AFRICA HABITAT REVIEW 14(2) (2020)

ISSN: 2524-1354 (Online), ISSN: 2519-7851 (Print)
Africa Habitat Review Journal
Volume 17 Issue 1 (December, 2022)
http://uonjournals.uonbi.ac.ke/ojs/index.php/ahr

Impacts Of Covid-19 Pandemic on Accessibility in Nairobi City

*** Silvester Kasuku, Samuel Akatch, Francis Gichaga, Romanus Opiyo and Rose Musyoka**

Received on 14th September, 2022; Received in revised form 5nd December, 2022; Accepted on 16th December, 2022.

Abstract

The present study evaluates the impacts of COVID -19 pandemic on accessibility to land use sites such as work environments, education, shopping centres, recreational and conference facilities among other services in Nairobi City. The study therefore analyses accessibility factors of travel time, length of journey, cost of travel behaviour. The study focuses on periods before COVID -19, during lock-down and after lock-down (normalcy) in Nairobi City. The research uses both primary and secondary data sources to examine the Impacts of COVID-19 on accessibility in Nairobi City. The independent variables measured against accessibility included travel time, travel cost and frequency of travel. The research used household questionnaires to collect data along the Ngong Road and Thika Road corridors. The data was analysed and interpreted to provide reliable information on real impacts of COVID-19 pandemic on households in urban dwellings. The study established that COVID -19 had significant impacts on physical accessibility to land use sites, particularly during peak lock-down period. The present research uses social norms and social identities theories to explain the change in public behaviour occasioned by the need to manage COVID-19 Pandemic. Social households therefore opted to use online modes as a substitute to physical access to work, schooling, shopping, worship, recreation, meetings, conferences and other socio-economic activities. This research recommends the increased and complementary use of both virtual and physical modes as a means of access in normal urban living., Planning authorities should consider planning residential neighbourhoods with- spaces and facilities that support alternatives to physical access to various socio-economic activity sites.

Keywords: Integration, urban, land use planning, accessibility, urban transport policy, COVID-19 pandemic, sustainability, resilience, cities

INTRODUCTION

From early 2020, nations all over the globe were drawn to crisis in dealing with impacts of Corona virus disease (COVID-19). This is an infectious disease caused by the SARS-CoV-2 virus, a world-wide pandemic that was declared by the World Health Organization on March 11th 2020. Cities and urban areas were epicentres of the epidemic accounting for majority of the confirmed cases as well as recording extreme impacts in various ways cutting across different sectors (UN-Habitat, 2020).

Transportation was one of the sectors affected within the city of Nairobi. Transportation is a key player in urban development. Majority of urban dwellers still depend on public transport such as matatus to access different parts of the city. For instance, Institute for Transportation and Development Policy (ITDP) records that large portion (41 per cent) of population within the city rely on public transport option for mobility. Only 13 percent of commuters within the city use private cars while 40 per cent rely on non-motorised modes such as walking (ITDP, 2020). At the height of the epidemic, urban mobility became limited following government directives to effect lock down which restricted movement into and out of the city. Part of the directives required public transport vehicles only carry a maximum of half of their usual capacity and everyone to put on masks. This eventually developed an access challenge due to limited mobility and transport cost implications from resulting fare increase. It is still unclear how much within-city mobility was reduced because of the citywide lock down (Pinchoff et al., 2021).

**Corresponding author:*
***Silvester Kasuku**, Lecturer at Department of Architecture, Faculty of the Built Environment and Design, University of Nairobi, Kenya.*
Email: silvester.kasuku@uonbi.ac.ke

AFRICA HABITAT REVIEW 14(2) (2020)

As such, the section of the report seeks to understand the impacts of Covid-19 pandemic on socio-economic status or the residents along Thika and Ngong road corridors, cost implications on accessing various basic services, as well as travel patterns and other related mobility issues. The study also seeks to sort out permanent impacts brought by the pandemic. Additionally, this research will seek to comprehend on various coping mechanism to access Medicare, work meetings, social facilities, business premises, shopping area and schools among others.

THEORY

Litman (2008) delineates accessibility as the definitive objective of transportation since it enables people to reach goods, services and activities. Litman denotes that there are several factors that affect the measure of accessibility such as physical movement, quality and affordability of transport choices, connectivity, transport alternatives, and land use patterns. (Litman, 2008). From early 2020, countries around the world were drawn to crisis in dealing with impacts of Corona-virus Disease (COVID-19). This is an infectious disease caused by the SARS-CoV-2 virus, a world-wide pandemic that was declared by the World Health Organization on March 11th 2020. Cities and urban areas were epicentres of the epidemic accounting for majority of the confirmed cases as well as recording extreme impacts such as high number of fatalities, illnesses, job and income losses, disrupted global logistics, closure of offices and institutions of learning, closure of commercial outlets that hurt different sectors of the economy around the globe (UN-Habitat, 2020).

Fergus. et al. (2021) notes that the COVID-19 pandemic caused changes in social norms. The change is explained by social identity theory. The social identity approach proposes that belonging to social groups provides individuals with a definition of the group (i.e., a social identity), and a description and prescription of what is involved in being a group, precinct or neighbourhood member.

The advent and high adherence to new COVID-19 pandemic social norms required people to go against behaviours that were previously normative, such as being physically co-present with in-group members. Maintaining physical distance from societal in-groups (such as work places) including friends and family influenced the adaptation of mobility substitutes by using telecommunications.

Transportation was one of the sectors affected within the city of Nairobi hence the change in social norms that define the new world order in urban transportation service. Transportation is a key player in urban development. Majority of urban dwellers still depend on public transport such as matatus to access different parts of the city. For instance, studies by ITDP shows that a large portion (41 per cent) of population within the city rely on public transport option for mobility. Only 13 percent of commuters within the city use private cars while 40 per cent rely on non-motorised modes such as walking (ITDP, 2020). At the height of the epidemic, urban mobility became limited following government directives to effect lock-down which restricted movement into and out of the city. Part of the directives required public transport vehicles only carry a maximum of half of their usual capacity and everyone to put on masks. This eventually developed an access challenge due to limited mobility and a hike of transport cost. It is still unclear how much within-city mobility was reduced because of the citywide lock-down (Pinchoff. et al., 2021).

Benai (2020) notes that the theories and practices of urbanism, creating the urban system from the city core to the region, are highlighted by place, cyberspace, density, access, and the city – region. The urban system resilience hence calls for the understanding of the urban sub-system – infrastructure, residential neighbourhoods, city centre and city suburbs and services as part of the whole, in which the region normally supplies the city with supplies for sustenance.

COVID-19 pandemic, while exposing the vulnerabilities of the urban system access function, is also a driver of positive change in planning resilient urban forms of the future. It provides an opportunity for comprehensive planning, with specific interventions toward urban resilience, with place, cyberspace, density, access, and the city-region (Reza, 2020).

