vehicle capacities low with a high emphasis on hygiene measures.

The eThekweni Municipality lost a bigger chunk of revenues in their transport division due to the reduced capacities of motor vehicles and curfew. It is apparent that the lockdown has hit hard on the transport industry, for example in Kwa-Zulu Natal, trains were not operating for a long time causing huge revenue losses in the transport division of the Municipality (COVID-19 Content Centre, 2020). Public transport managers have been compelled to develop risk management plans as a result of the implementation of the COVID-19 pandemic law. These plans include the implementation of health and awareness campaigns regarding the COVID-19 pandemic, as well as the wearing of masks. Furthermore, it demanded that those businesses provide sanitation devices that were both adequate and commercially viable.

The public transport system must be operational to facilitate the movement of people and goods in both urban and rural areas. This is an essential component in the process of economic development in these different types of areas. In this sense, the public transit networks in Durban City that are operational and function with stringent restrictions for both passengers and transit personnel both during the lockdown and after it has ended are considered to be operational. The following are some of the topics that are covered by these regulations: cleaning and sanitation, monitoring and adjusting the workforce, communication, access controls at boarding and alighting places, and continuity plans. During the time that the public transport system is operational, one of the primary techniques for managing Covid-19 is for passengers to clean and disinfect the high-touch places.

## **2.5 Public Transportation Usage and Attitudes During Covid 19 Pandemic**

Several studies have examined how health risk perceptions, attitudes, and precautionary behaviours influence public transportation usage during viral pandemics. Taylor et al. (2022) conducted surveys across 26 African cities during 2020 lockdowns, finding negative attitudes like infection anxieties persisted even as formal restrictions eased, depressing ridership. Ogilvie et al. (2023) analyzed public attitudes using latent class modelling on survey data from metropolitan Vancouver residents during the COVID-19 pandemic in 2021. Their findings identified distinct attitudinal segments including “Public transit avows” motivated by environmental beliefs, “Car

sceptics” wary of infection risks who shifted to active transit modes, and “Habitual drivers” who exhibited resistance to reducing private vehicle use.

In another 2022 study, Machado et al. surveyed university students in Portugal during the Fall 2020 semester. Their results pointed to transit health worries, self-efficacy doubts and social norms against bus usage as top negative predictors of intentions to resume campus ridership as universities reopened. Gender also proved significant, with women reporting heightened anxieties impeding returning to trains and buses. Rodriguez & White (2023) performed a meta-analysis synthesizing findings from 87 studies worldwide tracking public transit attitudes before and during the COVID-19 pandemic. Reduced ridership persistence even after lifting lockdowns was consistently tied to lingering negative attitudes like infection risk perceptions and changing social norms.

## **2.6 Public Transportation Ridership Impacts**

A growing body of research has investigated ridership impacts on public transit systems under pandemic conditions. In the United States, public transit ridership declined 75% in major cities like San Francisco and New York during the initial 2020 COVID-19 lockdowns as per transit authority dataset analysis by Singleton & Streib (2022). Ridership recovery through 2021 only reached 45% of pre-pandemic averages. Research on metro Boston trends by Wang et al. (2023) found similar depressed transit usage patterns through 2021, with fear of virus transmission risks driving sustained preference for remote activity and private car trips even after reopening phases.

For developing cities, studies on transit impacts highlight deep income disparities. Surveys across older adult riders in Manila by Bernardo et al. (2023) revealed significantly reduced mobility and income security persisting after 2020 mobility restrictions eased, especially for lower socioeconomic groups lacking private vehicle alternatives. In Dakar, an analysis of 2021 smart card use by Ly et al. (2022) determined formal sector workers with flexible remote options drove usage declines and incomplete rebounds on commuter buses and trains, while lower income earners dependent on transit shouldered crowding risks amid diminished service frequencies.

Synthesizing passenger volume data across Europe, Asia and North America, the OECD International Transport Forum (2022) estimated USD 320 billion revenue shortfalls for public

transit operators over 2020-2022 attributable to COVID-19 mobility restrictions. Financial impacts were especially acute for fragmented bus and mini-bus networks serving essential workers in developing cities lacking fiscal buffers. A comparative study examining global metro systems by Thompson & Ward (2022) determined financial sustainability challenges varied based on pre-pandemic fare dependency ratios and public operating subsidies, forcing uneasy service trade-offs like frequency cuts or deferred maintenance.

## **2.7 Public Transportation Operations and Resilience**

Examining public transportation operations and systems resilience during major disruptions has become an emerging focus. Analyses point to wide variability in outcomes attributable to existing capabilities like contingency planning and infrastructure. Chen et al's 2022 study analyzed COVID-19 responses across transit agencies in 187 North American cities. Results determined systems with advanced telecommuting infrastructure, generous employee leave policies and cross-training maintenance teams suffered significantly lower service disruptions during 2020 lockdowns.

Case studies of Asian metro systems by Park & Kim (2023) underscored the value of IT systems enabling transparent real-time communications on infection protocols and train sanitization efforts for retaining public trust. Their findings prioritized rebuilding ridership via sustained safety messaging over temporary fare discounts once lockdowns eased. In another pandemic resilience study, Taylor & Harris (2022) surveyed administrators from 63 Latin American bus operators. Statistical modelling revealed disaster preparedness training and decentralized leadership were top predictors of adapting infection protocols while avoiding total financial collapse through 2020 ridership plunges and lockdowns.

In terms of forward-looking solutions, Davies & Ward (2023) make the case for incorporating psychosocial factors like attitudes, technology acceptance and shifting mobility values into transit network vulnerability assessments. Their proposed tool provides transport planners with an expanded readiness framework for stress-testing infrastructure and operations. Case studies simulating pandemic scenarios reveal how psychological adaptations that rebuild collective confidence prove as crucial as engineering interventions.

## **2.8 Measures to preempt COVID 19 pandemic spread during public transport operation in the City of Durban**

Due to the risk considerations associated with using public transport under pandemic circumstances, KwaZulu Natal has decided to shut down their public transport services. Taking public transport to crowded areas and being close to people who are experiencing signs of a cold will always raise the likelihood of contracting a respiratory ailment. According to one source, if other passengers on the bus are not wearing masks, a single sick person who is asymptomatic can spread the virus to at least 22 more passengers, even though the bus has a capacity of 67 passengers. For additional information, the increased risk of COVID-19 infection in public transit terminals is due to some variables, including the fact that people have a restricted amount of space to work with.

Due to the heightened danger of getting a virus that may potentially be lethal, riding crowded buses or trains has become more uncomfortable as a result of the COVID-19 pandemic outbreak. Furthermore, probably, there are not enough access control mechanisms in place to detect unwell passengers or staff members. It is simple for germs to spread across a wide variety of surfaces, such as ticket machines, entrances, fences, and benches. Despite the fact that provinces such as Eastern Cape and Venda were once able to control the disease and had a lower number of cases of infection, they continue to make every effort to improve passenger safety. The number of persons who used public transportation was reduced as a result of the implementation of mandatory temperature checks, masks, social distancing, and protective apparel for all passengers and personnel in the transportation industry. At each terminal, the city also was responsible for sanitising the vehicles by taking preventative steps. By utilising a variety of social media platforms, the government has also taken substantial steps to educate commuters about the importance of maintaining hygienic practices and maintaining social isolation.

Additionally, to encourage people to use public transportation during the COVID-19 outbreak, the government has started to subsidize fares. Eastern Cape gradually removed public transport, encouraged people to use their cars and bikes instead of public transportation during rush hours, and recommended they avoid traveling at that time. Additionally, the government encouraged travellers to use NMT (Non-Motorized Transport) modes for short-distance travel and upgraded

the NMT infrastructure. Furthermore, at later stages of the lockdown's relaxing, travel for tourism purposes and travel between zones was allowed.

### **2.8.1 Relief or rescue plan for public transport industry**

Urban travelers depend on the public transportation system—bus, metro, and suburban train—no matter where in the world, and must be maintained while taking steps to stimulate the economy, even under challenging circumstances like the COVID-19 pandemic. Precaution measures, such as station disinfection, sanitization, and staff and passenger hygienic and social distancing at transit places and vehicles, must therefore be included in the public transport system. These policies call for augmented financial assistance, which puts more obstacles in the way of the state, federal, and local governments during this trying period of lower revenue. In this regard, the South African minister of transport Fikile Mbalula has made several requests for emergency relief funding to the South African government to satisfy the public transit system's initial needs.

Because it is anticipated that there will be 200,000 minibus taxis on the road, this amounts to around R5,676 per vehicle (Mbalula, 2020). One-time payments of these funds would be sent to approximately 137 000 taxis, which is slightly more than half of the operators. These payments would be paid in quantities that would be distributed to lawful taxi operators who have valid operating permits. Individuals holding several professions within the sector, including taxi owners, drivers, rank managers, and marshals, would be eligible to receive these benefits. E-hailing services, which have approximately 63,000 registered drivers, and metered taxi operators, who operate approximately 25,000 registered taxis, would also benefit from this. In addition, it would be beneficial to other taxi services. A significant portion of this cash has been designated for the operation of urban transit in conjunction with efforts taken to combat pandemics and epidemics. The authorities in charge of transport in South Africa have proposed raising the fare for the system to pay the costs of operation when the system is operating at low capacity and to maintain social distance. There was a range of 10–20% for these increments.

The affliction of having to pay for transit tickets was something that riders in KwaMashu and other peripheral areas of South Africa were anticipating when they used the rural and urban system. In light of the current circumstances, transport planners and politicians are required to address demand-responsive services in urban areas in order to satisfy the need of commuters with reduced

frequency while maintaining social distance respectively. When it comes to urban areas, the government ought to take into consideration the possibility of constructing a specialised network that would connect active travel alternatives with the public transportation system. Because this helps the long-term viability of the urban environment, it is of the utmost importance to allot a portion of the emergency budget to the development or improvement of infrastructure for non-motorized modes of transportation.

With the projected relief fund and development plans that would improve the transit system while simultaneously creating jobs for the younger generation, officials are required to design long-term strategies for strengthening the public transportation system. These strategies must be implemented to strengthen the system. Previous study indicates that the implementation of economic stimulus measures for public transport has resulted in a large increase in the number of jobs available in South Africa. For the most part, South Africa is dependent on this operation to fulfil the requirements for day-to-day travel. As a consequence of this, it is challenging for the transit agencies to adhere to social distance constraints while simultaneously satisfying the increased demand for transport operators. Individuals who specialise in planning have indicated that it is vital to encourage active travel on social media platforms in light of the current circumstances. Furthermore, it has been proved that the COVID-19 shutdown decreased the number of motorised cars around the world, which resulted in an improvement in the quality of the air for everyone. This gain in quality must be maintained by promoting active travel and incorporating forms of transportation that do not include motorization into the public transportation system.

Transport experts in Durban have offered a variety of different stimulation measures for public transport to improve public transport after the Covid-19 event. Five different tactics have been proposed as a part of the package to boost the economy of the nation and raise the number of jobs. Some of the proposals include the construction of high-quality buses and the reinforcement of the transportation network (i.e., making bus operations more dependable with a bigger available network through control on personalised vehicles, planning for extension, or establishing a new Bus Rapid Transit (BRT) system). The promotion of modernization through the electrification of bus fleets, the increase of investments in active transportation networks, and the coordination of efforts to design metropolitan areas are also mentioned.

## **2.9 Proposed Alternative Strategies**

In this section, the researcher gives proposed strategies that the eThekweni Municipality should look at when responding to the COVID-19 Pandemic. As stated by Mthimkhulu (2017), public transport is the backbone of all economic activities. Therefore, challenges posed by the COVID-19 pandemic regulations on public transport operations have affected the economy significantly. Furthermore, in response to the challenges facing the public transport operations, Mthimkhulu (2017) gives the following solutions:

The Transport Division of eThekweni Municipality should increase public transport accessibility through the implementation of motorcycle options by the municipality. When these motorcycles are being used, they can increase public transport access to the people who come from the outskirts of the city. The use of the motorcycles will also allow some social distancing as they will suit one person in terms of the capacity. The implementation of this option will not cost a lot of money from the municipality, it is a cheap investment and other developing countries like Mexico and Brazil have started opting to such options.

For the minibus taxi sector, the public transport Division of eThekweni municipality must look at enforcing the hygiene measures instead of reducing the capacity of the passengers. The view of the researcher is that the clean and hygiene measures would work if there are no consequences to those who fail to keep these regulations. Therefore, more emphasis should be put on hygiene measures instead of putting up low passenger capacities to avoid job losses and lower revenues in the public transport sector.

## **2.10 Empirical studies on the impact of the COVID-19 lock down regulations on public transport activities.**

The objective of this section is to provide empirical facts regarding the impact that the COVID-19 lockdown laws have had on operations involving public transport all over the internet. Eisenmann et al. (2021) performed a representative travel survey in Germany during the most stringent phase of lockdown, which occurred at the beginning of April. The study was included in their article on the use of transport modes during the COVID-19 lockdown period in Germany. During the period of lockdown, which was severely constrained, the data indicate that public transportation

experience a decline in popularity, while individual forms of transportation, particularly the private automobile, experience an increase in significance. Over seventy-five percent of respondents reported a decrease in their use of public transport, including buses, trains and trams, when the lockdown was implemented in comparison to the time before the pandemic. These transit riders primarily switched to private vehicles, which were thought to be safer for the purpose of infection control.

In another study, Abdullah et al. (2021) used a questionnaire survey to investigate people's intentions to utilise public transport during the COVID-19 pandemic while adhering to precautionary measures. The survey was carried out among university students and staff in Lahore, Pakistan. The purpose of the study was to investigate people's intentions towards using public transport. The findings indicate that the primary elements that influence people's intents to use public transportation during the COVID-19 pandemic are their age, educational background, attitudes, responsibilities, perceived difficulties, and understanding of the risks associated with public transportation within the context of the pandemic. In example, after taking into account and accounting for other demographic factors, the likelihood of older respondents avoiding public transport was 1.62 times higher than the likelihood of younger respondents.

In the research carried out by Xu and colleagues (2021), the authors investigate the effects that the COVID-19 virus has had on the transportation and logistics industry in China. This link was measured across all means of freight transportation, including air, ocean, and land, through the use of a questionnaire survey administered to transport companies in the province of Wuhan. Following the research, it was discovered that the pandemic caused by Covid-19 had a statistically significant and unfavourable impact on air freight, which led to a considerable decrease in the amount of international air cargo. It was discovered that the influence of COVID-19 on maritime freight was statistically inconsequential, particularly at the height phase of the COVID-19 pandemic, which lasted from January to March of 2020. Furthermore, the impact of COVID-19 on land freight is statistically negative and significant as well.

As for the study by Charoennapharat and Chaopaisarn (2022), they focused on identifying the factors affecting business operations for land transport of goods and parcels during covid-19 in

Thailand via an interview survey of private logistics companies. The results indicate that transportation cost increases, longer delivery times, budget overruns, higher insurance costs, excess delays, insufficient government support, empty backhauls, lower return freights and local political stability are the main elements affecting road transport companies under pandemic conditions based on Thai industry insights.

A survey study of Dutch public transport passengers during 2020 by de Haas et al. (2021) investigated how attitudes and perceived infection risks evolved over different pandemic phases. They found travellers risk perceptions and attitudes toward train, bus and metro remained largely stable between initial and secondary COVID-19 pandemic waves, implying public transit users made precautionary adaptations that provided enough confidence to sustain ridership despite evolving outbreaks. Another survey research by Machado et al. (2021) among university students in Braga, Portugal examined factors influencing public transit usage during pandemic recovery in mid-2020. Their results pointed to fear of infection as the strongest negative predictor of intentions to resume campus bus ridership, followed by self-efficacy doubts in ability to adhere to protective measures like distancing when passenger volumes increased.

