Journal of Sustainable Development of Transport and Logistics
journal home page: https://jsdtl.sciview.net

Aderibigbe, O.-O. B. (2024). Impact of COVID-19 on bus rapid transit system usage in Lagos State, Nigeria: A comparative analysis. *Journal of Sustainable Development of Transport and Logistics, 9*(1), 72-84. doi:10.14254/jsdtl.2024.9-1.6.

ISSN 2520-2979

Impact of COVID-19 on bus rapid transit system usage in Lagos State, Nigeria: A comparative analysis

Oluwayemi-Oniya Bosede Aderibigbe

Department of Urban and Regional Planning, Faculty of Engineering and Built Environment, University of Johannesburg, South Africa
oboniya@uj.ac.za

Article history:

Received: March 26, 2024
1st Revision: April 02, 2024
Accepted: May 15, 2024

DOI:
10.14254/jsdtl.2024.9-1.6

Abstract: *Purpose*: This study aims to analyse the patronage levels of the Bus Rapid Transit (BRT) system in Lagos State, Nigeria, before, during, and after the COVID-19 pandemic. *Methodology*: Primary data were collected through an online survey distributed via Google Forms, gathering socio-economic and travel information from respondents. Regression analysis was used to identify factors influencing trip frequency on the BRT system during each phase of the pandemic. *Results*: The findings revealed significant changes in transport costs and trip frequencies across the three periods. Before the pandemic, 55.64% of respondents spent between N501 and N1000 weekly on transport, while 56.41% spent N1501 and more weekly after the pandemic. The factors influencing trip frequency were seat availability, travel stability, driver attitude, ease of boarding and alighting, safety, travel time, and reliability. *Theoretical Contribution*: This research contributes to understanding the nuanced effects of COVID-19 on public transportation, particularly within the context of BRT systems in Lagos State. *Practical Implications*: The study suggests that strategic attention should be given to the lessons learned from COVID-19 to develop appropriate strategies for future unforeseen circumstances.

Keywords: COVID-19, mobility, bus rapid transit, sustainable development

1. Introduction

Road transport is a pivotal driver of urban, rural, and national development by facilitating the essential movements associated with urbanisation and national progress. It acts as a facilitator, making the flow of goods and services crucial for industry and consumers. Moreover, road transport fosters social and economic interactions while generating employment opportunities (Atubi, 2006). The aftermath of the Covid-19 pandemic has introduced a profound shift in travel behaviour, challenging the notion of a return to a "new normal" in cities, as highlighted by the International Transport Forum (2023). Amidst ongoing crises, policymakers are confronted with a complex decision-making landscape.

Corresponding author: *Oluwayemi-Oniya Bosede Aderibigbe*
E-mail: oboniya@uj.ac.za

Nevertheless, the pandemic experience has underscored the capacity for implementing substantial changes in response to emerging challenges, offering prospects for reshaping urban landscapes into more sustainable and livable environments. The lockdown measures during the pandemic resulted in an 80% reduction in mobility compared to pre-COVID-19 trends, with public transport being disproportionately affected due to concerns about virus transmission. Consequently, individuals increasingly turned to private vehicles to minimise physical interactions (Awad-Núñez et al., 2021). Variations in travel behaviour changes were observed across countries and cities. Some individuals substituted physical travel with virtual alternatives, while others experienced trip frequency and timing shifts.

In the United Kingdom, for instance, a panel study revealed alterations in the frequency and timing of trips (Anable & Marsden, 2022). Similarly, the Netherlands witnessed a substantial decrease of 55% in physical trips and a 68% reduction in distances travelled (De Haas et al., 2020). In Bangladesh, although there was a notable shift towards digital modes of "travel" and a decline in formal and informal public transport use, trip frequencies remained relatively stable (Anwari et al., 2021). Furthermore, walking and cycling have gained popularity in various cities globally, including Brussels, Beijing, Jakarta, Mexico City, and Paris (Buehler & Pucher, 2022). Conversely, in Pakistan, the attractiveness of walking and cycling was hindered by inadequate infrastructure and limited bicycle access (Lee et al., 2021). Numerous factors influence travel behaviour, encompassing the built environment, transportation options availability, financial and temporal costs, personal resources, perceptions of abilities, attitudes, preferences, subjective norms, and habits (Barajas, 2021; Heinen & Chatterjee, 2015; Schneider, 2013). The case of the BRT is no different, as passengers consider some of these factors before using this transport mode. Before establishing Bus Rapid Transit (BRT), the capacity management challenges in the road transportation sector of Lagos state cannot be overemphasised. Lagos state is one of Nigeria's states characterised as Nigeria's commercial hub.