The recent pandemic has posed the dilemma of physical vs. virtual space. Thus, changing the dimension of concepts of urban place and space. Cyberspace and physical space are related

concepts but with limitations in a pandemic situation. Cyberspace poses the dilemma of a "digital divide," whereas physical space poses the dilemma of public vs. private transportation with equity and efficiency.

The COVID-19 pandemic calls on the urban system to be reconfigured, from the perspective of public infrastructure (the street, town square, park, and open space) to place density with a human-scale, where telecommunication, is regarded at par with such essential infrastructure as water, sewer, and road, to integrated urban and regional economies that enhance efficient, sustainable local production and distribution of resources.

RESEARCH METHODS

Introduction

The present research gathered from secondary and primary sources of data. On secondary data the study gathered various existing literature to facilitate the understanding of the variables under study. Primary data sources involved administration of questionnaires to a number of respondents.

Research Design

This research employed the fully mixed design method given that both qualitative and quantitative questions were used. According to Leech et al. (2007), this is the highest degree of mixing of research methods and research paradigm characteristics. The research covered Ngong Road Corridor and Thika Road corridor

Sampling techniques

To provide a representative sample size of these areas, this study used a stratified random sampling approach. To administer the questionnaire. (Levy et al., 2008) define stratified sampling as sampling in which sampling frame can be partitioned into groups or strata, and the sampling can be performed.

The research employed due care to ensure that the sample size was sufficient for both the study areas and was representative. (Gay, 1987) suggests that for co-relational research, 30 cases or more are required; for descriptive studies, ten percent of the accessible population is enough and for experimental studies, at least 30 cases are required per group.

Data collection and research tools

The research used household questionnaires to gather empirical data for analysis. The questionnaire collected data on household mobility characteristics before COVID-19 pandemic, during COVID-19 pandemic lock-down and after normalcy resumed in order to measure the impact of COVID 19 on urban mobility. The study collected and analysed data on modal choice, cost of transport, accessibility to land use sites by different modes of transport, travel speed, travel cost, coping mechanisms and the impact of COVID-19 pandemic on mobility and mobility substitutes during the three phases of pre COVID, Peak COVID lock-down and post lock down normalcy. Travel time, journey length, journey distance, and cost of journey and modal choice alongside household characteristics of respondents. The questions were directly related to the indicators of accessibility.

Data Analysis

The data gathered was analysed using SPSS statistical tool. The findings from the statistical analysis were synthesised at the prescriptive stage. Recommendations were formulated at the prescriptive stage to inform policy for various research output users. In this study, the dependent variable is accessibility while the independent variable is impacts of COVID -19 measured by number of travels, travel time, transportation cost and transportation mode. Basically, the research focused on socio-economic impacts of COVID-19 on households and travel behaviour of the residents of the Nairobi City.

RESULTS AND DISCUSSION

Profile of the respondents

The gender distribution of respondents was 55.3 per cent male and 44.7% female. The age distribution found out that majority (30.8 per cent) of the respondents were aged between 25 and 30 years. This had a marginal difference with those between 18 to 24 years (29.7 per cent). Cumulatively, assuming the working class category is between 18 to 60 years, this accounted for 98 per cent forming a large category of those who dependence on urban transport and mobility is very high on daily basis. When asked if they were infected by COVID-19 virus, majority (74.4 per cent) were never infected, while on the other side, a sizable sample of the respondents (25.6 per

AFRICA HABITAT REVIEW 14(2) (2020)

cent) acknowledged having been infected. The percentage of those having being infected do not agree with the national statistics where close to 40 per cent of the infections have been recorded in Nairobi city since the first case was recorded. As of 14th July 2022, government statistics indicate that about 336,292 cases had been recorded in Kenya (GoK, 2022).

Socio-economic Impacts of COVID-19

Historical epidemics have shown to have health consequences tied to acute socioeconomic effects that unfold across different social groups. Notably, those that were previously in vulnerable circumstances are likely to be the most severely affected, as their capability to handle the impacts is inadequate (World Bank, 2021). COVID-19 pandemic shaped an urgent need for timely data and information to monitor and mitigate the socio-economic impacts of the crisis. This study sought to measure the socio-economic impacts of COVID-19 and its multiplier effects on accessibility on the study area to develop policy recommendations.

There was marginal impact on economic status of students. However, it was observed that there was a steady decline as recorded before COVID-19 (34 per cent), during peak COVID-19 (26.8 per cent) and after normalcy (21 per cent). During peak period, the number of unemployed residents rose from 11.8 to 21.6 per cent an indicator of impacts of COVID-19 on employment. In fact, more households (47.8 per cent) were employed after normalcy compared to peak and before COVID-19 period.

World Bank (2021a) research shows similarities with this study on household's welfare was affected by job prospects and earnings after unemployment rate increased from 5 per cent to 16.5 per cent (in the last quarter of 2019 in May to June 2020). The negative effects of COVID -19 rendered many a large percentage of adult citizens outside the labour force. The labour force participation decreased 61 percent in mid-May 2020 from 75 per cent in the last quarter of 2019.

It also agrees with, UNCTAD (2020) that the employment rate increased after normalcy compared to peak and before COVID -19 given that households adopted one or more strategies for instance relying on savings to start business as a coping mechanism.

This also points out to a higher percentage (21.6) becoming business owners after COVID-19 compared to the two aforementioned periods. The impacts of the economic status of the respondents has been illustrated by **Figure 1**:

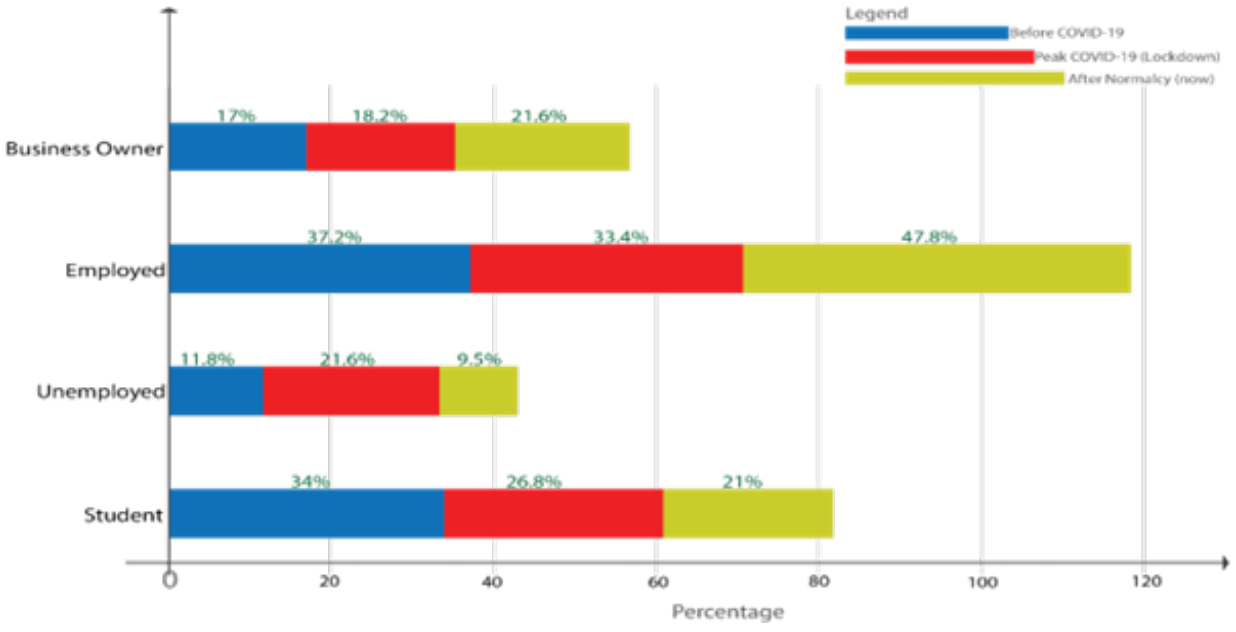


FIGURE 1
Aggregated impacts of COVID-19 on socio-economic status
Source: Author, 2022

Impacts of COVID-19 on travel patterns and modal choice

Before COVID-19 pandemic, majority of the residents (53.5 per cent) used to travel physically to either work, school or business premises 5-times in a week. During peak period when lock-down was in effect, the number of people who did not travel to the aforementioned places rose from 7.5 to 67.4 per cent, with those traveling at different number of times within the week reducing significantly to below 10 per cent. However, at the moment (after lock-down), majority of the households resumed physical travel with 46.7 per cent accounting for those traveling 5-times in a week. This is 6.8 percent less than before the onset of the COVID-19 pandemic. Notably, there was a slight increase (2 per cent) of number of those who did not travel physically to work while comparing the before and after scenarios of COVID-19, perhaps an indicator of slight though reluctant uptake of virtual modes to access school, work or conduct business as it will be seen later during this section.

Observations made during this study are consistent with the Pinchoff et al. (2021) which established a great variation in mobility patterns for residents in urban slums across Nairobi, 3 months into the COVID-19 pandemic and 2 months into normalcy. Enforcement of remote working rules by authorities such as physical distancing, remote working and lock-down to reduce COVID-19 infections resulted into closure of many businesses and offices hence impacting on the number of times individuals could go out (Camila, H, B et al, 2021). Before COVID -19 and lock-down only a small number, mainly unemployed female and infants could stay at home hence were at the lowest risk of COVID -19 transmission due to reduced interactions to only household contracts. During COVID -19 promotion of remote working and physical social distancing caused a reduction in the number of times individuals could travel (Pinchoff et al., 2021). The number of travels have been on the increase after normalcy due to uplifting of remote working rules, social distance requirements and vaccinations. The findings of this study also coincides with the observations of the GoK (2020) on the increase on the number of travels per individual during normalcy.

Walking was the most used (32.7 percent) mode of transport during peak COVID-19 period. It's important to underscore that during this time, the government had issued directives for partial lock-down limiting movement within the city, access to social places limited and public vehicles ordered to carry half of their normal capacity (Pinchoff, et al., 2021). Perhaps this is the reason that use of bus/matatus dropped with almost half from 43.4 percent (before COVID-19) to 20.1 percent (lock-down) then back again to 40 percent after normalcy. There was a sizable significant increase in use of virtual modes from 0.3 percent (before COVID-19) to 27.1 percent (peak COVID-19). There was however a low retention of use of virtual modes after normalcy as the percentage dropped to 2.7 per cent with majority of the households still preferring using other modes that enable physical access to various places. Disaggregated data indicate that there was significant uptake of virtual modes as means of travel during covid-19 peak period for respondents on both Thika road (23.7 percent) and Ngong road (36.6). However, there was low retention of the virtual modes after normalcy (now) as it was noted as mode of transport by 3.3 percent and 2.1 percent on Thika road and Ngong road respectively. Notably, along the two corridors, there was high dependence on walking (NMT) as the main mode of transport during the three aforementioned periods as shown in **Figure 2.**

This finding agrees with that after COVID -19 most individuals resorted to private cars relative to public transport (Gurdasani et al., 2020 and Almlof et al., 2020). The probability of choosing private cars comparative to public transport (buses and matatus) increased due avoidance of infections post COVID -19 due to distance to be covered and frequency which have a proportionate impact on cost of travel. Equally, the choice of mode of transport is dependent on distance to be covered. Gurdasani further established that individuals who are traveling primarily for work and studies are likely to use public transport to private transport post-COVID - 19. This conclusion is consistent with the findings of these study given the increase of people using buses and matatus from 20.1 percent during lock-down to 40 percent during normalcy. On non-motorized modes (walking, cycling and motorbikes), the findings of this study coincide with the observations of Aparicio, J, et al (2021) that individuals covering longer distances are less certain to use non-motorised compared

AFRICA HABITAT REVIEW 14(2) (2020)

to those traveling shorter distances. It is for this reason that the choice to walk has reduced from 32.7 percent during lock-down to 28.4 percent during normalcy. On the other hand, Manzira et al. (2022) agree that was higher probability of choice of remote working (virtual modes) during lock-down compared to during normalcy. During lock-down, only essential service providers could physically travel to work while the rest of the labour force were working remotely through virtual modes.

Aparicio et al. (2021) and Muhamad et al. (2020) while assessing the degree of demand change within METRO network in Lisbon for two different periods, established that the demand reliably reduced between almost 10 percent to 30 percent points due to remote working enforcement rules by the Portuguese government. This agrees with the findings that there was substantial change in travel patterns and number of households travelling to various destinations while at the same time conservative usage of the public transportation was being driven by safety and fear considerations arising from negative impacts of COVID – 19.

This findings also show that due to effects of COVID -19 people generally avoided public transportation and chose to use private cars which greatly changed travel patterns. On the transport model choice Guardasani et al. (2020) agrees that there was a substantial shift from public transport to private means of transport and non – motorized modes. The reasons for these significant shifts were infection –related factors such as passengers with face masks, social distancing, infection concerns and cleanliness, during COVID – 19. Guardasani et al. (2020) also established that travel time saving, cost of travel and relaxation (comfort) as major influences of the choice of mode of transport.

The observation is also consistent with the finding from Molloy et al. (2020) who spelt out that individuals who owned cars travelled more frequently during COVID -19 compared to those who did not own cars. Individuals who owned a motorbike travelled more distances for primary trip purposes before and during COVID -19 while essential service providers covered more distances for primary trip purpose before and during COVID-19.