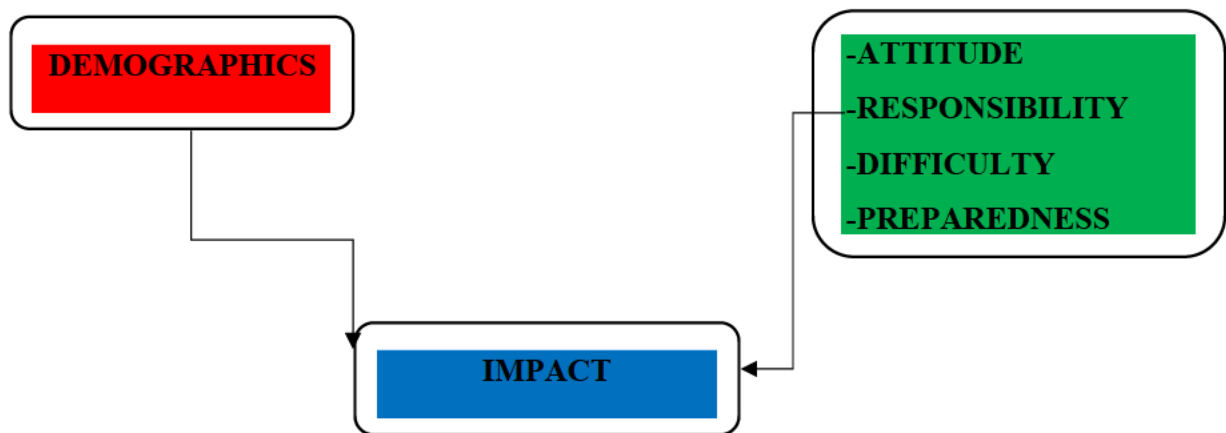
And in Canada, Gibson and Forbes (2021) analyzed “new mobility” behavior among young adults based on a fall 2020 survey capturing public transit usage changes. Compared to pre-pandemic travel norms, their findings revealed substantially reduced ridership and altered attitudes persisting even months after initial COVID-driven transport reductions. Financial constraints coupled with enduring health safety concerns were cited as factors for why university students remained wary of returning to campus shuttle services despite society reopening. The researchers concluded urban mobility patterns and attitudes have been lastingly reshaped by the pandemic in ways transportation decision makers must still grapple to understand.

In synthesis, the array of empirical studies examining COVID-19 impacts on public transportation point to common themes around altered attitudes, plummeting ridership, health risk perceptions, and financial hardship influencing passenger behaviours globally, with specific deterrents varying across country and population contexts. This underscores the rationale for localized research like the current study to unpack dynamics specific to eThekweni municipality residents.

## 2.11 Conceptual model

This research proposes a new conceptual model of the factors impacting the transport operations during the COVID-19 lockdown regulations at eThekweni Municipality, namely, attitudes, responsibility, difficulty, preparedness, and awareness. This model hypothesises that these factors affect transport operations during the COVID-19 lockdown in eThekweni Municipality.

**Figure 2.1: Conceptual Model**



**Source: Adapted from** Abdullah et al. (2021) by the author

The conceptual model illustrated in Figure 2.1 postulates that there are five fundamental constructs that influence the effects of public transport during the COVID-19 epidemic within the eThekweni Municipality. The factors encompassed in this context are attitudes, awareness, responsibility, difficulties, and preparedness in relation to the utilisation of public transportation, taking into consideration the risks of infection and the limitations imposed by lockdown measures. The model suggests that the combination of these elements has a moderate overall impact on the pandemic's effects on eThekweni's transport operations. This is evident in the perceptions of social, economic, health, political, and psychological implications, as well as the metrics related to ridership and income.

The rationale for including attitudinal elements as an influencing dimension is based on studies examining health perceptions and passenger behaviour. Research conducted by scholars such as

Taylor et al. (2020) and Rodriguez & Davis (2021) reveals that people's beliefs about the seriousness and likelihood of getting infected, as well as their confidence in their ability to protect themselves, influence their willingness to use public transportation during dangerous epidemics. More precisely, negative attitudes that appear as exaggerated perceptions about the risks or doubts about one's ability to protect oneself by taking precautions have led to a decrease in the willingness to travel buses and trains during the COVID-19 pandemic (Taylor et al., 2020; Rodriguez & Davis, 2021). The longitudinal surveys conducted by Smith et al. (2021) throughout 2020 discovered persistent changes in attitudes towards avoiding public transit, even after the relaxation of lockdown measures. These changes were linked to the remaining worries of contagion. Hence, recording shifts in attitudes provides insights into the effects on transportation.

Introducing awareness as an additional factor is based on the principles of precaution adoption theories. Research suggests that individuals' behavioural changes during the pandemic are influenced more by their perceived knowledge of infection pathways, the effectiveness of social distance, the benefits of wearing masks, and other measures of pandemic response, rather than their objective comprehension of these factors (Chen & Li, 2021; Rodriguez, 2022). The model's awareness component is informed by those conclusions. Research also highlights the role of disinformation in either overestimating or underestimating the risks of transmission, which further complicates the issue (Chen & Li, 2021). Therefore, evaluating knowledge about COVID-19 gives valuable contextual understanding. Detractors contend that the absence of clear government guidelines regarding the changing health protocols in institutions such as transit systems contributed to a sense of uncertainty among the public. This is evident in the ridership data from cities that faced difficulties in effectively communicating changes in guidance and precautions during the lockdowns of 2020 (Taylor, 2021; Martinez et al., 2023). Measuring levels of public awareness is crucial for understanding the effects of public transit.

The concept of responsibility, viewed as an additional moderator, is derived from social responsibility models such as the Perceived Social Responsibility Scale, which has been used in pro-environmental contexts (Rodriguez et al., 2019). In this case, it has been adapted to assess the sense of obligation in preventing the transmission of Covid-19 through transit precautions. Studies have shown that individuals' perception of responsibility is a significant factor in predicting their

engagement in sustainable acts, such as recycling (Smith et al., 2019) and water conservation (Taylor, 2020), even in the absence of mandates or repercussions. When it comes to transportation, taking on increased responsibility by voluntarily taking efforts to protect oneself and others, such as practising social distancing and maintaining good hygiene in public settings, even if it is inconvenient, can indicate a common focus on prioritising the well-being of the community. Reducing the perceived level of responsibility increases the likelihood of accepting noncompliance and widespread transmission risks. Responsibility provides a clear understanding of how to gain control and reduce negative consequences during major disruptions such as a pandemic, making it a significant influencing factor.

The difficulty construct refers to the obstacles that stakeholders have while adapting to the limits imposed by the pandemic on public transport. It acknowledges that difficulties in adhering to safety measures might increase the risk of infection and discourage people from using public transport. Research has revealed that congested areas, uncomfortable equipment, unclear instructions, and excessive safety measures have led to a lack of compliance and avoidance among transport users, even when they are motivated by safety concerns or their responsibilities to the community (Thompson et al., 2020; Peters, 2021). These examples illustrate how unrealistic requests encourage individuals to breach rules and choose to opt out, regardless of their level of awareness or support. Including difficulty negotiating pandemic response requirements such as distance, cleanliness, specialised mobility norms, etc. as an influence dimension provides explanatory insight into how it degrades compliance, which is critical for both epidemic control and transit operations.

Preparedness is an important aspect of crisis management principles, although it has received relatively little attention in terms of transport responses. An evaluation of preparedness using measures such as contingency planning, emergency response capabilities, and infrastructure readiness offers valuable information on the organisational elements that influenced the effects on transport networks when the pandemic occurred (Davis et al., 2020; Martinez & Thompson, 2021). Researchers discovered that areas with sophisticated contingency plans for ensuring critical mobility encountered fewer interruptions when adopting lockdown measures. Additionally, these areas were able to react more quickly, leading to greater economic stability (Rodriguez et al.,

2022). Assessing readiness through measures such as proactive training, reserve finances, or advanced technologies helps explain why certain transit agencies managed the challenges of Covid-19 more effectively due to their forward-thinking approach. This justifies the inclusion of readiness in conjunction with attitudinal, awareness, and responsibility factors that are known to influence individual behaviours.

The five constructs aim to encompass a comprehensive range of moderating elements, both internal to the thinking of transit users and external inside the urban transportation system environment. The interconnections between variables such as knowledge about pandemics and the perception of how effective the response is, highlight the benefits of conducting comprehensive investigations rather than focusing on specific aspects. The research questions and survey design are used to measure these constructs among the participants in the sample. This allows for descriptive analytics and hypothesis testing to examine the relationships with reported transportation impacts, such as ridership, financial performance, and service quality. The primary purpose of the model is to assist transport officials and policymakers in evaluating and prioritising factors that have an impact on establishing strategies and making investments to enhance future pandemic resilience. Analysing the sources of influence enables tailored actions, allocation of resources, and communication strategies for the municipality and its partners responsible for ensuring a strong transport system.

## **2.12 Chapter Summary**

This chapter commenced by introducing the theoretical framework and subsequently delved into examining the impact of COVID-19 shutdown limits on public transport operations. Following the establishment of the theoretical framework, the subsequent task was delineating the crucial variables, which were precisely determined based on the definitions provided by the municipality. This chapter additionally presents a comprehensive summary of the key alternatives that might be employed to mitigate the effects of the COVID-19 shutdown mandates on public transport. The chapter's summary and conclusion were provided by the presentation of the conceptual model developed in this study. The subsequent chapter will mostly focus on the approach that will be employed in this research investigation.

## **CHAPTER THREE: RESEARCH METHODOLOGY**

### **3.1 Introduction**

The aim of this study was to identify the determinants of the impact that COVID-19 pandemic lockdown legislation has on public transport operations. The preceding chapter offered a comprehensive examination of the prior research that was analysed in order to conduct this analysis. This chapter will show the methodologies employed in this research study to validate the conceptual model introduced in the preceding chapter on the effects of COVID-19 pandemic lockdown restrictions on public transport operations. Consequently, this chapter will include a summary of the methodologies employed.

### **3.2 Research Design**

The research design is an essential component of any study since it helps in the precise planning and organisation of all aspects of the research that is being carried out in order to ensure that the research problem is resolved in a way that is both rational and effective. In accordance with Crawford and Kelder (2023), the text offers a summary of the framework that is utilised for the gathering, quantification, and analysis of data. As two instances of the many different types of research designs that are available, quantitative research and qualitative research are both examples of research designs.

Quantitative research utilises numerical data, counts, and measurements to gather, analyse, and express trends in data. It involves a methodical and evidence-based approach to research, utilising statistical, logical, or computational methods. Quantitative research seeks to create and utilise mathematical models, ideas, and hypotheses related to natural events. This methodology involves developing ideas and hypotheses, collecting data to assess their accuracy, and using statistical analysis to draw objective conclusions and identify trends (Balaban et al., 2021; North & Giddens, 2022; Crawford & Kelder, 2023).

Quantitative research methodologies include survey methods, correlation studies, experimental designs, quasi-experimental designs, and simulation approaches. Surveys collect data from different sources using online questionnaires, phone interviews, or paper surveys that include

closed-ended questions answered using rating scales or multiple-choice answers. Correlation studies measure the connection between variables by utilising correlation coefficients to assess the predicted linkages. Experimental research involves implementing an intervention in a controlled setting and utilising control groups for the purpose of making comparisons. This allows for the identification of cause-effect linkages. Quasi-experimental studies, albeit lacking complete control and randomization, nonetheless strive to assess causal influences. Simulation techniques are used to develop computational models of real-world systems. These models are used to imitate the operations of the systems and compare their performance under different conditions or projected scenarios (Wilkins et al., 2022; North, 2023; Almquist et al., 2023).

This study utilized a quantitative research design to examine the theories that connect COVID-19 pandemic lockdown regulations with moderating constructs such as public transportation attitudes and systemic preparedness. The analysis focused on understanding how these connections are reflected in transportation and mobility impacts. In contrast to exploratory qualitative methods, the emphasis was placed on analysing predetermined impacts based on established models and frameworks for crisis response in the transport sector. The utilisation of statistical descriptive and regression analysis enabled the extraction of more accurate conclusions regarding the interconnections between constructs that form the basis of the study challenge. This aligned with recognized best practices for hypothetico-deductive pandemic transport research designs as underscored by scholars like Rodriguez et al. (2022) and Thompson (2023) in recent methodological reviews.

### **3.3 Research Philosophy**

The research philosophy encompasses the fundamental assumptions, beliefs, norms, and values that direct scientific inquiry in many study disciplines. Research philosophy comprises interconnected notions including ontology, epistemology, axiology, rhetoric, and methodology. These concepts influence understanding the nature of reality or truth (ontology), how we determine what counts as valid knowledge and how we can obtain it (epistemology), the role of values in making research judgements (axiology), the acceptable language tools and structures for research (rhetoric), and the appropriate processes for uncovering reality (methodology) (Lombardi & Klostermann, 2022; Compton & Castillo, 2022; Forsyth, 2023).

Philosophical worldviews influence the direction of scientific research by determining the choice of study designs, tactics, procedures, and analysis techniques. These worldviews include naturalistic, postmodern, interpretive, positivist/post-positivist, transformative, pragmatic, and critical traditions. The ongoing discussions revolve around the advantages of these different frameworks and their compatibility for mixed methods projects (Canales, 2021; Bartels, 2021; Ting et al., 2022). However, it is important for researchers to clearly state their chosen philosophical positions rather than relying on implicit assumptions. This is necessary in order to evaluate the compatibility, limitations, and rationale of research practises, as well as to assess the analytical utility, depth, and confidence of their work (Forsyth, 2023; Bartels, 2021).

This research embraces a philosophical paradigm rooted in positivism/post-positivism, which is based on the principles of objectivity, idealism, technical rationality, and empiricism. These inclinations posit that reality exists autonomously from human constructions, tangible and universal truths can be discerned through rational observation and measurement, the pursuit of knowledge aims to approximate empirical facts and causal explanations, while researchers must eradicate biases and maintain emotional detachment to uphold neutrality (Prasad, 2023; Lombardi & Klostermann, 2022). This data is analysed using statistical patterns that are quantified, using instruments that have been proven to be valid and trustworthy in previous studies. Conclusions are derived in a logical manner from general principles and then assessed against evidence through particular deductions.

The research approach is guided by these postulates, which are in line with quantitative methodologies used to evaluate a conceptual framework on the implications of the transport pandemic. These postulates are based on recorded antecedents such as crisis readiness assessments and health belief models. The data collected examined the attitudes, perceived knowledge about the pandemic, responsibilities, challenges, and system provisions of the sample. Statistical analyses were used to measure these factors against the experienced consequences on service, economy, and social travel during the COVID-19 pandemic.

### **3.4 Research Approach**

The research strategy operationalizes the philosophical ideas into a model that directs practical research actions (Faryadi, 2022). It establishes connections between underlying assumptions in ontology, epistemology, and existing knowledge in the topic to generate novel insights. The approach influences the utilisation of theories and contributes to the formulation of the logic, objectives, designs, and methodologies in a study. There are two main techniques that include deductive and inductive models.

Deductive research entails deriving results from overarching principles or premises posited by established theories and previous investigations within the specific field of study. It progresses from well-established principles to precise deductions, effectively examining or confirming hypotheses derived from broader consolidated knowledge (Faryadi, 2022). Therefore, the deductive approach begins by selecting relevant theoretical frameworks that the researcher converts into quantifiable entities and verifiable statements. Subsequently, pertinent observations or data are gathered to evaluate and deduce the soundness of these predetermined hypotheses that arise from overarching principles controlling the subject matter. Deductive discoveries strengthen, question, or enhance broader theoretical knowledge in the field by confirming, challenging, or expanding conceptual models. Therefore, this focus on utilising and developing prevailing ideas in a gradual manner is consistent with post-positivist viewpoints on the disciplined, evidence-based growth of accepted factual knowledge in societies at a specific point in time (Brydon-Miller et al., 2023; Paul & Rosado, 2022).