In 2015, Lagos State's population was estimated at 23 million people, and thus, it was earmarked as a megacity that accommodates over 10 million people, as defined by UN-Habitat in 2006. Notably, over 90 per cent of this population used a road transportation system loosely regulated by private commercial buses to provide mobility capacity within the Lagos metropolitan axis. Specifically, the early 1990s began the proliferation of the medium-sized commercial vehicles popularly known as minibus (Danfo & Molue) and the different types of small-sized commercial vehicles such as tricycles, bikes, taxis and others. In addition, the carrying capacity of this small-sized and medium-sized commercial vehicle ranges from 4 passengers for taxis and tricycles to 14 passengers for popular Danfo (medium-size yellow buses) and 50 passengers for Molue (long yellow buses). Despite the increase in the vehicles carrying capacity and numbers of vehicles, Lagos state, with its continuously increasing population, is faced with incessant traffic jams, longer travel time, increased travel cost, accidents and above all, a broad capacity imbalance between transport system supply capacity and transport users demand capacity. Not until the late 19th century did the Bus Rapid Transit (BRT) become an alternative panacea to resolving the alarming road transportation system problems through a strategic change from increasing the quantum of minibuses to a sizeable fast bus conveying mass passengers of about 40,000 passengers per hour. After that, the successful implementation of the BRT resulted in the spread of BRT in about 146 cities, including the Lagos Lite BRT system, while most others implemented a Full BRT system that carries nearly 24 million passengers per day around the world (Wirasinghe *et al.,* 2013).

BRT has been defined differently, but the widely referenced Institution for Transportation Development Policy (ITDP) defines BRT as “a high-quality bus-based transit system that delivers fast, comfortable, and cost-effective urban mobility through the provision of segregated right-of-way infrastructure, rapid, and frequent operations, and excellence in marketing and consumer service”. To this end, a public-private partnership (PPP) entrepreneurial initiative formed a Bus Rapid Transit (BRT-Lite) under the management control and supervision of the Lagos Metropolitan Area Transport Authority, commonly known as LAMATA, that began operations on March 17th, 2008. The primary objective of this organisation is to achieve sustainable capacity management, unlike the loosely regulated transport system. The Lagos Bus Service Limited has 36 routes, as public transport brings people into those close contact in a confined space, thus increasing their risk of exposure to the virus.

Several studies have delved into the repercussions of the COVID-19 pandemic on transportation and the environment, primarily scrutinising aspects such as worker mobility, the aviation industry, and employment dynamics. Despite this, scant attention has been given to exploring its effects on the

ridership of Bus Rapid Transit (BRT) systems. Therefore, this study aims to investigate the ridership patterns of the BRT system before, during, and after the pandemic, to identify factors that influenced respondents' utilisation of the BRT both preceding, during, and follow the pandemic period.

2. Literature review

General overview of the guidelines on movement and their impact on BRT in Lagos State

Regarding pandemics, Lagos State has consistently faced significant medical vulnerabilities. Similar to the coronavirus outbreak, the Ebola epidemic of 2014 originated and disseminated within Nigeria through Lagos State. The dense population, strained infrastructure, and pivotal role as a central regional transit hub for air, land, and sea transport (Ebenso & Otu, 2020) have significantly facilitated coronavirus transmission. Among the 36 states in Nigeria, Lagos State has recorded the highest number of laboratory-confirmed COVID-19 cases, along with associated deaths and recoveries. Per the Nigerian Centre for Disease Control's (NCDC) report dated May 19, 2020, 42.5% (n = 2624) of all reported cases in Nigeria originated from Lagos. At the pandemic's peak, the Lagos state government issued transportation guidelines to operators and users of public passenger transport to help curtail the spread of the virus at various garages and pickup points in March 2020 (LSGOW, 2020). These guidelines detailed the spacing between passengers as a minimum of 2m distance between commuters.

Nevertheless, the cash payment mode peculiar to Lagos transporters puts drivers and essential workers at risk. But with the high population rate of Lagos at large. It is scarce for social distancing to be practised effectively on the road mode of transport, and the lockdown procedure has been initiated to curtail the spread of the virus. The bus rapid transport system within the metropolis, one of the public transport initiatives provided by the state government, is affected by various factors ranging from long queues to late arrival of vehicles at boarding points.