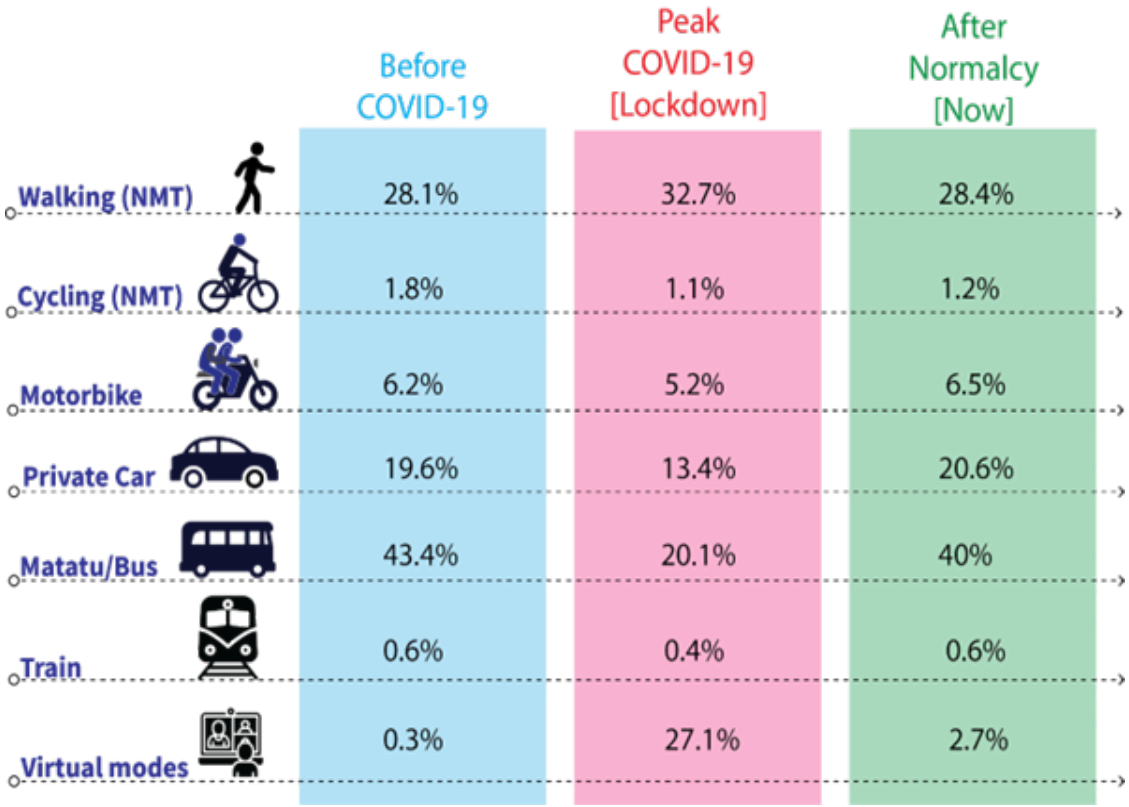


FIGURE 2
Aggregated data on Modes of transport used to travel to work before, during and after normalcy of COVID-19
Source: Author, 2022

Impacts of COVID-19 on travel time and cost

Before COVID-19, majority (50.7 per cent) of the respondents used between 31-60 minutes to travel to work. An additional sizable sample (35.4 per cent) used to spend less than 30 minutes to travel to work. The lock-down period saw a significant reduction of motor vehicles on roads reducing traffic and travel time significantly. As such, within the study area most of the respondents (72.6 per cent) indicated to spend less than 30 minutes for a similar trip to work during this period in comparison with pre-COVID19 period. This is also the same scenario on disaggregated data as presented by 70.3 percent and 74.5 percent of the respondents along Thika road and Ngong road respectively. Presently, when normalcy has resumed, aggregated data indicate that those spending less than 30 minutes to access their place of work has reduced with 31.6 percent and more people (20.5 per cent) are now spending more than one hour to travel to their work places. This situation is direr along Ngong road compared to Thika corridor as presented by 27 percent and 12.1 percent respectively, spending more than one hour.

When asked what was the cost of transport to school, work or business premise, majority (65.6 per cent) of the respondents noted to be spending Ksh.100 or less before COVID-19. The percentage of those whose spend ksh.50 and below almost doubled during COVID-19 peak as indicated by the rise from 37 to 66.1 percent perhaps due to limited access and travel that was caused by government directives on partial lock-down. After normalcy, a sizable percentage (45) mentioned to be using more than ksh.100 as transport cost. This is a significant increase (+24.5 percent) from the number of people who spent same amount during lock down period. **Figure 3** illustrates travel expenses before COVID-19, during, after normalcy. The findings of the study are consistent with Parady et al. (2020) which postulates that social stimulus in Japan led to self –restriction hence reducing congestions on roads and other infrastructure thereby making people to travel long distances within short periods. The observations also coincide with Drift et al. (2021) who noted that in Netherlands, there was strong increases in cycling and households avoided travelling during peak hours which led to a substantial reduction in the travel time. Equally, Camila, B. et al (2020) realized that people started travelling less from late May to early June 2020 in Australia which greatly caused a decrease in travel time for those individuals who at least travelled to work daily.

Wee B. V. et al, (2021) also observed that the effects of COVID -19 lowered congestion levels on roads and less crowding in public transport given that most people resorted to working remotely and restrictions. This observation corresponds with the findings of this study. This study also finds out that travel time increased after COVID -19 (during normalcy) which concurs with Haas M. et al. (2022) who observed that after uplifting of travel restrictions, roads become congested hence causing proportionate increase in travel time.

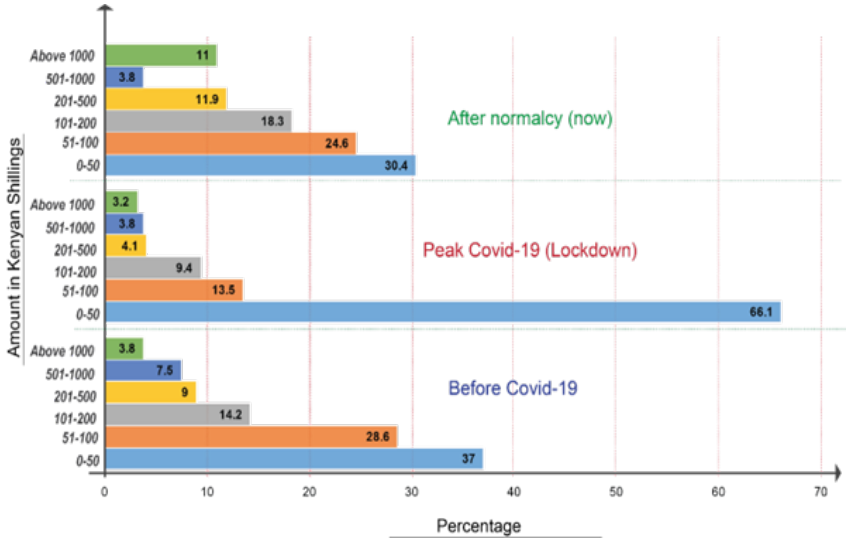


FIGURE 3

Aggregated data on travel cost before, during and after normalcy of COVID-19

Source: Author, 2022

AFRICA HABITAT REVIEW 14(2) (2020)