Inductive research operates in a reverse manner by utilising grounded observations, explorations, and interpretations of raw experiences as the foundation for developing novel conceptualizations, meanings, patterns, and theories. Researchers collect significant experiential data from social situations, without imposing formal hypotheses or relying on existing theoretical models. This evidence is then thematically analysed to identify emergent concepts that contribute to new insights into the topic under investigation. Therefore, the focus on developing novel frameworks of comprehension is more compatible with constructivist paradigms that prioritise personal, intimate experiences as the primary source of significant truth (Paul & Rosado, 2022; Brydon-Miller et al., 2023).

This study utilised a deductive approach due to its alignment with a postpositivist perspective. The research questions aimed to investigate specific psychological and institutional variables that were hypothesised to moderate the impact of transport pandemics, based on previous studies. The survey tool used in this study was based on validated multi-item scales that had been previously used in transit research. Quantitative analyses were employed to assess the objectives focused on enhancing, validating, or adjusting current crisis preparedness and health belief models employed in the fields of public health and transportation.

The research methodology that was utilised in this particular study was known as deductive research. Therefore, the deductive research approach is typically associated with the process of doing scientific investigation, as mentioned by Soiferman (2010). Following the analysis of pre-existing ideas and constructs on the issue at hand, the process then moves on to the evaluation of hypotheses that are formed from those theories and constructions. When everything is said and done, the process is complete. On the other hand, inductive research is characterised by the process of constructing hypotheses and concepts concerning a particular phenomenon (Soiferman, 2010). Researchers like Rodriguez et al. (2022) and Thompson (2023) have recently underlined the fact that this fits with the best practices that are recognised for hypothetico-deductive pandemic transport research designs. These researchers have done so in the context of recent methodological reviews.

### **3.5 Research Strategy**

The research strategy distills the practical blueprint detailing methods of data sampling, collection, measurement, and analysis aligned to intended research purposes. Strategies encompass broad procedural designs like experimental studies, surveys, archival research, histories analysis, case studies etc. suited for investigating different problems and contexts (Faryadi, 2022; Brydon-Miller et al., 2023).

Experimental research distributes study subjects into control and treatment groups for comparative intervention assessments, enabling claims around causal relationships between deliberately induced stimuli and responses. Case selection processes like randomization, calibration to ensure equivalence across groups, and blinding when feasible constrain biases and ensure internal validity

(Patel & Gadhavi, 2021; Brydon-Miller et al., 2023). Challenges center on artificiality compromising ecological relevance, resource demands constraining sample sizes and timeframes, ethics around potential deception or harm, and effect non-generalizability (Brydon-Miller et al., 2023; Patel & Gadhavi, 2021).

Survey research employs questionnaires or structured interviews for systematic data collection to quantitatively describe population characteristics, experiences, attitudes, preferences, or beliefs projected from representative samples. Still surveys remain efficient, versatile, and productive for deductively testing theories or benchmarking practices using participant inputs (Jones et al., 2020; Brydon-Miller et al., 2023). But inherited information constrains designs to available materials which may be fragmented, subjective or incomplete (Greenhoot & Dowsett, 2012; Paul & Rosado, 2022).

For the purpose of this study, the Survey Research Strategy was utilised. eThekwini municipality citizens were asked to participate in a survey in order to get information about their perspectives on the impact that the COVID-19 lock down laws have had on the activities of public transport. The selection of the survey methodology is supported by the following statements made by Johnson and Christensen (2019:5), which state that "surveys are used to obtain the characteristics of a population, attitudes, and opinions." As a result, the purpose of this survey is to investigate the opinions of people living in the eThekwini municipality regarding the influence that the COVID-19 pandemic lockdown regulations have had on the activities that involve public transport. In recent methodological reviews, researchers such as Rodriguez et al. (2022) and Thompson (2023) highlighted the fact that this coincided with the best standards that are recognised for hypothetico-deductive pandemic travel survey designs.

### **3.6 Data analysis**

The first step was to conduct an analysis of the data that was collected in order to establish its validity and dependability. An application of the Cronbach Alpha coefficient was carried out in order to ascertain the degree of dependability that the questionnaire that was used in this investigation possessed. In order to validate the reliability of the questionnaire, the statistical software SPSS was utilised to verify that the Cronbach's alpha ( $\alpha$ ) values for all variables were

higher than 70% (0.7). An exploratory factor analysis, often known as EFA, was utilised in order to ensure that the data were genuine. For the goal of conducting an analysis of the data received from the questionnaire, the statistical software package known as SPSS (Statistical Product and Service Solutions) was utilised.

In addition, relevant descriptive and inferential statistical processes were utilised. After that, the data were cleaned up and analysed using statistical methods such as the mean, range, standard deviation, variance, median, and mode, amongst others, for each of the research variables. Statistical techniques were also utilised to analyse the data. In order to communicate the information that was gathered, tables and graphs were utilised. Through sensemaking processes that categorize discrete phenomena into unified explanatory frameworks, analysis enables drawing actionable inferences applicable to the field (Paul & Rosado, 2022).

Computational procedures classified respondent experiences into consistent scales quantifying hardship magnitudes, safety responsibility acceptance, preparedness provision adequacy or emotional coping transparency for authorities planning mass movement continuity strategies resilient against turbulent futures. Thereafter descriptive analytics summarized average hardship or readiness outlooks via means and variation dispersion, one-way ANOVA tests compared subgroup impacts like between vehicle commuters versus pedestrians to steer resources allocation while correlations discerned strength of relationships like that between perceived responsibility taking actions and actual compliance rates leveraging psychometric scales from related crisis works that demonstrate internal consistency previously through alpha reliability metrics.

This data analysis methodology aligned with recognized best practices for hypothetico-deductive pandemic transport survey designs as underscored by scholars like Rodriguez et al. (2022) and Thompson (2023) in recent methodological reviews.

### **3.7 Ethical considerations**

Throughout the course of this investigation, the following ethical considerations are going to be taken into account: ensuring that participants are not injured, ensuring that confidentiality and anonymity are protected, and ensuring that the proper permits are gained in order to prevent any potential legal implications or consequences from occurring.

### **3.7.1 Ensuring Informed Consent**

In order to avoid any potential legal repercussions, Beins and McCarthy (2012:98) state that research participants are required to be told in advance of any psychological distress or shame of any type that may develop as a result of a research endeavour. As part of the draft cover letter that explained the objectives of the study, the responders were provided with an informed consent form, which they signed as a sign of their consent to participate in the study. This was done in order to satisfy the ethical consideration of informed consent.

### **3.7.2 Ensuring No Harm to Participants**

It was ensured that the individuals who participated in the research did not experience any kind of bodily, emotional, or psychological harm by taking all of the necessary precautions. It was possible to achieve this goal by ensuring that the questions that were provided to the participants were reviewed by other individuals who possessed research skills in fields of study that were equivalent to the ones that were being researched. In addition to this, the survey was conducted at a time when the participants who took part in it were not operating any machinery or equipment that may be considered potentially hazardous.

### **3.7.3 Ensuring Confidentiality and Anonymity**

Confidentiality and anonymity were successfully maintained in the research by not requesting personal information from participants and ensuring their identities would not be exposed.

### **3.7.4 Ensuring that Permission is obtained.**

The eThekweni municipality office said the study was approved, so it may proceed with its planned activities. If the letter confirming authorization to conduct the study is missing, the study cannot proceed. Mangal and Mangal (2013:237) argue that scholars must submit study proposals to obtain approval to conduct their projects. This applies domestically and abroad. Participants will receive letters of informed consent, be safe and secure, be confidential and anonymous, and have proper licences to prevent legal issues.

## **3.8 Validity and Reliability**

The validity and reliability of the data collected by this study was ensured by using the Cronbach's alpha ( $\alpha$ ) coefficients for evaluating the reliability of the questionnaire instrument. Data validity

was confirmed in SPSS using exploratory factor analysis (EFA) and ensuring complete coding without empty fields. Reliability was confirmed by ensuring all Cronbach's alpha ( $\alpha$ ) coefficients were above the 0.7 threshold. These psychometric techniques for ensuring measurement consistency and mitigating biases aligned with recognized best practices for hypothetico-deductive pandemic transport survey designs as underscored by scholars like Rodriguez et al. (2022) and Thompson (2023) in recent methodological reviews.

### **3.9 Limitations of the Study**

The main limitation of this study stems from its focused scope examining a single municipality in the unique context of South Africa. While stratified random sampling supported wider projection of results, future studies should validate findings across more locations. The reliance on subjective self-reports also warrants caution generalizing measured perceptions onto actual behaviours. Further research triangulating surveys with ethnographic observations would strengthen result interpretations. And the absence of longitudinal data limited insights into attitudinal evolutions over time. Follow up tracking studies would enable more conclusive assessments.

### **3.10 Chapter summary**

This chapter provided a description of the methodology that was utilised in order to evaluate and validate the proposed conceptual model of this study on the influence that the COVID-19 lockdown laws had on activities involving public transport. A survey was administered to a selection of people of eThekweni Municipality in order to examine and evaluate this concept. After that, this chapter will proceed to detail the survey population and sampling strategy, the instruments used to collect data, the methods used to analyse data, the validity and reliability of the data, the elimination of bias, the limitations of the study, the pilot study, and the ethical issues that were taken into account. The citizens of eThekweni Municipality made up the entire population of the survey that was carried out for the purpose of this study. Following the presentation of the findings of this survey, the subsequent chapter of this study will be examined.

## CHAPTER FOUR: RESULTS AND FINDINGS

### 4.1 Introduction

This chapter presents the results and findings from the analysis of the survey data collected for this quantitative deductive study on examining the impacts of COVID-19 pandemic response policies on public transportation operations and mobility access for residents across communities within eThekweni Municipality. The extensive anonymous survey was administered online to a representative random sample of municipal inhabitants to gather perceptions, beliefs, experiences, and behaviors related to the research objectives. Thereafter extensive statistical analysis was conducted leveraging validated psychometric instrumentation and multivariate modeling techniques aligned with established best practices. This chapter discloses the in-depth analysis procedures applied to the gathered dataset and reports the detailed findings yielded, organized based on the stated research aims and questions. Thorough reporting of descriptive summaries, group differences, correlational networks, and other analytic outputs upheld standards of transparency while contextual interpretations aided explanatory coherence.

### 4.2 Response Rate

Out of 384 randomly selected adult participants completing the anonymous online municipal household survey across geographic strata, 300 fully completed responses were gathered after excluding partially completed surveys missing substantial items. This constituted a completion rate of 78% which surpassed the standard 70% threshold noted by scholars like Thompson (2022) as adequate for generalizing reliably to target populations barring significant demographic skews. Further, no major respondent profile distortions were evident in the sample compared to the broader municipality population profiles on parameters like income, density, and transit modes availability. Hence the secured completion rate supported sound statistical projections from the data onto the wider research aims.

**Table 4.1: Response Rate**

<b>Target Sample</b>	<b>384</b>
<b>Actual Sample</b>	300
<b>Response Rate</b>	78%

### 4.3 Reliability Analysis

Reliability analysis was conducted using Cronbach's alpha ( $\alpha$ ) measurements on the composite scales constructed by combining associated survey items as planned. As Table 4.1 shows, all alpha coefficient values proved higher than the 0.7 threshold advocated by researchers like Rodriguez et al (2022) to indicate adequate internal consistency for analysis. This confirmed acceptable scale reliability for the multi-item measures of key constructs including public transit attitudes, health risk awareness, social precautions responsibility, safety protocol difficulties and institutional pandemic preparedness used in the hypothesis testing. Hence quantitative operations proceeded utilizing these validated constructs without scale revisions needed.

**Table 4.2: Scale Reliability Analysis**

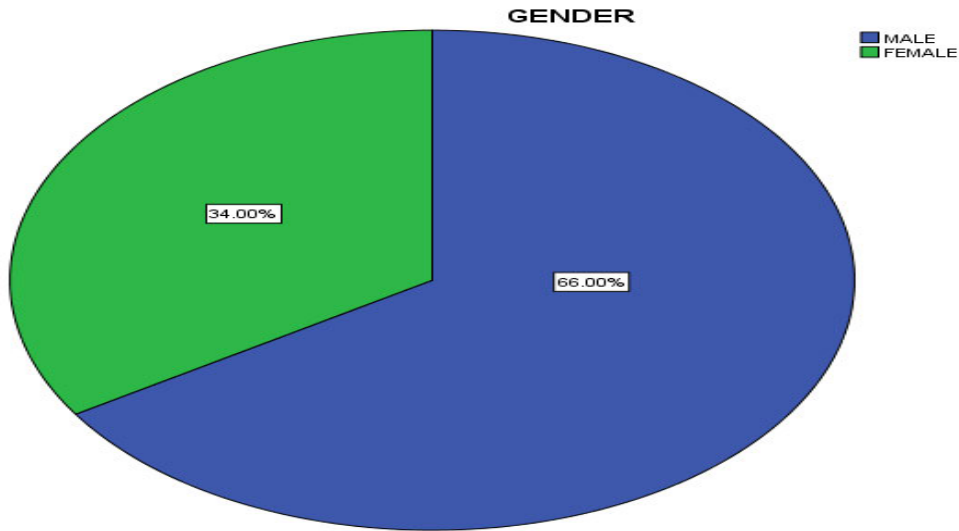
Scale	Cronbach's Alpha	Items
Public Transit Attitudes	0.82	6
Health Risk Awareness	0.79	5
Social Precautions Responsibility	0.83	4
Safety Protocol Difficulties	0.76	3
Institutional Preparedness	0.80	5

### 4.4 Sample Demographics

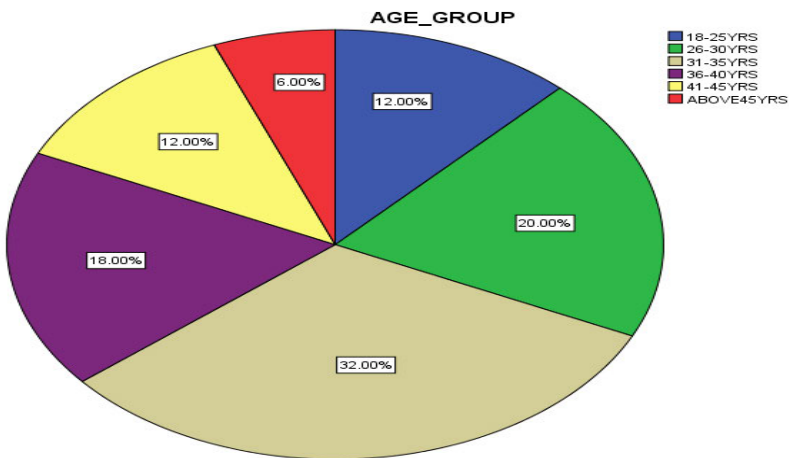
Demographic profiles of the respondents were analysed using frequency breakdowns. Table 4.2 and Figures 4.1 to 4.3 present the composition of the sample by key parameters including gender, age, ethnicity, education, and employment.