COVID-19 and Transportation

Numerous studies have delved into the ramifications of COVID-19 on transportation systems across developed and developing nations. Eisenmann et al. (2021) underscored the heightened significance of car transport in Germany during the pandemic, juxtaposed with the diminished relevance of public transport. This trend was echoed by Dai et al. (2021), who noted a substantial shift from public to private transport in India. Examining the local context, Mogaji et al. (2021) investigated the repercussions of COVID-19 on transportation in Lagos, Nigeria's most significant commercial city. They highlighted how economic, religious, and social factors influenced transport dynamics amidst the pandemic's peak. Similarly, Barbieri et al. (2021) observed a stark reduction in transport utilisation for meeting passengers' travel requirements across ten countries, shedding light on the pandemic's impact and associated risk factors along various transportation routes.

In a comparative analysis focusing on Africa, Porter et al. (2021) explored how COVID-19 affected women's mobility in Cape Town, Abuja, and Tunis. Their findings underscored a pressing need for greater female involvement in the transport sector as commuters and operators to assume regulatory roles capable of mitigating COVID-19 consequences in Africa. Demographic factors such as age, income, gender, education, and transport costs emerged as significant determinants shaping travel behaviours. These studies collectively reveal the adverse effects of the pandemic on crucial sectors like transportation and the broader economy. In light of this, the current research investigates the impact of COVID-19 on vehicular traffic within Lagos State, focusing on the Bus Rapid Transit system.

3. Material and methods

This research identified two study groups: drivers and passengers. However, for this study, the projected population of the study area was used as opposed to the population as of 2006. This is because the 2006 population will not be liable for the study simply because the population would have increased. Hence, the projected population was used. According to the National Population Commission of Nigeria, the population growth of the study area is 3.63% per year. Therefore, the projected population for the year 2023 is 15,946,000. The study adopted a random sampling technique. Data was collected randomly via questionnaires from Lagos BRT users online using the Google Forms platform. According to a report published on primerotsl.com on 11th of October, 2022, about 350 million passengers boarded the Lagos

BRT between 2015 and 2022. The primary data collection method involved an online survey conducted via questionnaire administration from April to September 2023. To gather responses consistent with previous studies (Aderibigbe & Gumbo, 2022; Lee et al., 2021), a questionnaire was designed using Google Forms and distributed randomly across social media platforms such as Facebook and WhatsApp. A total of 415 questionnaires were obtained and utilised for analysis. According to Lindemann (2021), an acceptable response rate for online surveys is 33% or higher, while for other survey methods, 50% or higher is considered acceptable. The sample size was determined using the Taro Yamane Formula, which applies to finite populations where the population size is known. The formula for determining the sample size is as follows:

$$n = \frac{N}{1 + N(e)^2}$$

Where
n= Sample size,
N = population size, and
e = Margin of error (MoE), e = 0.05

$$n = \frac{15{,}946{,}000}{1 + 15{,}946{,}000X(0.05)^2} = 399.9$$

$$n = 400$$

3.1. Study area

Lagos, located in southwestern Nigeria along the coast of the Bight of Benin, is bordered by the state of Ogun to the north and east, the Bight of Benin to the south, and the Republic to the west. Historically, from 1914 to 1954, this region fell under British administration as part of the Nigerian colony. The enactment of the 1954 constitution led to the establishment of the Federal Territory of Lagos, encompassing a 27-square-mile (70 square km) area, including Lagos Island and the city itself, while its hinterland became part of the administrative region of Western Nigeria. This administrative division constrained the expansion of Lagos state onto the mainland. However, in 1967, the Nigerian government reinstated Lagos state, granting the city sovereignty over its hinterland. Today, Lagos is one of the world's prominent cities and holds the title of Africa's most populous city, surpassing Cairo. Its economy thrives on diverse industries, including manufacturing, transportation, construction, services, and wholesale and retail.

4. Results and discussions

4.1. Demographic characteristics of respondents

The socio-demographic data of all the respondents in Table 1 reveals that 56.1% of commuters are females, and the majority are artisans (29.23%). It further revealed that 53.08% are educated till the tertiary level (NCE, OND, HND etc). The frequent users of the Lagos state BRT are between the ages of 60 and above (42.8%). 49.4% earn between 30,000 - 50,000 naira monthly. From the preceding analysis, it is evident that the respondents possess a high level of education, indicating a thorough understanding of the survey content. Moreover, our findings revealed that the constant users of BRT were the elderly (60 years and above). This contradicts the findings of Amiegbebhor and Popoola (2018), who asserted that most of those who commute with the BRT were the youth and working-class group.