Coping mechanisms during COVID-19 peak period

From discussion above, it is clear that COVID-19 had an impact on access. . For instance, Camila et al. (2020) cite that from late May to early June 2020, the people of Australia changed their travel pattern and behaviour. They started travelling less by car for shopping, social and recreational activities. According to Parady et al. (2020) social effects defined the level of self –restriction in Japan. Lamb et al. (2020) states in the USA the decision to fly depends on perceived COVID -19 threat levels, effects and fear of the citizens. In Netherlands, it was found out that people shifted to use of bicycles and most people avoided travelling during peak hours (Drift et al., 2022).

Of course, to understand the coping mechanism during the peak period, it is vital to first get disaggregated data on impact of the COVID-19 pandemic accessibility to various key places and basic services. Chang et al. (2018), Lattarulo et al. (2019) and Circella (2021), show that in the perspective of analysis the results of the past are no guarantee for the future hence they recommend for new data collection process to define the consequences of observed changes for any study.
To understand the coping mechanism during the peak period, it is vital to first get disaggregated data on impact of the pandemic accessibility to various key places and basic services. As such, the study found out that during this period, significant number had full access to work (26.9 per cent) and to religious activities (31.6 per cent). However, this does not match with those who had completely no access to such areas are indicated by 42.9 percent and 37.1 percent. To add on this majority (52.2 per cent) of the respondents had minimal access to shopping for essential services. There was average access to social/recreation services (34.1 per cent) with a significant sample (29.8 per cent) indicating to completely having no access to this services. Access to Medicare was given an average score (30.7 per cent) by majority of the respondents. The table below brakes down accessibility score to various facilities during COVID-19 peak period.

The findings of study agree with Qian X, (2021), who show that the demand for mobility is satisfied by elaborate transportation system which also have proportionate impact on the accessibility of different areas and services. Transportation systems also plays a major role in the transmission and control of infections as well as spread of the epidemic outbreaks. Henceforth, it is vital to have a transportation system that mirrors sustainable mobility models even in the phase of pandemic (Wilbur M. et al 2020). Equally, transport policies should be assessed comprehensively prior to execution for sustainability (Simi et al., 2022).

When asked what coping mechanisms used to meet individual needs for travel during the COVID-19 Pandemic, there were significant percentage who indicated of use of virtual access as the main coping mechanisms as indicated by access to conference activities (54.8 per cent), access to school (62.6 per cent), and access to social/recreation activities (40.4 per cent). There was almost an even distribution of the three coping mechanisms used to access to work where 37.1 percent indicated physical travel, 30.6 percent mentioned a mix of physical and virtual, and, 32.3 percent specified virtual access as their coping mechanism. The hybrid access coping mechanism that entailed mix of physical and virtual means was noted to be the main coping mechanism to accessing business premises (49.2 per cent), access to religious activities (45.5 per cent) and access to work meetings (43.3 per cent). Notably, the lease coping mechanism was indicated as physical travel to school (2.9 per cent) as well as virtual access to medical care (6.7 per cent). **Figure 4** summarizes travel need and the coping mechanisms used during the height of COVID-19 in Nairobi city.

Accessibility of various places and services were limited by the introduction of a number of restrictions and lock-downs to control of COVID-19 in many nations across the globe. Primarily, these measures were intended to restrict movement of individuals, for instance requirements to work from home and physical social distancing (Parady G. et al, 2020). The consequence of such restrictions and lock-downs therefore enabled virtual access given that most people had to work despite the impacts of the COVID -19.

The research shows that it was that mobility restrictions limited the ability of individuals from social participation, performance of essential and non-essential activities as well as enjoying their best quality of life and well-being. For example, senior citizens had limited or no physical access to work, business premises, social and recreational activities among others due to their vulnerability.

Consequently, substantial travel behaviour adaptations have been observed across the globe as coping mechanisms in a sector normally considered resistant to change (Marsden et al., 2021). The findings show that travel demand shifted from physical to home working due to limited access or lock-downs hence households adopted e-shopping, virtual meetings and conferences as well as home delivery services as coping mechanisms.

Kim et al. (2021) also found out that post COVID-19 most people will adopt a mix of both physical access and virtual access to most of the services due a more developed systems in preparation for any pandemic.