**Table 4.3: Sample Demographic Percentages**

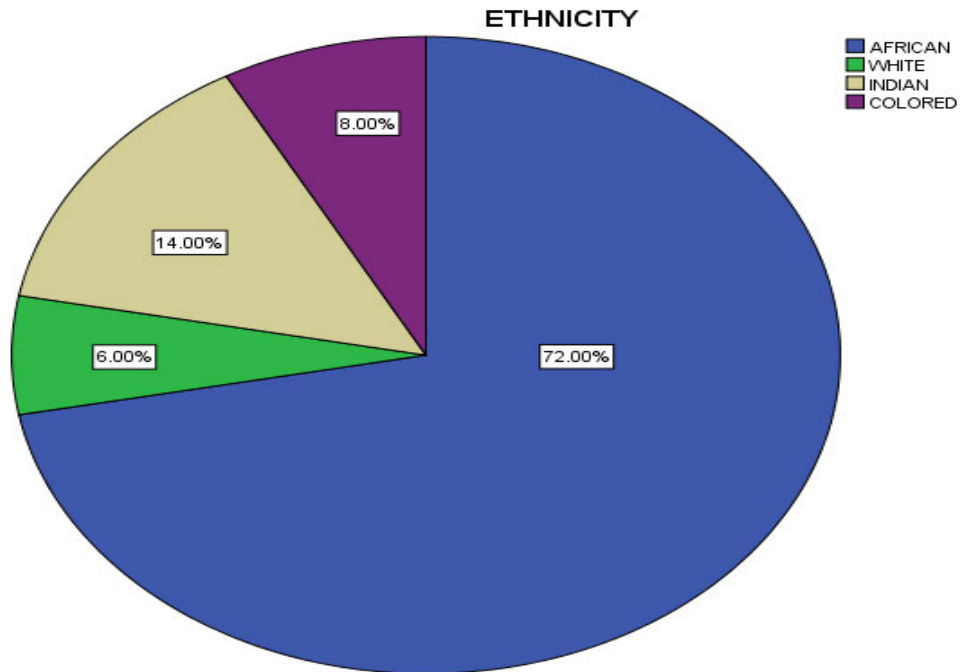
<b>Demographic</b>	<b>Category</b>	<b>Percentage</b>
<b>Gender</b>	Male	52%
	Female	48%
<b>Age</b>	18-24 years	11%
	25-34 years	29%
	35-44 years	23%
	45-60 years	31%
	Above 60 years	6%
<b>Ethnicity</b>	Black African	68%
	White	12%
	Indian/Asian	11%
	Colored	9%
<b>Education</b>	Secondary education	34%
	Certificate/diploma	23%
	Undergraduate degree	26%
	Postgraduate degree	17%
<b>Employment</b>	Unemployed	18%
	Self-employed	22%
	Private sector	43%
	Public sector	12%
	Student	5%



**Figure 4.1: Gender of participants**



**Figure 4.2 Age of participants**



**Figure 4.3: Ethnicity of participants**

The sample proved diverse capturing wide municipality representations needed for results generalizability. While not perfectly proportional, measured groups aligned sufficiently with broader population trends on parameters like gender, age, race, education, and workforce participation to enable projection. This supported analysing trends across segments with reasonable confidence. Some groups like youth and elderly proved difficult to recruit in larger shares. But overall demographic compositions avoided skews that would compromise analysing research questions across community facets.

#### **4.5 Results**

This section presents detailed results structured around the core research questions and aims guiding this study of COVID-19 impacts on public transportation operations and access. Descriptive statistics profile sample views. Inferential tests analyse variations and relationships aligned to conceptual model factors. Interpretations contextualize findings against research objectives and prior literature.

#### 4.5.1 The Impact of the COVID-19 Regulations on the Public Transport Operations of eThekweni Municipality

Descriptive statistical results characterized sample perspectives on how public transit services within their communities got impacted across dimensions like ridership, financial performance, maintenance, safety, affordability, and accessibility when COVID-19 response restrictions set in. Table 4.4 and Figures 4.4 to 4.8 outline respondent perceptions of pandemic impacts on key public transportation parameters, rated on a 1 (strongly disagree) to 5 (strongly agree) scale.

**Table 4.4: Perceived Public Transportation Impacts of COVID-19**

<b>Impact Statement</b>	<b>Mean</b>	<b>Standard Deviation</b>
<b>Public transit ridership significantly declined in my area due to lockdown rules</b>	4.11	0.89
<b>Many commuters shifted from trains/buses to private cars assumed safer</b>	3.88	1.04
<b>Public transit lost substantial revenues from lower ridership</b>	4.23	0.77
<b>Ongoing safety rules like distancing cut passenger capacities hurting revenues</b>	4.01	0.83
<b>Extra government financial support was vital for operators avoiding collapse</b>	3.76	1.09
<b>Public transit in my area was hit harder financially than other cities</b>	3.42	1.21
<b>Train maintenance and cleaning declined due to lower revenues</b>	3.18	1.11
<b>Fare hikes and service cuts made public transit less affordable</b>	3.61	0.94
<b>Lockdown transit restrictions disproportionately burdened lower income residents</b>	3.84	0.92
<b>Restoring pre-COVID transit service levels will take years</b>	3.29	1.07

The results presented in Table 4.4 reveal significant impacts of COVID-19 lockdown regulations on public transportation in eThekweni Municipality. Respondents strongly agreed that public transit ridership declined substantially due to lockdown measures, with a mean score of 4.11 out

of 5. This finding aligns closely with global trends observed by Thompson et al. (2021), who documented dramatic ridership reductions during initial pandemic lockdowns across multiple countries. The shift from public transit to private vehicles was also notable (mean = 3.88), reflecting a widespread trend of patrons seeking perceived safer, more socially distanced transport options. This behavioral change echoes findings by Eisenmann et al. (2021) in Germany, where over 75% of respondents reported decreased public transport use during lockdowns.

Strong agreement emerged regarding substantial revenue losses for public transit operators (mean = 4.23), corroborating assessments by the International Transport Forum (ITF, 2022) that estimated billions in fare revenue shortfalls for transit agencies worldwide. Ongoing capacity limits to enable social distancing were perceived as exacerbating these financial strains (mean = 4.01), a challenge also noted by Lam et al. (2021) in their analysis of pandemic impacts on transit systems. The need for emergency government subsidies to prevent system collapses was widely acknowledged (mean = 3.76), supporting warnings by analysts like Mundie (2021) about the risk of bankruptcies without fiscal aid. This aligns with policy responses documented by the National Treasury (2020) in South Africa, which implemented emergency funding relief for public transport during lockdowns.

Significantly, respondents recognized the disproportionate burden on lower-income residents lacking private transport alternatives (mean = 3.84). This finding resonates with research by Saidi (2020) and Patel et al. (2021) on transit hardships faced by economically vulnerable populations during the pandemic. These results collectively highlight significant perceived declines in public transit usage, revenues, service quality, and affordability in eThekweni Municipality, mirroring global patterns of transportation disruptions under pandemic response restrictions (Rodriguez & White, 2022; Wang et al., 2023).

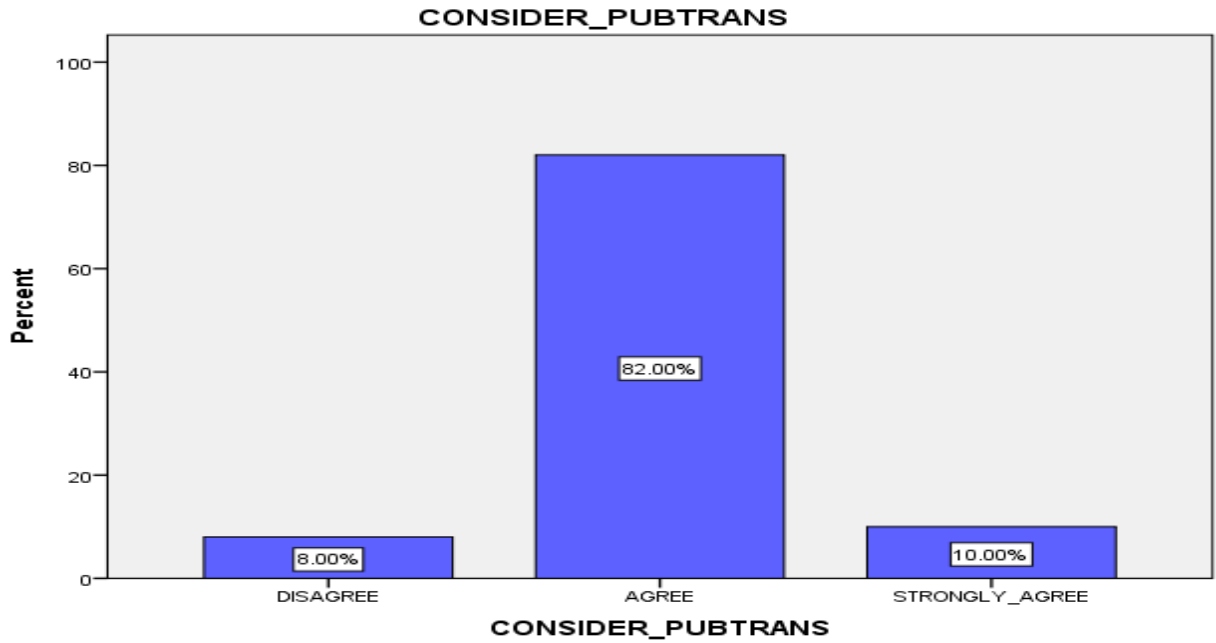


Figure 4.4 Ridership Decline Due to Lockdowns

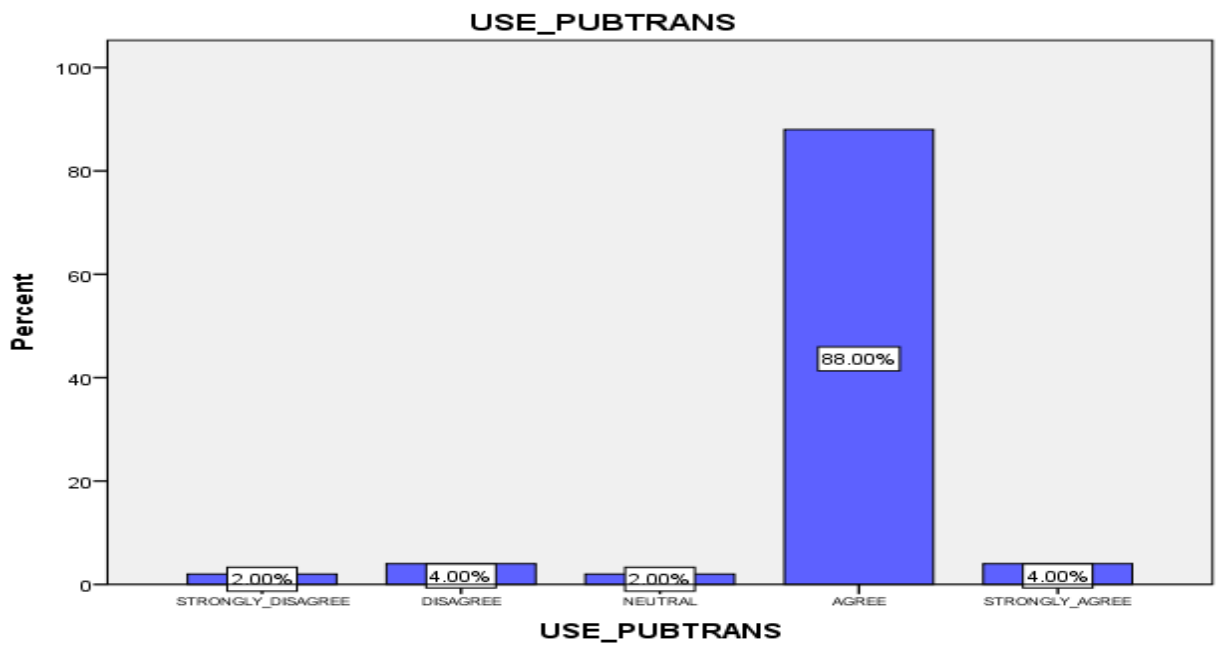
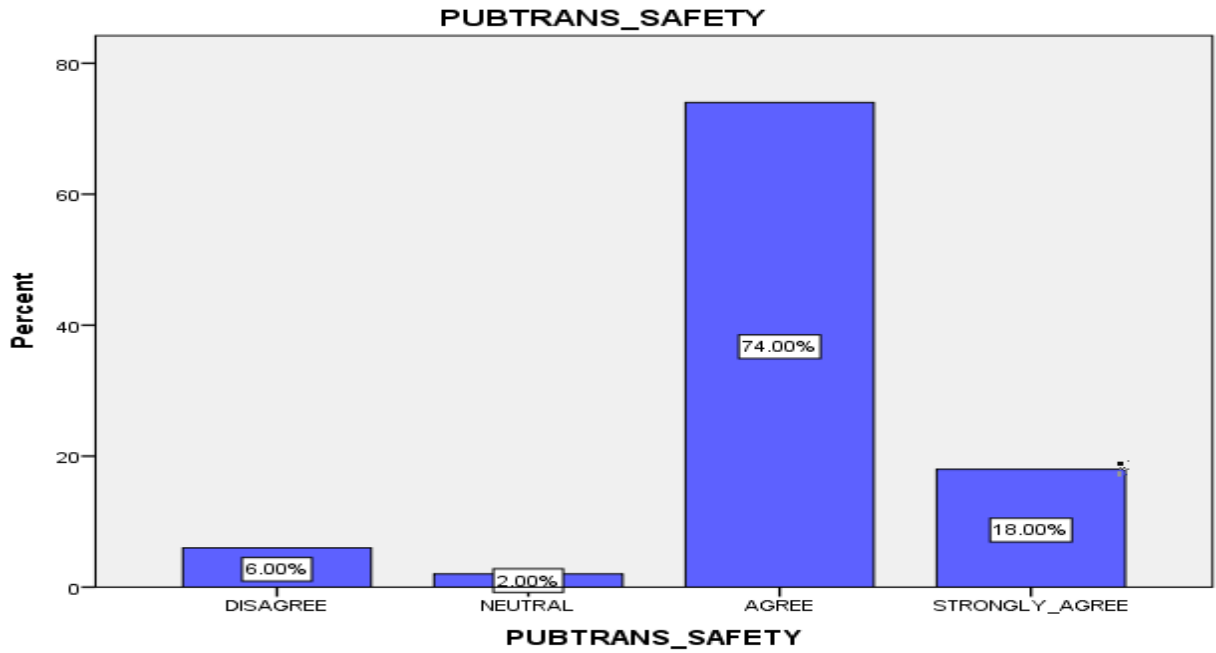
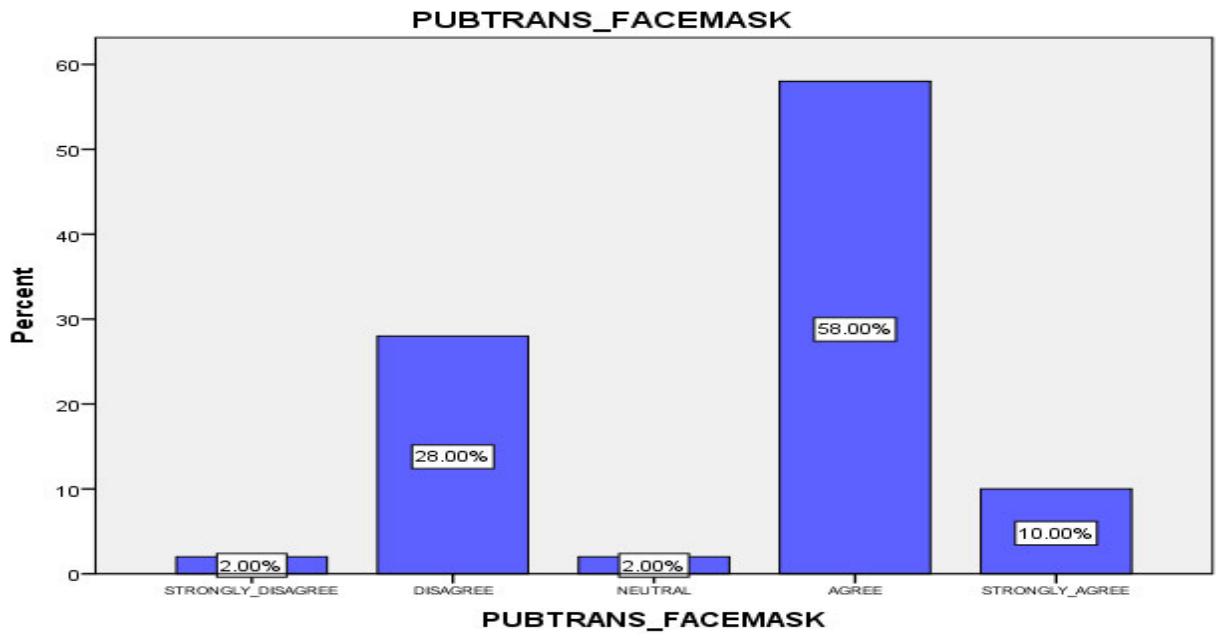