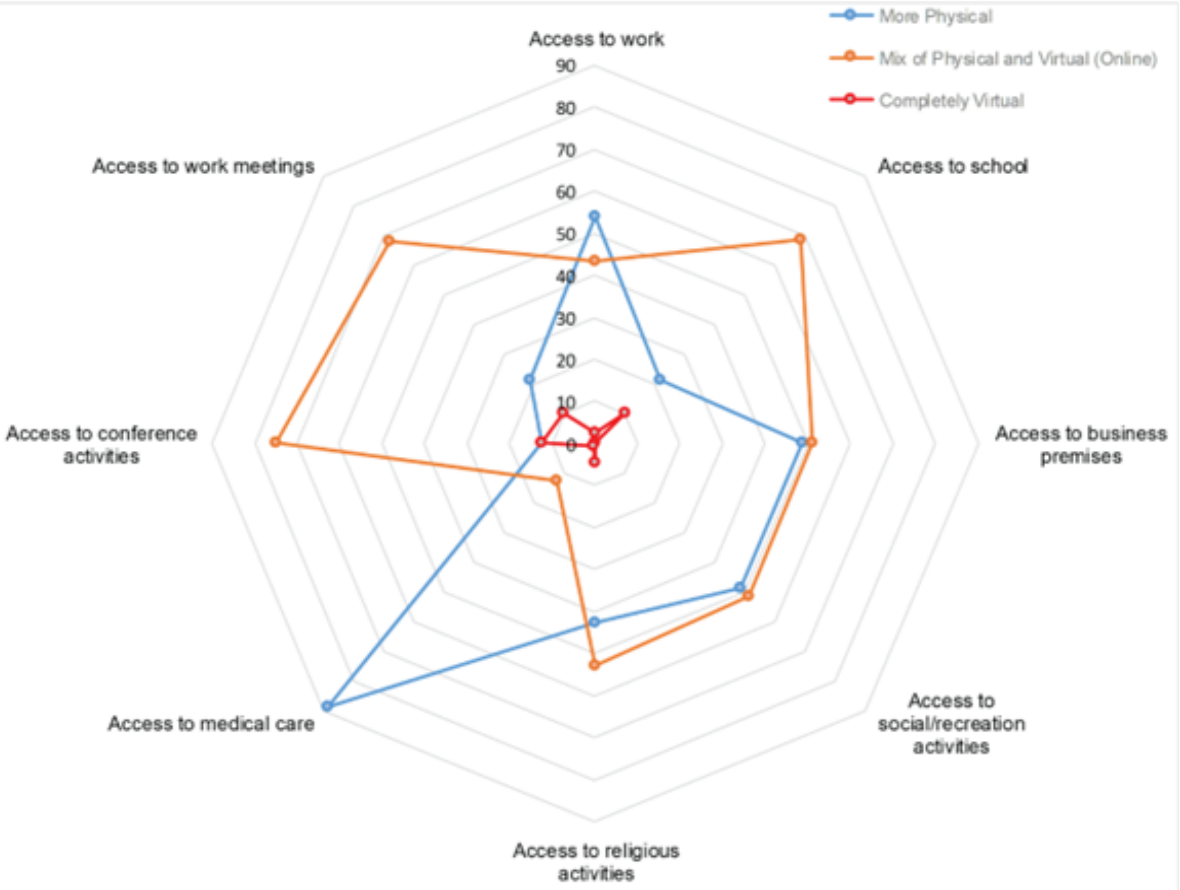
Spread of COVID-19 pandemic had a significant restraint on the mobility systems mainly because of the requirements for social distancing. This also lead to the need for framing COVID-19 mobility measures for rapid deployment in order to move people safely for public health reasons and to enable economic recovery (Combs et al ., 2021). Measures for creating safe spaces for social distancing were implemented around the world with a sense of urgency. Several experimental initiatives were taken to reallocate the road spaces originally meant for cars and on-street parking to allow more pedestrians and cyclists as well as facilitating low-risk business activities such as outdoor dining and retail (Combs et al., 2021).

Some of the impacts brought by COVID-19 pandemic were permanent. When asked what permanent impacts have occurred as a result of the pandemic, majority that indicated more physical travel entailed access to work (59.9 per cent), access to social/recreational activities (56.2 per cent) and access to medical care (83.7 percent). A permanent impact that contributed to development of a hybrid of physical and virtual modes was indicated by majority respondednts whose travel need was access to school (61.4 per cent), access to business premises (52.3 per cent), access to conference activities (70.9 per cent) and access to work meetings (65.1 per cent). In the contrary, the impacts of the pandemic did not have a permanent impact that dictated high uptake of virtual option as a main coping mechanism as observed by low percentages. Notwithstanding, a sizeable sample (22.1%) indicated use of virtual modes as an access mechanism to conference activities. The rest of the travel needs indicated figures below 10 percent.

Kim et al. (2021) recognizes that a decline for public transport services were experienced during COVID-19 pandemic which subsequently reduced the physical access to services. He notes that it was established that decline in access was most prominent at the early stages of the COVID-19 when infections were at the highest level and stringent requirements were put in place for travels.

The observations from this study coincides with the findings of Almlof et al. (2021), Qian et al. (2021 and Kim et al. (2021) travels especially availability of public transport systems enables accessibility of various areas and activities especially within homogeneous population groups. According to Almlof et al. (2021) and Kim J.et al. (2021), urban cities in developing countries largely depend on public transport systems and services hence access to services is also facilitated public transport system. This observation is consistent with the outcomes of this research.

Disaggregated data indicate that there were permanent impacts on travel for respondents along Thika road. For instance, Majority of residents indicate that access to work place (54.1 percent) and access to medical care (88.6 percent) required more physical access post covid-19 (normalcy). Additionally, majority also indicated access to school (68.4 percent) as well as access to work meeting (68.2 percent) required a mix of physical and virtual (online) access as a result of permanent impacts of covid-19 pandemic as shown in the **Figure 4.**



Travel need	Permanent impacts on travel		
	More Physical	Mix of Physical and Virtual (Online)	Completely Virtual
Access to work	54.1	43.2	2.7
Access to school	21.5	68.4	10.1
Access to business premises	48.9	51.1	0
Access to social/recreation activities	48.6	51.4	0
Access to religious activities	42.6	52.7	4.7
Access to medical care	88.6	12.8	0.7
Access to conference activities	12.5	75	12.5
Access to work meetings	21.5	68.2	10.3

FIGURE 4
Permanent impacts of COVID-19 pandemic on travel on Thika Road Corridor respondents
Source: Author, 2022

Equally, results from filed survey indicate that there were permanent impacts on travel for respondents along Ngong road. For instance, Majority of residents indicate that access to work place (64 percent), access to social/recreational activities (62.4 percent) and access to medical care (81.5 percent) required more physical access post covid-19 (normalcy). Additionally, majority also indicated access to school (55.2 percent), access to business premise (53.4 percent), access to conference activities (66.3 percent) as well as access to work meeting (62.3 percent) required a mix of physical and virtual (online) access as a result of permanent impacts of covid-19 pandemic.

A further probe on the impacts to determine whether they were efficient or convenient, majority (61.1 percent) confirmed that they were effective while the rest (37.9 percent) were of the opposite opinion. The impacts were however more effective on Ngong road (77.2 percent) in comparison to Thika road (47 percent) as shown in **Figure 5.**