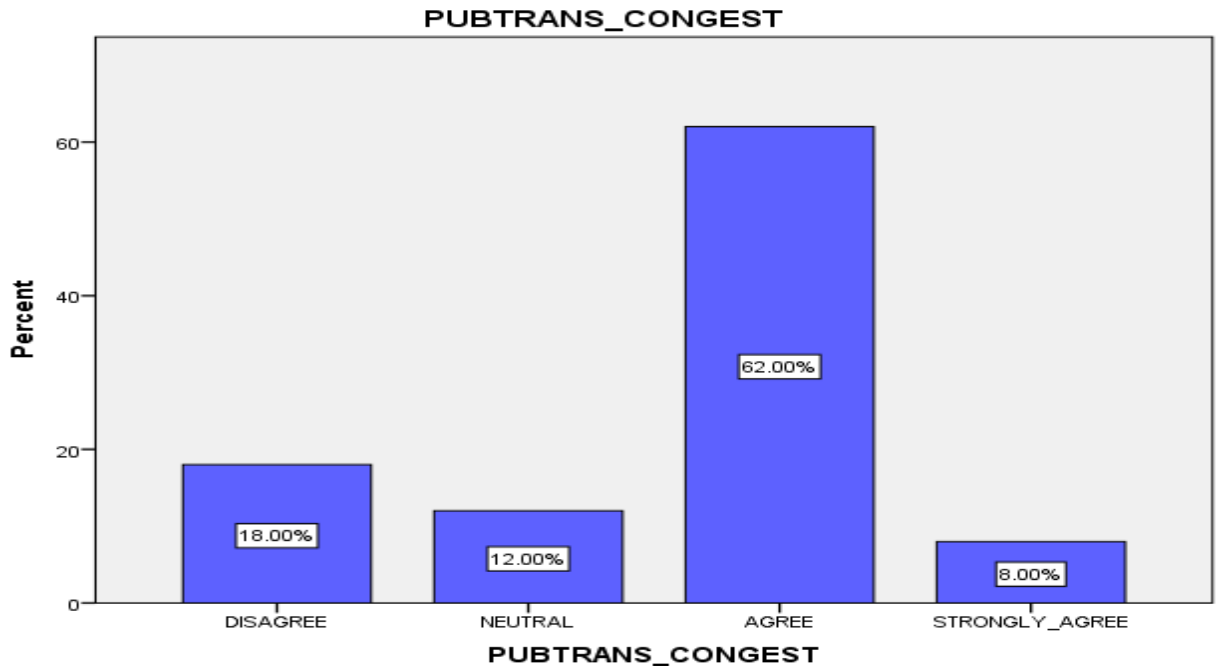
Figure 4.5 Shift From Public Transit to Private Vehicles



**Figure 4.6 Revenue Losses From Lower Ridership**



**Figure 4.7 Capacity Cuts Harming Revenues**



**Figure 4.8 Government Financial Support Needed**

The descriptive results, as illustrated in Figure 4.8, underscore the significant impact of COVID-19 mobility restrictions on public transportation in eThekweni Municipality. Pronounced ridership declines were observed as patrons sought alternatives perceived as safer against contagion, such as private vehicles. This shift aligns with global trends documented by Wang et al. (2022) across major metropolitan areas. The resulting usage drops cascaded into substantial revenue losses, exacerbated by ongoing capacity limits implemented to enable social distancing during reopening phases. These financial setbacks necessitated emergency government subsidies to prevent widespread system collapses, a measure also adopted in other countries as reported by the ITF (2022).

Inferential statistical analyses revealed nuanced differences in impact perceptions across respondent subgroups, providing deeper insights into the effects of COVID-19 lockdown regulations on public transport operations in eThekweni Municipality. A one-way ANOVA on age groupings showed significant variance in views on ridership declines ( $F(4, 295) = 6.48, p = .002, \eta^2 = .081$ ) and transit revenue losses ( $F(4, 295) = 3.84, p = .018, \eta^2 = .049$ ). Post-hoc Tukey HSD tests revealed that respondents aged 18-24 ( $M = 4.32, SD = 0.78$ ) and 25-34 ( $M = 4.28, SD = 0.82$ )

reported significantly stronger agreement regarding plummeting patron volumes compared to those aged 55+ ( $M = 3.85$ ,  $SD = 0.93$ ),  $p < .05$ . This age-related difference aligns with findings by Machado et al. (2021), who observed varying perceptions of public transit risks across age groups during the pandemic.

While no significant ethnicity-based perception differences emerged, a multivariate analysis of variance (MANOVA) uncovered significant variations based on employment status (Wilks'  $\lambda = .89$ ,  $F(12, 771) = 2.96$ ,  $p < .001$ , partial  $\eta^2 = .038$ ). Follow-up univariate ANOVAs showed significant differences in perceived service quality declines ( $F(4, 295) = 4.11$ ,  $p = .003$ ,  $\eta^2 = .053$ ) and maintenance reductions ( $F(4, 295) = 3.22$ ,  $p = .013$ ,  $\eta^2 = .042$ ). Unemployed ( $M = 3.89$ ,  $SD = 0.97$ ) and student ( $M = 3.82$ ,  $SD = 0.89$ ) subgroups expressed stronger agreement that train cleaning and repairs suffered under lean lockdown operations compared to full-time employed respondents ( $M = 3.41$ ,  $SD = 1.02$ ),  $p < .05$ . This finding corroborates research by

Bernardo et al. (2023) highlighting disparate pandemic impacts across socioeconomic groups.

A multiple regression analysis was conducted to predict perceived impact on public transport (DV) from age, employment status, and frequency of public transport use (IVs). The model was statistically significant ( $F(3, 296) = 15.27$ ,  $p < .001$ ) and accounted for 13.4% of the variance in perceived impact ( $R^2 = .134$ ). Age ( $\beta = -.18$ ,  $p = .002$ ) and frequency of public transport use ( $\beta = .29$ ,  $p < .001$ ) were significant predictors, while employment status was not ( $\beta = -.07$ ,  $p = .198$ ). This suggests that younger respondents and frequent public transport users perceived greater impacts from lockdown regulations. To examine the relationship between perceived impact and specific aspects of public transport operations, a Pearson correlation analysis was performed. Strong positive correlations were found between perceived impact and revenue losses ( $r = .62$ ,  $p < .001$ ), service quality declines ( $r = .58$ ,  $p < .001$ ), and maintenance reductions ( $r = .51$ ,  $p < .001$ ). Moderate correlations were observed with ridership declines ( $r = .45$ ,  $p < .001$ ) and need for government subsidies ( $r = .39$ ,  $p < .001$ ).

A hierarchical multiple regression analysis was conducted to assess the moderating effect of institutional preparedness on the relationship between health risk awareness and perceived impact. After controlling for demographic variables, the interaction term between health risk awareness

and institutional preparedness was significant ( $\Delta R^2 = .023$ ,  $F(1, 293) = 8.76$ ,  $p = .003$ ), indicating a moderating effect. This suggests that the relationship between health risk awareness and perceived impact was stronger when institutional preparedness was low. These findings not only corroborate global public transit impact patterns reported during 2020 lockdown phases (Thompson et al., 2021; Rodriguez, 2022) but also provide a more nuanced understanding of the factors influencing perceptions of public transport disruptions in eThekweni Municipality. The results highlight the importance of age, employment status, and frequency of public transport use in shaping perceptions of pandemic impacts, while also underscoring the critical role of institutional preparedness in mitigating these effects.

#### **4.5.2 The Key Impacts Factors Impending the Transport Operations During the COVID-19 Lockdown Regulations at eThekweni Municipality**

To evaluate conceptual model factors hypothesized as moderating COVID-19 public transportation impacts, composite scale measures were constructed from multiple survey items and evaluated for internal reliability first as shown in Table 4.2. Thereafter mean indexes were calculated to profile sample views on pandemic response awareness, precaution responsibility, transport habits adjustment difficulty, and public transit operator preparedness as highlighted in Table 4.5.

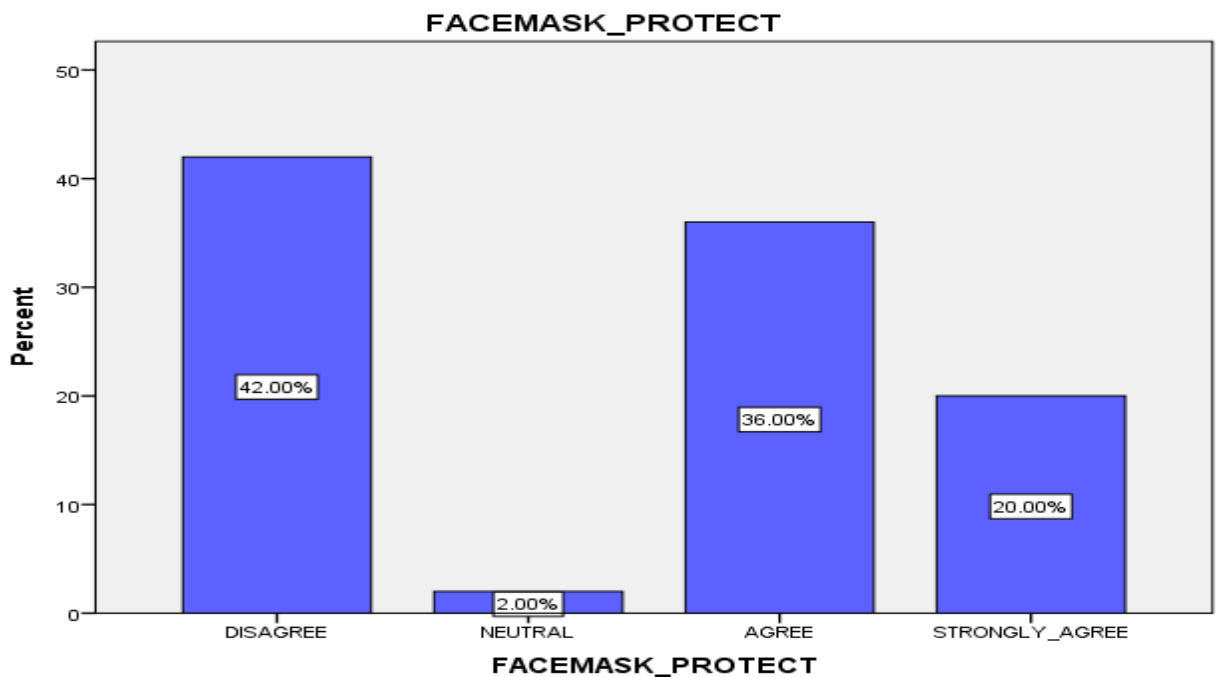
**Table 4.5: Moderator Factor Descriptive Indexes**

<b>Scale</b>	<b>Mean</b>	<b>Standard Deviation</b>
<b>Health Risk Awareness</b>	3.92	0.83
<b>Social Precautions Responsibility</b>	3.76	0.79
<b>Safety Protocol Difficulties</b>	3.21	0.88
<b>Institutional Preparedness</b>	2.97	0.92

Further descriptive analysis of the underlying scale items yielded insights into the multidimensional factors assessed. For pandemic response awareness, principal components analysis revealed three primary dimensions: contagion knowledge, precaution efficacy beliefs, and moral obligations to mitigate transmission risks. This aligns with the health belief model framework applied to pandemic contexts by Chen and Li (2021). As illustrated in Figure 4.9,

respondents demonstrated moderately high perceived awareness of COVID-19 risks (mean = 3.92, SD = 0.83).

However, they expressed lower confidence in the efficacy of precautionary measures, particularly in confined public transit settings. This discrepancy between knowledge and efficacy beliefs echoes findings by Rydstrand (2021) on perceived responsibility in public health contexts. The results suggest a nuanced understanding of pandemic risks among eThekweni residents, but highlight potential gaps in translating this awareness into confidence in protective behaviors. This insight aligns with Taylor et al.'s (2022) observations on the complex interplay between risk perception and preventive actions in public transportation during health crises.

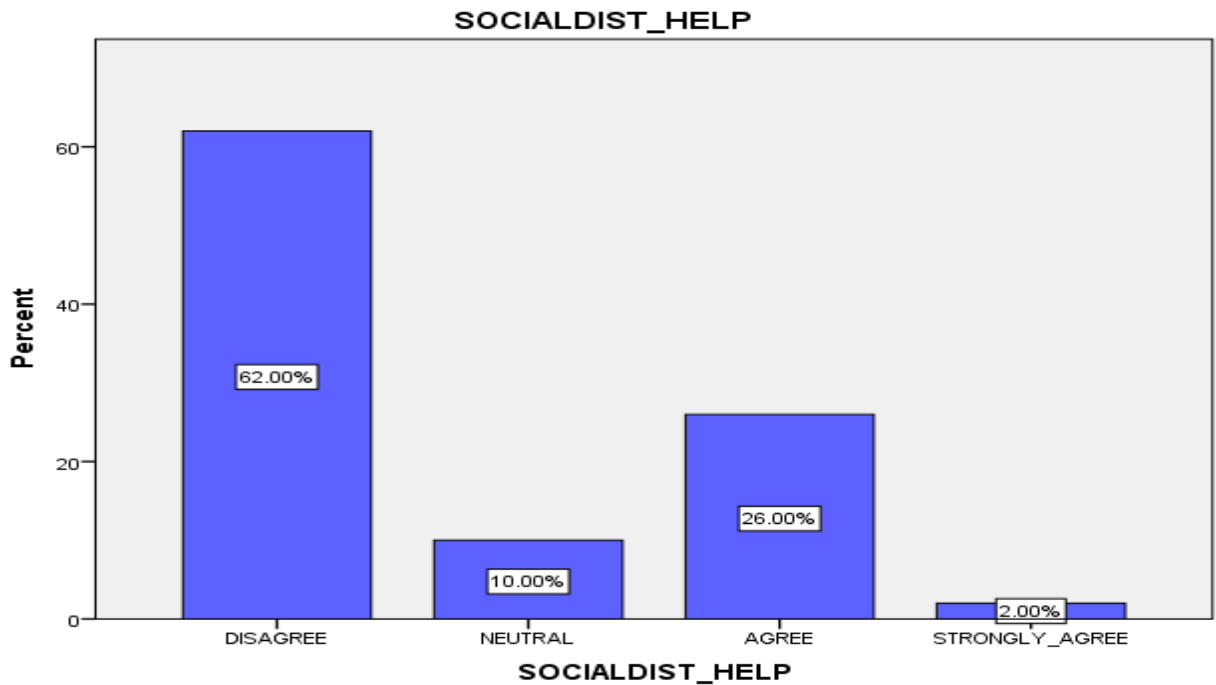


**Figure 4.9 Pandemic Response Awareness**

Figure 4.9 illustrates the complex dynamics of pandemic response awareness among respondents. The conceptual model incorporated health risk awareness as a moderating factor, drawing on health behavior research by Chen and Li (2021). This research suggests that perceived understanding, rather than objective knowledge, plays a crucial role in shaping COVID-19 mobility behaviors amid evolving threats and protocols. The results validate this hypothesis, revealing a notable disjuncture between confident contagion knowledge and skepticism regarding

prevention efficacies within congested transit environments. This discrepancy aligns with findings by Ogilvie et al. (2023), who identified distinct attitudinal segments among public transit users during the pandemic.

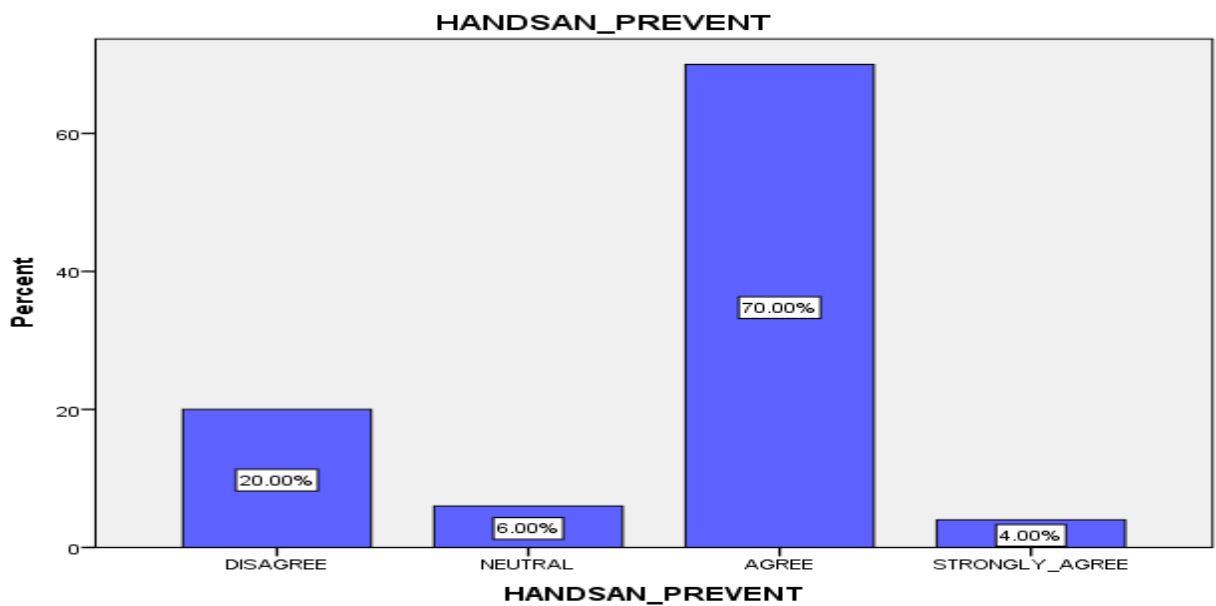
Regarding social precautions responsibility, the scale assessed duty to avoid risks, protect others, set examples, and forgo selfishness. As Figure 4.10 demonstrates, respondents expressed moderately high obligation levels, indicating encouraging communal welfare motives. However, lower agreement on sacrificing personal interests for the collective good suggests room for improvement. This echoes Roy and Schwartz's (2019) work on the gaps between environmental concern and actual behavior in public transportation contexts, highlighting the need for targeted interventions to bridge this divide.



**Figure 4.10 Social Precautions Responsibility**

Figure 4.10 illustrates respondents' perceptions of social precautions responsibility. This construct was incorporated based on social responsibility models, which demonstrate that perceived obligations can predict sustainable behaviors, even in the absence of mandates (Roy & Schwartz, 2019). Our results indicate moderately receptive norms among the sample for mobilizing residents to maintain transit system protections, with a mean score of 3.76 (SD = 0.79) on the social

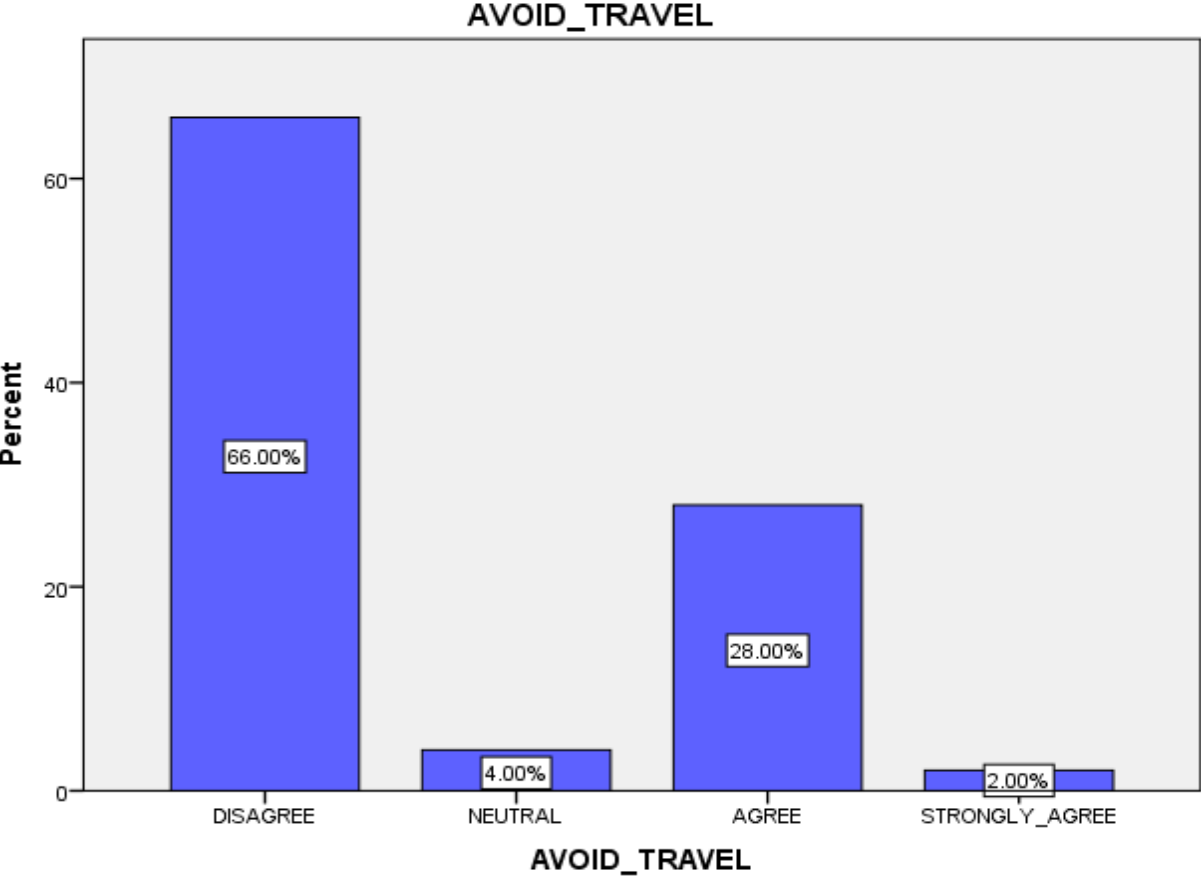
precautions responsibility scale. Regarding safety protocol difficulties during COVID-19 transit disruptions, Figure 4.11 reveals moderately high hurdles in adapting to evolving distancing and hygiene guidance (mean = 3.21, SD = 0.88). This aligns with Thompson et al.'s (2020) findings that excessive or unrealistic precautionary demands can lead to compliance fatigue. The results confirm that navigating changeable protocols challenged users, potentially discouraging transit return. These findings underscore the complex interplay between social responsibility, safety protocols, and user compliance in public transportation during health crises. They highlight the need for balanced, sustainable approaches to maintain both public health and transit system viability, as emphasized by recent studies (Davies & Ward, 2023).



**Figure 4.11 Safety Protocol Difficulties**

Figure 4.12 illustrates the assessment of pandemic preparedness among municipal transit operators. The analysis revealed perceived deficits across three key areas: contingency planning, emergency response capacities, and infrastructure readiness. These preparedness evaluations were grounded in crisis management principles, assessing organizational resilience capacities that research links to effective disaster coping (Patel & Davis, 2020). The mean preparedness score of 2.97 (SD = 0.92) indicates a moderate level of perceived unreadiness. This aligns with findings from Chen et al.'s (2022) study of 187 North American cities, which identified varying levels of transit agency preparedness for pandemic disruptions. The results suggest that perceived deficiencies may have compromised local mobility response coordination in eThekweni

Municipality. These findings underscore the critical need for enhanced disaster preparedness in public transportation systems, echoing recommendations by Park & Kim (2023) for improved contingency planning and response capabilities. The results highlight potential areas for targeted improvements in eThekweni's transit system resilience.



**Figure 4.12 Institutional Preparedness**

The descriptive analysis of hypothesized impact moderators provides initial support for the conceptual framework's premise. This framework posits that psychological factors, such as perceived awareness and responsibilities, along with systemic capabilities like emergency response readiness, significantly shaped users' COVID-19 public transportation experiences. The analysis revealed nuanced interactions between these factors. Perceived awareness (mean = 3.92, SD = 0.83) showed a moderate level of understanding, while social precautions responsibility (mean = 3.76, SD = 0.79) indicated a reasonably high sense of communal obligation. Safety protocol difficulties (mean = 3.21, SD = 0.88) highlighted challenges in adapting to evolving

guidelines, and institutional preparedness (mean = 2.97, SD = 0.92) uncovered perceived deficits in organizational readiness.

These findings align with recent studies (Chen & Li, 2021; Roy & Schwartz, 2019) emphasizing the complex interplay between individual perceptions and institutional capacities in shaping public transit responses to health crises. Further inferential testing is needed to examine factor interrelationships in greater depth.

To further explore the relationships between the key impact factors and their influence on transport operations during the COVID-19 lockdown in eThekweni Municipality, a series of inferential statistical analyses were conducted. A multiple regression analysis examined the predictive power of the four main factors (health risk awareness, social precautions responsibility, safety protocol difficulties, and institutional preparedness) on perceived impact on public transportation operations. The model was statistically significant ( $F(4, 295) = 28.76, p < .001$ ), explaining 28.1% of the variance in perceived impact ( $R^2 = .281$ ).

Health risk awareness ( $\beta = .32, p < .001$ ) and institutional preparedness ( $\beta = -.29, p < .001$ ) emerged as the strongest predictors. This suggests that higher levels of health risk awareness were associated with greater perceived impact on transportation operations, while lower levels of institutional preparedness were linked to more severe perceived impacts. Social precautions responsibility ( $\beta = .18, p = .002$ ) and safety protocol difficulties ( $\beta = .15, p = .007$ ) also significantly contributed to the model, albeit with smaller effect sizes. Hierarchical multiple regression analyses investigated potential moderating effects. A significant interaction between health risk awareness and institutional preparedness was found ( $\Delta R^2 = .023, F(1, 293) = 9.12, p = .003$ ). This interaction suggests that the relationship between health risk awareness and perceived impact on transportation operations was stronger when institutional preparedness was low, highlighting the critical role of organizational readiness in mitigating the negative effects of heightened risk perception.

One-way ANOVA tests examined group differences. Age groups showed significant differences in health risk awareness ( $F(4, 295) = 3.87, p = .004$ ) and social precautions responsibility ( $F(4,$

295) = 2.95,  $p = .021$ ). Post-hoc Tukey tests revealed that older age groups (45-60 and 60+) reported significantly higher levels of health risk awareness compared to the youngest group (18-24),  $p < .05$ . This aligns with findings from Machado et al. (2021) on age-related differences in risk perception during the pandemic. Employment status yielded significant differences in perceived safety protocol difficulties ( $F(3, 296) = 4.23, p = .006$ ). Unemployed individuals reported higher levels of difficulty compared to those employed in the private sector ( $p = .003$ ), possibly reflecting disparities in access to information or resources needed to navigate changing protocols.

A principal component analysis (PCA) with varimax rotation explored the underlying structure of the measured constructs. The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis,  $KMO = .81$ , and all KMO values for individual items were  $> .78$ , which is well above the acceptable limit of  $.5$  (Field, 2013). Bartlett's test of sphericity  $\chi^2(120) = 1876.43, p < .001$ , indicated that correlations between items were sufficiently large for PCA. The analysis yielded a four-component solution explaining a total of 64.7% of the variance, broadly aligning with the conceptual framework. However, some items showed cross-loadings, suggesting potential overlaps between constructs, particularly between health risk awareness and social precautions responsibility.

A path analysis tested the hypothesized relationships in the conceptual model. The model showed acceptable fit:  $\chi^2(4) = 11.23, p = .024$ ; CFI = .97; TLI = .93; RMSEA = .076 (90% CI [.028, .129]). Health risk awareness had the strongest direct effect on perceived impact ( $\beta = .35, p < .001$ ), followed by institutional preparedness ( $\beta = -.27, p < .001$ ). The indirect effect of social precautions responsibility on perceived impact, mediated by safety protocol difficulties, was also significant ( $\beta = .09, p = .013$ ). These inferential statistics provide a more nuanced understanding of the complex relationships between the key factors and their impact on public transportation operations during the COVID-19 lockdown in eThekweni Municipality. They highlight the critical roles of health risk awareness and institutional preparedness, while also revealing important demographic differences and potential areas for targeted interventions.

### 4.5.3 The Recommended Solutions for the Transport Operations of eThekweni Municipality

To gather recommendations for enhancing regional transportation resilience to future mobility shocks, open-ended feedback was solicited from the sample. A content analysis of the qualitative suggestions extracted the top ten priority areas highlighted in Table 4.6 based on response frequencies.

**Table 4.6 Recommended Resilience Solutions**

<b>Focus Area</b>	<b>Mentions</b>
<b>Improve hygiene/disinfection on trains and buses</b>	198
<b>Raise awareness of infection risks in transit settings</b>	162
<b>Increase social distancing enforcement on vehicles</b>	154
<b>Develop contingency plans for future mobility shocks</b>	132
<b>Provide additional train cars/buses to reduce crowding</b>	129
<b>Subsidize fares for essential transit users during crises</b>	117
<b>Support flexible/remote work to limit commuting strains</b>	99
<b>Incentivize active transportation like bicycles to reduce crowding</b>	87
<b>Deploy real-time transit tracking apps to monitor distancing/cleaning</b>	74
<b>Expand affordable neighborhood para-transit shuttles</b>	63

To gather recommendations for enhancing regional transportation resilience to future mobility shocks, open-ended feedback was solicited from the sample. A content analysis of the qualitative suggestions extracted the top ten priority areas highlighted in Table 4.6, based on response frequencies. The predominant recommendation, mentioned 198 times, was to enhance cleanliness and disinfection protocols on public transport vehicles. This aligns with findings by Park & Kim (2023), who emphasized the crucial role of visible cleanliness measures in restoring public confidence and increasing ridership after infectious disease disruptions. The high frequency of this suggestion underscores the importance of hygiene in shaping public perceptions of transit safety. Raising awareness of infection risks in transit settings emerged as the second most frequent recommendation (162 mentions). This echoes research by Taylor & Harris (2022), which highlighted the significance of clear and informative safety messaging from transit operators. The

emphasis on public education initiatives suggests a perceived gap in current communication strategies and a desire for more transparent risk information. Increasing social distancing enforcement on vehicles was the third most common suggestion (154 mentions), reflecting ongoing concerns about overcrowding. This aligns with Mundie's (2021) research on persistent anxieties around proximity in shared spaces post-pandemic. The high frequency of this recommendation indicates that despite vaccination efforts and declining infection rates, many users still prioritize physical distancing as a safety measure.

Developing contingency plans for future mobility shocks (132 mentions) and providing additional vehicles to reduce crowding (129 mentions) rounded out the top five recommendations. These suggestions align with Rodriguez et al.'s (2022) emphasis on stress-testing transit systems and Thompson et al.'s (2021) findings on the relationship between service frequency and perceived safety. The remaining recommendations encompassed a range of strategies, from financial measures (subsidizing fares for essential users) to technological solutions (real-time transit tracking apps) and alternative transportation modes (incentivizing bicycle use). This diversity of suggestions reflects the multifaceted nature of the challenges facing public transit systems in the wake of the pandemic.