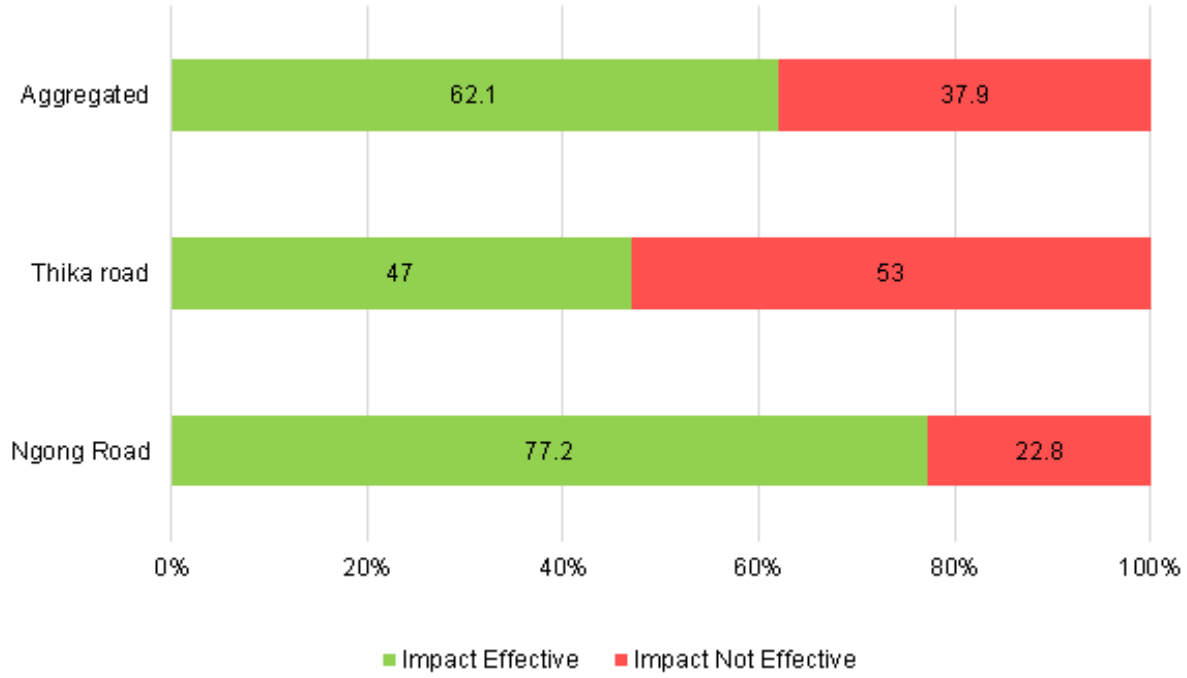


FIGURE 5
Efficiency of impacts on travel need
Source: Author, 2022

CONCLUSION AND RECOMMENDATIONS

This research sought to evaluate the urban transport impacts of the COVID-19 pandemic on accessibility in Nairobi City.

The study findings established that most people resorted to use of private cars and virtual /online modes during COVID-19. It can be concluded that most people resorted to using private cars due to fear infections post-COVID-19. Equally travel time during lock-downs was found to be lower compared to before COVID-19 and normalcy. The study reveal that this reduction was due to less congestion on urban roads in response to the government enforcement of remote working, social distancing, and travel restrictions.

From a spatial standpoint, this study establishes that the conversation of the long-term impacts of COVID-19 is relevant for various reasons. First, it focuses on the need of rethinking accessibility since virtual accessibility and physical accessibility are used interchangeably. Second, should the substitution be actualized, several areas and services will be accessed through virtual means such as e-shopping, delivery services, online meetings, virtual conferences and online education services. Also, considering the outcomes of this study, it is evident that households are likely to make residential choices relative to work locations while choices for destination might become flexible if such places are visited frequently by a number of households. Places such recreational and social facilities where chances of spread of COVID-19 is highest are most likely to be avoided by households. Third, increase in virtual activities will directly affect need for physical travel to activity locations.

Policy impacts of COVID-19 on travel calls for an efficient and effective urban transport systems that reduce congestion levels and promote less crowding. Due to indirect effects, the time saved for travel might be compensated by accepting longer commute distances or additional travel for other purpose. In the case of commuting and education, at least a reduction in travel frequencies can be expected, and probably also a reduction in rush hour traffic, leading to less congestion on roads and less crowding in public transport. This offer opportunity to people to make a choice of when to travel to work which is more flexible and avoids peak hours. For example a person may

AFRICA HABITAT REVIEW 14(2) (2020)

decide to work remotely for few hours and travel to the work place peak when hours have passed.

In order to prepare for future waves of COVID-19 or any other pandemics with similar characteristics, the following are critical. This research recommends that authorities focus on policies that support the use of non-motorized modes such as cycling to make them attractive to urban commuters. Planning authorities should consider planning residential neighbourhood with- facilities that support remote working and more outdoor spaces. There is need for more studies on the impacts of COVID-19 on travel patterns and options for the future activity patterns to address time-consuming trips such as work and education related trips which face increased options of activity patterns not available before COVID-19.

CITED REFERENCES

Abdullah, M., Dias, C., Muley, D. & Shahin, Md. (2020). Exploring the impacts of COVID-19 on travel behaviour and mode preferences. *Transportation Research Interdisciplinary Perspectives,* 8, 1-13. Retrieved from https://www.sciencedirect.com/science/article/pii/S2590198220301664.

Almlöf, E., Rubensson, I. & Cebecauer, M. (2021). Who continued travelling by public transport during COVID-19? Socioeconomic factors explaining travel behaviour in Stockholm 2020 based on smart card data. *European Transport Research Review,* 13(31), 1-13. Retrieved from https://etrr.springeropen.com/articles/10.1186/s12544-021-00488-0

Aparicio, J. T., Arsenio, E. & Henriques, R. (2021). Understanding the Impacts of the COVID-19 Pandemic on Public Transportation *Travel Patterns in the City of Lisbon. Sustainability,* 13(15), 1-18. Retrieved from //dx.doi.org/10.3390/su13158342

Balbontin, C., Hensher, D. A., Beck, M. J., Giesen, R., Basnak, P., Vallejo-Borda, J. A. & Venter, C. (2021). Impact of COVID-19 on the number of days working from home and commuting travel: A cross-cultural comparison between Australia, South America and South Africa. *Journal of Transport Geography,* 96, 1-13. Retrieved from https://www.sciencedirect.com/science/article/pii/S0966692321002416?via%3Dihub

Banai, R. (2020). Pandemic and the planning of resilient cities and regions. *Elsevier: Cities,* 106, 1-7. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7490286/

Circella, G. A. F. (2021). Transport policy in the era of ridehailing and other disruptive transportation technologies. *Advances in Transport Policy and Planning,* 1, 119-144. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S2543000918300106?via%3Dihub

Cochran, A. L. (2020). Impacts of COVID-19 on access to transportation for people with disabilities. *Elsevier, Transportation Research Interdisciplinary Perspectives.* 8(5), 1-8. Retrieved from https://www.researchgate.net/publication/347846173

Combs, T. S. & Pardo, C. F. (2021). Shifting streets COVID-19 mobility data: Findings from a global dataset and a research agenda for transport planning and policy. *Elsevier, Transportation Research Interdisciplinary Perspectives,* 9, 1-15.

Drift, S., Wismans, L. & Kalter, O. M. (2022). Changing mobility patterns in the Netherlands during COVID-19 outbreak. *Journal of Location Based Service,* 16(1), 1-24.

Gay, L. R. (1987). *Educational research competencies for analysis and application.* London: Merrill Publishing.

Giancarlos, P. A. & Taniguchi, K. T. (2020). Travel behaviour changes during the COVID-19 pandemic in Japan: Analysing the effects of risk perception and social influence on going-out self-restriction. *Transportation Research Interdisciplinary Perspectives,* 7, 1-15. Retrieved from https://www.sciencedirect.com/science/article/pii/S2590198220300920

Government of Kenya Ministry of Tourism and Wildlife. (2020). *COVID-19 and Travel and tourism in Kenya Policy brief.* Nairobi: Ministry of Tourism and Wildlife.

Government of Kenya. (2022). *Covid-19 Updates. Ministry of Health.* Retrieved June 12, 2022 from https://www.health.go.ke

Gurdasani, D. & Ziauddeen, H. (2020). On

the fallibility of simulation models in informing pandemic responses. *The Lancet Global Health,* 8(6), 778-779. Retrieved from https://www.thelancet.com/journals/langlo/article/piis2214-109x(20)30219-9/fulltext

Haas, M. D., Faber, R. & Hamersma, M. (2020). How COVID-19 and the Dutch intelligent lockdown change activities, work and travel behaviour: Evidence from longitudinal data in the Netherlands. *Elsevier, Transportation Research Interdisciplinary Perspectives,* 6, 1-11.

ITDP. (2020, November 20). *Better than a ban: Prioritising efficient public transport in the Nairobi CBD.* Retrieved from https://africa.itdp.org/better-than-a-ban-prioritising-efficient-public-transport-in-the-nairobi-cbd/

Joewono, B. T. & Kubota, H. (2006). Safety and security improvement in public transportation based on public perception in developing countries. *ATSS Research,* 30(1), 86-100.

Kim, J., Youn, K., Kim, J. & Kim, Y. (2021). *Ultrasonographic anatomy of the face and neck for minimally invasive procedures: An anatomic guideline for ultrasonographic-guided procedures. Gateway East.* Singapore: Springer.

Lamb, T. L., Winter, S. R., Rice, S., Vaughn, A. & Ruskin, K. J. (2020). Factors that predict passengers' willingness to fly during and after the COVID-19 pandemic. *Journal of Air Transport Management,* 89, 1-10. Retrieved from https://www.sciencedirect.com/science/article/pii/S0969699720304816

Lattarulo, P., Masucci, V. & Pazienza, M. G. (2018). Resistance to change: Car use and routines. *Elsevier, Transport Policy,* 74, 63-72.

Levy, S. P. & Lemeshow, S. (2008). *Stratification random sampling: Further issues. Sampling of populations: methods and application.* Hoboken, NJ: John Wiley & Sons.

Litman, T. (2008). *Evaluating accessibility for transportation planning.* Vitoria, Canada: Victoria Transport Policy.

Manzira, C. K., Charly, A. & Caulfield, B. (2022). Assessing the impact of mobility on the incidence of COVID-19 in Dublin City. *Sustainable Cities and Society,* 80, 1-16. Retrieved from https://www.sciencedirect.com/science/article/pii/S2210670722001007?via%3Dihub

Marsden, G. & Docherty, I. (2021). Mega-disruptions and policy change: Lessons from the mobility sector in response to the Covid-19 pandemic in the UK. *Transport Policy,* 110, 86-97.

Matthew, J. B., David, A. H. and Edward, W. (2020). Slowly coming out of COVID-19 restrictions in Australia: Implications for working from home and commuting trips by car and public transport. *Elsevier Public Health Emergency Collection,* 88, 1-17. Retrieved from https://pubmed.ncbi.nlm.nih.gov/32904879/

Michael, W., Afiya, A., Anna, O., Vincent, P., Riyan, K., Abhiram,V., Philip, P., Daniel, F., , Aron, L. & Abhishek, D. (2020). Impact of COVID-19 on public transit accessibility and ridership. *Physics and Society,* 14, 1-9. Retrieved from https://ui.adsabs.harvard.edu/abs/2020arXiv200802413W/abstract

Molloy, J., Schatzmann, T., Schoeman, B., Tchervenkov, C., Hintermann, B. & Axhausen, K. W. (2021). Observed impacts of the Covid-19 first wave on travel behaviour in Switzerland based on a large GPS panel. *Transport Policy,* 104, 43-51.

Neville, G. F., Templeton, A, Smith, R. J. & Louis, R. W. (2021). Social norms, social identities and the COVID-19 pandemic: Theory and recommendations. *Social and Personality Psychology Compass,* 15(5), 1-12. Retrieved from https://compass.onlinelibrary.wiley.com/doi/10.1111/spc3.12596

Onwuegbuzie, A. J. & Leech, N. L. (2007). Sampling designs in qualitative research: Making the sampling process more public. *Qualitative Report,* 12(2), 238-254.

Parady, G., Ataniguchi, A. and Takami, K. (2020). Travel behavior changes during the COVID-19 pandemic in Japan: Analyzing the effects of risk perception and social influence on going-out self-restriction. *Elsevier, Transportation Research Interdisciplinary Perspectives,* 7, 1-17. Retrieved from https://www.sciencedirect.com/science/article/pii/S2590198220300920

Pinchoff, J., Kraus-Perrotta, C., Austrian, K., Tidwell, J. B., Abuya, T., Mwanga, D. and Ngo, T. D. (2021). Mobility patterns during covid-19 travel restrictions in Nairobi urban informal settlements: Who is leaving home and why. *Journal of Urban Health,* 98(2), 211–221.

Qian, X., Sun, L. & Ukkusuri, S. V. (2021). Scaling of contact networks for epidemic spreading in urban transit systems. *Scientific Reports,* 11(4408), 1-12. Retrieved from https://www.nature.com/articles/s41598-021-83878-7

Qian, X. & Ukkusuri, S. V. (2021). Connecting urban transportation systems with the spread of infectious diseases: A trans-seir modelling approach, transportation research part b: Methodological. *Elsevier,* 145, 185-211.

Simic, V., Ivanovic, I., Doric, V. & Torkayesh, E. A. (2022). Adapting Urban Transport Planning to the COVID-19 Pandemic: An Integrated Fermatean Fuzzy Model. *Sustainable Cities and Societies,* 79, 1-26. Retrieved from https://www.sciencedirect.com/science/article/pii/S2210670722000038?via%3Dihub

UN-Habitat. (2020). *Covid-19 in African Cities: Impacts, responses and policies recommendations.* Nairobi: UN-Habitat.

Wee, V.B. & Witlox, F. (2021). COVID-19 and its long-term effects on activity participation and travel behaviour: A multiperspective view. *Journal of Transport Geography,* 95, 1-6. Retrieved from https://www.sciencedirect.com/science/article/pii/S0966692321001976

World Bank. (2021). *Socioeconomic impacts of COVID-19 in Kenya on households.* Washington, DC: World Bank.

World Bank. (2021). *Global economic prospects.* New York: World Bank.

Zhan, J. X. (2020). Covid-19 and investment--an UNCTAD research round-up of the international pandemic's effect on FDI flows and policy. *Transnational Corporations,* 27(1), 1-2. Retrieved from https://unctad.org/system/files/official-document/diaeia2020d1a1_en.pdf