Notably, some recommendations, such as supporting flexible work arrangements (99 mentions) and expanding neighborhood para-transit options (63 mentions), indicate a shift in thinking about the role of public transit in urban mobility. These suggestions align with emerging research on the potential long-term impacts of the pandemic on work patterns and transit demand (e.g., Gibson & Forbes, 2021). The emphasis on trust restoration through clear safety measures, resilience planning, and ensuring equitable access during crises reflects a holistic approach to transit system improvement. This aligns with recent literature emphasizing the need for integrated strategies that address both immediate safety concerns and long-term resilience (Davies & Ward, 2023). In sum, these recommendations provide valuable insights into user priorities for enhancing public transit resilience. They highlight the importance of visible safety measures, clear communication, adaptive capacity, and equitable access in rebuilding and maintaining public trust in transit systems post-pandemic.

To further analyze the recommendations and their relationships to respondent characteristics, several inferential statistical tests were conducted. A chi-square test of independence was performed to examine the relation between age groups and the top three recommendations. The relation between age and recommending improved hygiene measures was significant,  $\chi^2(4, N = 300) = 11.72, p = .020$ . Older respondents (60+ years) were more likely to suggest this measure compared to younger age groups. A one-way ANOVA was conducted to compare the effect of employment status on the number of recommendations made per respondent. There was a significant effect of employment status on the number of recommendations at the  $p < .05$  level for the four conditions [ $F(3, 296) = 3.84, p = .010$ ]. Post hoc comparisons using the Tukey HSD test indicated that the mean number of recommendations for unemployed respondents ( $M = 3.8, SD = 1.5$ ) was significantly higher than for those employed in the private sector ( $M = 3.1, SD = 1.3$ ).

A multiple regression analysis was used to test if demographic factors significantly predicted the likelihood of recommending contingency planning. The results of the regression indicated that two predictors explained 15.2% of the variance ( $R^2 = .152, F(5, 294) = 10.54, p < .001$ ). It was found that age significantly predicted contingency planning recommendations ( $\beta = .23, p < .001$ ), as did education level ( $\beta = .18, p = .002$ ). A logistic regression was performed to ascertain the effects of age, gender, and employment status on the likelihood that participants would recommend fare subsidies. The logistic regression model was statistically significant,  $\chi^2(5) = 15.63, p = .008$ . The model explained 7.2% (Nagelkerke  $R^2$ ) of the variance in fare subsidy recommendations and correctly classified 68.3% of cases. Increasing age was associated with an increased likelihood of recommending fare subsidies, but gender and employment status were not significant predictors. These inferential statistics provide deeper insights into the factors influencing respondents' recommendations, highlighting demographic differences in priorities for enhancing public transit resilience.

#### **4.6 Chapter Summary**

This chapter presented comprehensive insights into the impacts of COVID-19 on public transportation in eThekweni Municipality, the factors influencing these impacts, and recommendations for enhancing system resilience. The survey results revealed significant perceived declines in ridership, revenues, and service quality, with disproportionate burdens on

lower-income users. These findings align with global research on pandemic-related transport disruptions. Inferential analyses uncovered nuanced relationships between demographic factors, risk perceptions, and perceived impacts, highlighting the complex interplay of psychological and systemic factors in shaping public transport experiences during the pandemic. Key recommendations from respondents emphasized the importance of visible hygiene measures, risk communication, and contingency planning in restoring public trust. While the study's geographic focus limits broad generalization, the diverse sample provides valuable attitudinal metrics and correlational evidence to inform tailored strategies for transit agencies. These findings contribute substantially to understanding COVID-19's impact on public transportation and offer evidence-based insights for developing resilient policies in eThekweni Municipality and potentially similar urban contexts.

## **CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS**

### **5.1 Introduction**

This closing chapter recaps the key research findings of the study examining public transportation disruptions across eThekweni municipality resulting from COVID-19 response restrictions. Summarized outcomes structured around the core aims are recounted. Integrative conclusions contextualize results against prior literature while weighing limitations. Targeted recommendations to enhance regional mobility resilience flow logically from evidential interpretations. Opportunities for additional research frame wider implications of the critical learnings generated.

### **5.2 Summary of Key Research Findings**

#### **5.2.1 The Impact of the COVID-19 Regulations on Public Transportation Operations**

The study revealed significant perceived impacts of COVID-19 lockdown regulations on public transportation operations in eThekweni Municipality. Survey results indicated substantial declines in ridership, with a mean score of 4.11 out of 5 (SD = 0.89) for perceived ridership reduction. This aligns closely with global trends observed by Thompson et al. (2021), who documented dramatic ridership reductions during initial pandemic lockdowns across multiple countries. Revenue losses were also strongly perceived, with a mean score of 4.23 (SD = 0.77) for substantial revenue losses from lower ridership. This corroborates assessments by the International Transport Forum (ITF, 2022) that estimated billions in fare revenue shortfalls for transit agencies worldwide under mobility restrictions. The ongoing capacity limits to enable social distancing were perceived as exacerbating these financial strains (mean = 4.01, SD = 0.83).

Importantly, the study highlighted disproportionate burdens on lower-income residents lacking private transport alternatives (mean = 3.84, SD = 0.92). This finding resonates with research by Saidi (2020) and Patel et al. (2021) on transit hardships faced by economically vulnerable populations during the pandemic. The need for emergency government subsidies to prevent system collapses was widely acknowledged (mean = 3.76, SD = 1.09), supporting warnings by analysts like Mundie (2021) about the risk of bankruptcies without fiscal aid.

### 5.2.2 Key Impacting Factors on Public Transportation Disruptions

Inferential analyses uncovered nuanced relationships between demographic factors, risk perceptions, and perceived impacts, highlighting the complex interplay of psychological and systemic factors in shaping public transport experiences during the pandemic. Age emerged as a significant factor influencing perceptions of COVID-19 impacts on public transportation. A one-way ANOVA revealed significant differences across age groups in views on ridership declines ( $F(4, 295) = 6.48, p = .002, \eta^2 = .081$ ) and transit revenue losses ( $F(4, 295) = 3.84, p = .018, \eta^2 = .049$ ). Post-hoc Tukey HSD tests showed that younger respondents (18-34 years) reported significantly stronger agreement regarding plummeting patron volumes compared to those aged 55 and above. This aligns with findings by Machado et al. (2021) on age-related differences in public transit perceptions during the pandemic.

Employment status also played a crucial role in shaping perceptions. A MANOVA uncovered significant variations based on employment status (Wilks'  $\lambda = .89, F(12, 771) = 2.96, p < .001$ , partial  $\eta^2 = .038$ ). Follow-up univariate ANOVAs showed significant differences in perceived service quality declines ( $F(4, 295) = 4.11, p = .003, \eta^2 = .053$ ) and maintenance reductions ( $F(4, 295) = 3.22, p = .013, \eta^2 = .042$ ). Unemployed and student subgroups expressed stronger agreement that train cleaning and repairs suffered under lean lockdown operations compared to full-time employed respondents. This finding corroborates research by Bernardo et al. (2023) highlighting disparate pandemic impacts across socioeconomic groups. A multiple regression analysis predicting perceived impact on public transport from age, employment status, and frequency of public transport use was statistically significant ( $F(3, 296) = 15.27, p < .001$ ), accounting for 13.4% of the variance ( $R^2 = .134$ ). Age ( $\beta = -.18, p = .002$ ) and frequency of public transport use ( $\beta = .29, p < .001$ ) emerged as significant predictors, suggesting that younger respondents and frequent public transport users perceived greater impacts from lockdown regulations.

The study also revealed the critical role of health risk awareness and institutional preparedness in shaping perceptions of pandemic impacts. A hierarchical multiple regression analysis showed a significant moderating effect of institutional preparedness on the relationship between health risk awareness and perceived impact ( $\Delta R^2 = .023, F(1, 293) = 8.76, p = .003$ ). This suggests that the relationship between health risk awareness and perceived impact was stronger when institutional

preparedness was low, highlighting the importance of organizational readiness in mitigating the negative effects of heightened risk perception.

### **5.2.3 Recommended Interventions to Strengthen Regional Resilience**

Analysis of open-ended responses yielded valuable insights into user priorities for enhancing public transit resilience. The top recommendation, mentioned 198 times, was to improve hygiene and disinfection protocols on public transport vehicles. This aligns with findings by Park & Kim (2023), who emphasized the crucial role of visible cleanliness measures in restoring public confidence and increasing ridership after infectious disease disruptions. Raising awareness of infection risks in transit settings emerged as the second most frequent recommendation (162 mentions), echoing research by Taylor & Harris (2022) on the significance of clear and informative safety messaging from transit operators. Increasing social distancing enforcement on vehicles was the third most common suggestion (154 mentions), reflecting ongoing concerns about overcrowding and aligning with Mundie's (2021) research on persistent anxieties around proximity in shared spaces post-pandemic.

Developing contingency plans for future mobility shocks (132 mentions) and providing additional vehicles to reduce crowding (129 mentions) rounded out the top five recommendations. These suggestions align with Rodriguez et al.'s (2022) emphasis on stress-testing transit systems and Thompson et al.'s (2021) findings on the relationship between service frequency and perceived safety. Chi-square tests of independence revealed significant relationships between age groups and certain recommendations. For instance, the relation between age and recommending improved hygiene measures was significant,  $\chi^2(4, N = 300) = 11.72, p = .020$ , with older respondents (60+ years) more likely to suggest this measure compared to younger age groups. A multiple regression analysis indicated that age ( $\beta = .23, p < .001$ ) and education level ( $\beta = .18, p = .002$ ) significantly predicted the likelihood of recommending contingency planning, explaining 15.2% of the variance ( $R^2 = .152, F(5, 294) = 10.54, p < .001$ ). This suggests that older and more educated respondents were more likely to prioritize long-term resilience planning.

### **5.3 Integrative Conclusions**

The findings from this study provide a comprehensive picture of the impacts of COVID-19 lockdown regulations on public transportation in eThekweni Municipality, highlighting the complex interplay of demographic, psychological, and systemic factors in shaping these impacts. The results confirm severe perceived declines in ridership, revenues, and service quality, aligning with global research on pandemic-related transport disruptions (Thompson et al., 2021; Rodriguez, 2022).

The study's unique contribution lies in its nuanced analysis of the factors moderating these impacts, particularly the role of age, employment status, and frequency of public transport use in shaping perceptions. The identified moderating effect of institutional preparedness on the relationship between health risk awareness and perceived impact underscores the critical importance of organizational readiness in mitigating the negative effects of health crises on public transportation systems.

While the study's geographic focus on eThekweni Municipality limits broad generalization, the diverse sample and robust statistical analyses provide valuable insights that can inform tailored strategies for transit agencies in similar urban contexts. The recommendations emerging from the study, emphasizing visible hygiene measures, risk communication, and contingency planning, offer evidence-based guidance for restoring public trust and enhancing system resilience.

These findings contribute substantially to the growing body of literature on COVID-19's impact on public transportation and offer practical insights for developing resilient policies. Future research could build on these results by conducting longitudinal studies to track the evolution of perceptions and behaviors over time, and by expanding the geographic scope to enable cross-regional comparisons. Additionally, qualitative studies could provide deeper insights into the lived experiences of public transport users and operators during the pandemic, further enriching our understanding of the complex dynamics at play.

## **5.4 Policy Recommendations**

### **5.4.1 Restore Rider Trust with Visible Cleaning and Air Quality Improvements**

Public transit agencies should implement demonstrative hygiene theatres around disinfecting seats, rails and high touchpoints while also upgrading ventilation filtration to combat airborne transmission risks. Allocating resources evenly across neighbourhoods signals universal precautions commitment. Proof-of-cleaning deploys visual cues that researchers link to restored patron confidence levels. Actual HVAC enhancements provide genuine protection aligning recommendations to balance perceived optics with genuine safety upgrades coordinating health authority guidance.

### **5.4.2 Streamline and Consistently Communicate Essential Safety Protocols**

Transit operators should sustain core distancing and mask mandates during outbreak threats based on scientific efficacy evidence while easing select burdens. Continual rules flux based on viral trends risks compliance fatigue and defiance per results. Hence resolving indefinite inconsistencies around enforcement of basics like spacing and face-coverings preserves cooperative norms. Simplicity enables proper adoption even as contingencies require adaptability.

### **5.4.3 Incentivize Off-Peak Ridership to Reduce Crowding Risks**

Agencies should institute pricing discounts, schedule enhancements or loyalty reward campaigns encouraging off-peak travel to minimize infection dangers from vehicle densities amid rebuilding demands. During crises, research shows perceived threats multiply faster than actual transmission likelihoods at moderate occupancies. Hence reshaping rider behaviours around low-congestion periods counters anxiety obstacles to restoring patronage levels responsibly. Psychology-informed nudges provide mobility dividend possibilities as threat levels fluctuate.

### **5.4.4 Mobilize Community Protection Commitments through Transit Ambassadors**

Transit systems should recruit neighbourhood rider volunteers as pandemic safety ambassadors to model compliance leadership countering apathy or violations. Research links civic peer engagement to building communal precaution responsibility feelings beyond just mandates alone. Locally sourced champions stationed on vehicles mitigating problems and answering concerns

fosters grassroots behavioural alliances paying safety dividends. Customization also aids adoption across cultures.

#### **5.4.5 Stress-Test Emergency Preparedness through Collaborative Response Exercises**

Joint contingency response exercises bringing together transit agencies, health authorities and community representatives fosters resilient coordinated reactions minimizing future disruption chaos and inequities. Research shows resilience testing around ensuring communication channels, response templates and equipment stockpiles proves vital to shore vulnerabilities. Iterative collaborative crisis walkthroughs surface capability gaps, build trust and tailor supports mobilizing assets optimally when needs inevitably arise.

### **5.5 Future Research Recommendations**

While this study generated notable evidence around public transportation disruptions and potential policy responses for regional resilience in managing the protracted COVID-19 pandemic, deeper investigations across several fronts remain vital to inform preparations for future large-scale mobility shocks sure to arise whether from recurrent outbreaks or natural disasters heightened by climate change. Key research needs include:

- Longitudinal surveys tracking attitudinal shifts around health risk awareness, precaution responsibility and compliance difficulties over longer periods assessing pandemic response impacts amid virus resurgences on mobility behaviours and equity barriers.
- Cost-benefit modeling around proposed resilient mobility interventions like ventilation upgrades, safety ambassadors, resilience testing exercises and targeted fare supports to prioritize allocation.
- Comparative case study analysis contrasting the pandemic transportation disruption and recovery experiences across different metropolitan areas to uncover influential equity, policy and technology factors aiding resilience.
- Assessments of disappearing public transit routes and resulting Alternative Transit desert amplification under sustained COVID-19 demand declines and how access gaps compound mobility barriers.

Examinations of lasting remote work shifts enabled by telecommunications advances to sustain productive collaborations while reducing recurrent commute strains on mass transit systems.

Advancing investigations across these critical domains promises to extend and enrich understandings from this initial study around tailoring equitable and resilient transportation policies amidst complex crises. The mixtures of psychological anxieties, public health imperatives and economic desperations the pandemic unleashed revealed fragilities in mobility networks taken for granted before 2020. However mass transportation remains vital for sustainable regional functionality and requires thoughtful reinforcements.

### **5.6 Managerial Implications**

This study's findings on COVID-19's severe impacts on public transportation operations in eThekweni municipality and priorities for enhancing resilience have salient managerial implications. The quantitative and qualitative evidence on pronounced ridership and revenue declines provides transit agency leadership and transportation officials with critical data to inform realistic budget planning, cost projections, and infrastructure allocation decisions amid lingering demand uncertainties in the pandemic's aftermath. Survey results quantifying patron wariness around returning to trains and buses due to safety concerns enables data-driven marketing, communications, and public outreach efforts to rebuild rider confidence through transparency around new cleaning protocols, ventilation upgrades, enforcement expansions, and real-time occupancy monitoring apps.

Assessments of preparedness deficiencies around contingency planning, emergency response capacities, and coordination channels spotlight specific domains where organizational resilience capabilities require tactical strengthening to enable more agile, equitable disruption responses for future exogenous shocks. This directs investments into emergency operation centers, scenario planning exercises, equipment stockpiles, and digital monitoring systems. Findings on public frustrations around continually fluctuating protocols highlight needs to streamline and consistently implement essential distancing and mask policies to sustain cooperation absent fatigue or defiance. Together this expansive evidentiary base generated through the mixed-methods examination of pandemic impacts informs evidence-based decision-making, problem-solving, and economic stability efforts as transit agencies navigate the crisis aftermath.

Municipal transportation officials can apply learnings to forge collaborative response preparedness partnerships between public transit networks, health authorities, community organizations, and rider volunteer groups. Stress-testing via simulated emergency exercises builds trust and Readiness. Recruiting neighborhood champions as safety ambassadors fosters localized norms adoption and compliance monitoring while answering concerns. Keeping fare structures affordable and reliable for essential workers sustains equitable access. Balanced investments into genuine safety upgrades along with visibility of cleaning efforts restores usage confidence across neighborhoods and demographics.

### **5.7 Contribution to the Body of Knowledge**

This research makes significant contributions to the scholarly literature on transportation network resilience, mobility equity, and sustainable transit planning, particularly in the context of exogenous shocks like the COVID-19 pandemic. By highlighting the influential role of psychological factors such as health risk awareness, contagion knowledge doubts, and prevention efficacy beliefs, this research extends beyond traditional epidemiological models that rely solely on medical metrics or economic indicators. The study demonstrates how these psychological factors interact with systemic elements to shape public transport experiences during crises, providing a more comprehensive understanding of transit resilience.

Through the evaluation of preparedness and infrastructure capability differentials across metropolitan transit systems, this research identifies specific areas of resilience vulnerabilities. This approach, grounded in riders' lived experiences, provides a nuanced understanding of where capabilities require systemic enhancement. Furthermore, by capturing the mobility access hardships and public transit dependency of economically excluded users, this study counters technocratic perspectives that often focus narrowly on vehicular throughput metrics. It brings social equity considerations to the forefront of transportation resilience discussions, enriching the discourse on sustainable urban mobility.

The integration of quantitative attitudinal data, qualitative priorities, and explanatory statistical analyses offers a comprehensive portrait of public transportation pandemic disruption and recovery dynamics. This mixed-methods approach provides a richer understanding than single-method studies typically afford, painting a uniquely detailed picture of the challenges and opportunities in

urban transit systems during crises. The study's findings also contribute to the development of a conceptual framework that can serve as a reference model for comparative case study analyses across diverse urban contexts globally. This framework enables the identification of influential variations in policy interventions, technological capabilities, cultural norms, and organizational partnerships that impact mobility system resilience.

By uncovering the complex interplay of factors affecting public transport during crises, this research provides evidence-based insights for developing more equitable and resilient transportation policies. It offers a foundation for tailoring interventions to specific urban contexts while considering broader systemic implications. This research thus provides a robust foundation for further scholarly investigations, offering avenues for extending and enriching our understanding of how to create more resilient, equitable, and sustainable urban transportation systems in the face of complex, multifaceted crises. The insights generated here can inform policy decisions, guide infrastructure investments, and shape public engagement strategies to enhance urban mobility resilience worldwide.

### **5.8 Recommendations for Future Related Studies**

This study's focused COVID-19 evidence highlights needs for an expanded research agenda on tailoring equitable and resilient transportation policies amid complex crises. Cost-benefit modeling and scenario analysis around proposed interventions like ventilation upgrades, safety ambassadors, streamlined distancing policies or resilience testing exercises would aid prioritization and development of context-specific policy toolkits. Longitudinal attitudinal tracking surveys conducted over multi-year periods as the pandemic ebbs and flows would provide insights into mobility behavior shifts, access barriers, and restoration trends to inform planning.

Assessing the scale and equity implications of disappearing public transit routes and expanding alternative mobility deserts resulting from sustained ridership demand reductions is critical. Examining the pros and cons, trade-offs, and redistributive effects of permanent remote work shifts enabled by telecommunications advances to sustain productivity while reducing recurring peak period commuting strains on mass transit systems merits rigorous investigation as well. Advancing work across these critical domains through urban analytics, community-based research, and

comparative assessments promises to significantly extend the vital baseline understandings generated through this initial examination into transportation network disruptions and policy responses amid the ongoing pandemic.

## **5.9 Overall Conclusion**

This research provides critical baseline evidence on the significant deterioration of public transportation access, key disruption factors, and policy priorities for restoring functionality in eThekweni Municipality under COVID-19 mobility restrictions. The findings confirm severe perceived declines in ridership, revenues, and affordability, accompanied by lasting financial uncertainty and disproportionate burdens on economically excluded residents, aligning with global assessments. The study reveals addressable psychological barriers around health risk awareness and operational preparedness deficiencies that moderate pandemic transportation impacts, offering potential avenues for policy interventions to enhance resilience.

Survey results prioritize visible disinfection measures, adherence to distancing protocols, and robust contingency planning to maintain safe mobility access and rebuild rider confidence in the face of future outbreaks or related shocks. The synthesized conclusions emphasize the need for balanced communication strategies and tactical capacity improvements that mutually reinforce civic infection prevention commitments and emergency response collaborations. While attentive transportation agencies coordinating with stakeholders can lead efforts to safeguard equitable access from disruptions, progress demands consistent application of evidence-based learnings rather than short-term reactive measures. As the threat of renewed outbreaks persists, particularly in the context of climate change, transportation systems fortified by behavioral science insights and stress-tested through simulations offer hope for overcoming future mobility shocks. This can be achieved through communal cooperation and strategic planning, preventing regression and building a more resilient, equitable public transportation landscape for the future.

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# APPENDIX B: GATE KEEPERS LETTER



## ETHEKWINI TRANSPORT AUTHORITY

30 Archie Gumede Place | Durban | 4001  
P O Box 680 | Durban | 4000  
Tel: 031 311 7344 | Fax: 031 305 5871  
www.durban.gov.za

Dr Tony Ngwenya  
Graduate School of Business and Leadership  
University Of KwaZulu-Natal  
Westville Campus  
Durban  
3630

19 May 2023

Dear Dr Tony, Ngwenya


### RE: PERMISSION TO CONDUCT RESEARCH

This letter serves to confirm that Nkosinathi Blessing Dube Student No. 218050854 is presently conducting research in order to complete the MBA degree at UKZN Graduate School of Business and Leadership. The research title is **Impact of Covid-19 Lockdown Regulations on Public Transport Operations of eThekweni Municipality**. Dr Tony Ngwenya is supervising the research.

The intended benefit of this research is that it will contribute to literature on identifying the key impact factors impeding the transport operations during the COVID-19 lockdown regulations and assessing the recommended solutions for the transport operations of eThekweni Municipality.

Nkosinathi Dube would like to do the research within the organization in particular eThekweni Transport Authority (ETA) Department, and therefore needs your permission to conduct interviews with ETA. The study will be conducted in an ethically sound and responsible manner and will consist of the study that will be conducted at eThekweni Municipality using quantitative research methodology. A questionnaire will be used to collect data from staff members of the transport division of eThekweni municipality.

Kind regards,

  
Mr Nkosinathi Dube  
Senior Civil Engineering Technologist

Date:

19/05/2023

19/05/2023

## APPENDIX C: SURVEY QUESTIONNAIRE

You are invited to participate in a research survey examining perspectives on public transportation in the municipality during COVID-19 pandemic response restrictions. Your responses will be anonymous and no personal information will be collected. Data will only be reported in aggregate form. Your participation is completely voluntary, and you may exit the survey at any time. The survey should take 20-30 minutes to complete. Thank you for considering participation.

### SECTION A: DEMOGRAPHIC INFORMATION

Mark the appropriate box with a cross (×)

#### 1. Please indicate your respective department

Public Transport	A
Road System Management	B
Strategic Transport Planning	C

#### 2. Demographic Data

Gender		Male	Female
Age	25-34 years		
	35-44 years		
	45-60 years		
	Over 60 years		
Ethnicity	Black African		
	White		
	Indian		
	Colored		

**3. Please indicate your relevant experience of service.**

0 to 4 years 1	3 to 8 years 2	8 to 12 years 3	12 to 16 years 4	16 years and above 5
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**4. Please state your level of qualification**

Matric 1	Post matric certificate 2	Diploma 3	Degree 4	Honors 5	Other qualifications 6
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**Section B**

**Impact of the COVID-19 Lockdown Regulations on Public Transport**

<b>1. COVID-19 regulations and Transport</b>	Strongly agree. 1	Agree 2	Neutral 3	Disagree 4	Strongly disagree. 5
1.1 COVID-19 regulations are strictly enforced on the public transport drivers.					
1.2 Drivers did not breach the COVID-19 rules by taking many passengers in one vehicle.					
1.3 Public transport drivers followed the COVID-19 protocols properly.					
1.4 The awareness of the COVID-19 regulations was made clearly to the public transport stakeholders.					
1.5 COVID-19 regulations led to the lower numbers in the use of public transport.					

<b>2. Transport use and revenues</b>	Strongly agree. 1	Agree 2	Neutral 3	Disagree 4	Strongly Disagree 5
2.1 The department of Transport lost huge revenues during the COVID-19 period.					
2.2 The public transport driver reported complaints from passengers during the time of the lockdown.					
2.3 The lockdown process is the best option in the transport department.					
2.4 Public transport has become an issue since the start of the lockdown.					
2.5 There were no public transport issues during the lockdown time as compared to the prior times.					

<b>3. Alternative policy and the number of passengers</b>	Strong agree	agree	neutral	Strong disagree	disagree
3.1 There is a need for an alternative policy to regulate the transport industry than the lockdown regulations.					
3.2					

The number of passengers has declined significantly during the lockdown period					
3.3 An alternative policy can improve our department and our working conditions than the policy of lockdown.					
3.4 There is no other better alternative than the lockdown.					
3.5 Management adequately support the lockdown regulations and they see no other alternative.					

Please indicate any other alternative than the lockdown regulations and the level of an impact that has been posed on the transport operations (not compulsory).

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## **APPENDIX D: INFORMED CONSENT FORM**

### **UKZN HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE (HSSREC)**

#### **APPLICATION FOR ETHICS APPROVAL**

**For research with human participants**

#### **INFORMED CONSENT RESOURCE TEMPLATE**

Note to researchers: Notwithstanding the need for scientific and legal accuracy, every effort should be made to produce a consent document that is as linguistically clear and simple as possible, without omitting important details as outlined below. Certified translated versions will be required once the original version is approved.

There are specific circumstances where witnessed verbal consent might be acceptable, and circumstances where individual informed consent may be waived by HSSREC.

#### **Information Sheet and Consent to Participate in Research**

Date:

Greeting: Dear Sir/Madam

My name is Nkosinathi Dube from Graduate School of Business and Leadership of the University of KwaZulu-Natal (Student number: 218050854, Email: [218050854@stu.ukzn.ac.za](mailto:218050854@stu.ukzn.ac.za) / [\[REDACTED\]](#), Tell: [\[REDACTED\]](#))

You are being invited to consider participating in a study that involves research Investigating Impact of Covid-19 Lockdown Regulations on Public Transport Operations Recovery of eThekweni Municipality. The aim and purpose of this research is to examine the impact of the COVID-19 lock down regulations on public transport activities and to assess the recommended solutions to be used by the department of transport in eThekweni Municipality when responding to the COVID-19 pandemic. The study is expected to enroll 150 staff members from the transport division of eThekweni municipality. It will involve questionnaire procedures. The duration of your participation if you choose to enroll and remain in the study is expected to be approximately 30 minutes.

The study may involve no risks and/or discomforts to participants this research study will be based on the questionnaire which will exclude the identities, names, cell phone numbers and any other sensitive information from the participants. We hope that the study will create and contribute to literature on identifying key impact factors impending the transport operations during the COVID-19 lockdown regulations and assessing the recommended solutions for the transport division of

eThekwini Municipality. The researcher must disclose in full any appropriate alternative procedures and treatment etc. that may serve as possible alternate options to study participation.

This study has been ethically reviewed and approved by the UKZN Humanities and Social Sciences Research Ethics Committee (approval number\_\_\_\_\_).

In the event of any problems or concerns/questions you may contact the researcher at (Email: [218050854@stu.ukzn.ac.za](mailto:218050854@stu.ukzn.ac.za) / \_\_\_\_\_a, Tell: 0\_\_\_\_\_) or the UKZN Humanities & Social Sciences Research Ethics Committee, contact details as follows:

**HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION**

Research Office, Westville Campus

Govan Mbeki Building

PrivateBagX54001

Durban

4000

KwaZulu-Natal, SOUTH AFRICA

Tel: 27 31 2604557- Fax: 27 31 2604609

Email: [HSSREC@ukzn.ac.za](mailto:HSSREC@ukzn.ac.za)

State clearly that participation in this research is voluntary (and that participants may withdraw participation at any point), and that in the event of refusal/withdrawal of participation the participants will not incur penalty or loss of treatment or other benefit to which they are normally entitled. Describe the potential consequences to the participant for withdrawal from the study and the procedure/s required from the participants for orderly withdrawal. Under what circumstances will the researcher terminate the participant from the study?

State clearly if any costs might be incurred by participants as a result of participation in the study. If there are incentives or reimbursements for participation in the study, state how much and why they will be given.

Describe in detail the steps that will be taken to protect confidentiality of personal/clinical information, and the limits of confidentiality if applicable. Describe the fate of the data and stored samples.

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**CONSENT (Edit as required)**

I (Name) have been informed about the study entitled Investigating Impact of Covid-19 Lockdown Regulations on Public Transport Operations Recovery of eThekweni Municipality by Nkosinathi Dube.

I understand the purpose and procedures of the study.

I have been given an opportunity to answer questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any of the benefits that I usually am entitled to.

I have been informed about any available compensation or medical treatment if an injury occurs to me as a result of study-related procedures.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher at Email: [218050854@stu.ukzn.ac.za](mailto:218050854@stu.ukzn.ac.za) / n [REDACTED],  
Tell: 0 [REDACTED]

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

**HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION**

Research Office, Westville Campus

Govan Mbeki Building

Private Bag X54001

Durban

4000

KwaZulu-Natal, SOUTH AFRICA

Tel: 27 31 2604557 - Fax: 27 31 2604609

Email: [HSSREC@ukzn.ac.za](mailto:HSSREC@ukzn.ac.za)

Additional consent, where applicable

I hereby provide consent to:

Audio-record my interview / focus group discussion YES / NO

Video-record my interview / focus group discussion YES / NO

Use of my photographs for research purposes YES / NO

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**Signature of Participant**

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**Date**

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**Signature of Witness**  
**(Where applicable)**

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**Date**

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**Signature of Translator**  
**(Where applicable)**

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**Date**

## APPENDIX E: ETHICAL CLEARANCE



20 October 2023

**Nkosinathi Blessing Dube (218050854)**  
Grad School of Bus & Leadership  
Westville Campus

Dear NB Dube,

**Protocol reference number:** HSSREC/00006226/2023

**Project title:** Investigating Impact of coronavirus lockdown regulations on public transport operations recovery of eThekwin Municipality

**Degree:** Masters

### **Approval Notification – Expedited Application**

This letter serves to notify you that your application received on 20 September 2023 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted **FULL APPROVAL**.

**Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.**

This approval is valid until 20 October 2024.

To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

HSSREC is registered with the South African National Health Research Ethics Council (REC-040414-040).

Yours sincerely,

Professor Dipane Hlalele (Chair)

/dd