Table 1: Summary of survey table (Socio-economic characteristics)

Characteristics	Variables	Frequency	Percentage
Gender	Male	171	43.85
	Female	219	56.15
Educational Status	No formal education	10	2.56
	Primary/Secondary Education	87	22.31
	Tertiary Education	207	53.08
	Post Graduate Education	86	22.05
Occupation	Trader	93	23.85
	Artisan	114	29.23
	Student	56	14.36
	Civil/Public Servant	80	20.51
	Others	47	12.05
Age	18 - 29	47	12.05
	30 - 44	79	20.26
	45 - 59	97	24.87
	60 and above	167	42.82
Income Level	30,000 - 50,000	193	49.49
	51,000 - 70,000	146	37.44
	71,000 - 90,000	23	5.89
	91,000 and above	28	7.18

Source: Author's Field Survey

4.2. Transport cost before and after the Covid-19 pandemic

Data in Table 2 shows that 55.6% of the respondents spent between N501 - N1000 weekly on public transport before the COVID-19 pandemic. 26.1% revealed that they spent between N1001 - N1500 weekly, 12.3% revealed that they spent N1501 and more, while 5.90% revealed that they spent less than N500 on public transport before the COVID-19 pandemic. Meanwhile, 56.4% of the respondents spend N1501 or more weekly on public transport after the COVID-19 pandemic. 31.54% revealed that they spend between N1001 - N1500 weekly, 10.26% revealed that they spend N501 - N1000 while 1.79% revealed that they spend less than N500 on public transport after the covid-19 pandemic. Variance in the cost of transport depends on the travel distance of the commuters. This corroborates the findings of Inmaculada and Felicitas (2008), which suggest that transportation costs also increase as distance increases, with a steeper increase observed for longer distances. In addition, the inflation rate rose after the COVID-19 pandemic, and the increase in the cost of vehicle maintenance and fuel, among others, all aided the increase of transport fares after the pandemic.

Table 2: Transport cost before and after the Covid-19 pandemic

Characteristics	Before	(%)	After	(%)
Less than N500	23	(5.90)	7	(1.79)
Between N501 - N1000	217	(55.64)	40	(10.26)
Between N1001 - N1500	102	(26.15)	123	(31.54)
N1501 and more	48	(12.31)	220	(56.41)

Source: Author's Field Survey

4.3. Trip frequency of respondents before, during and after the pandemic

As revealed in Table 3, 35.38% of the commuter respondents indicated that they go on 6 to 10 trips per day before the pandemic, 30.7% revealed that they make 11 to 15 trips per day, 18.2% go on 16 trips or more while 15.6% of the respondents unveiled that they make between 1 to 5 trips per day. The respondents revealed that they could make such high number of trips before the pandemic because there were no restrictions on movement, and most of them made more on non-discretionary trips before the pandemic. However, during the pandemic, the trip frequency of respondents was reduced as 41% go on just 1 to 5 trips per day, 29.7% of the respondents unveiled that they go on 6 to 10 trips per day during the pandemic, 22.8% revealed that they go on 11 to 15 trips while 6.41% go on trips 16 times or

more per day during the pandemic. This is because there was restricted movement during the pandemic, and many businesses were shut down, corroborating findings from Aderibigbe and Gumbo (2022), who asserted that trip frequency declined during the pandemic. Meanwhile, the post-pandemic period saw a significant increase in the trip frequency of respondents as major economic activities were restored and the restrictions on movement were lifted.

Table 3: Trip frequency of respondents before, during and after the pandemic

Characteristics	Before	(%)	During	(%)	After	(%)
1 - 5	61	(61.64)	160	(41.03)	105	(26.92)
6 - 10	138	(35.38)	116	(29.74)	124	(31.80)
11 - 15	120	(30.77)	89	(22.82)	70	(20)
16 and above	71	(18.21)	25	(6.41)	83	(21.28)

Source: Author's Field Survey

4.4. Travel time of respondents before, during and after the pandemic

Data in Table 4 shows that a higher proportion (31.2%) of the respondents' travel time was between 1-2 hours, 30.2% indicated that theirs was between 30 minutes to 1 hour, 25.6% revealed that their travel time was less than 30 minutes while 12.8% revealed that they spend 2 hours and above on trip making through the BRT system before the pandemic.

Table 4: Travel time before the pandemic

Characteristics	Frequency	Percentage of total
Less than 30 mins	100	25.64
30 mins - 1 hr	118	30.26
1 hr - 2hrs	122	31.28
2hrs and above	50	12.82

Source: Author's Field Survey

Table 5: Travel time during the pandemic

Characteristics	Frequency	Percentage of total
Less than 30 mins	307	78.72
30 mins - 1 hr	42	10.77
1 hr - 2hrs	22	5.64
2hrs and above	19	4.87

Source: Author's Field Survey

From Table 5, it was discovered that respondents spent less time commuting to their destinations during the pandemic. 78.7% of the respondents revealed that they spent less than 30 minutes, 10.7% said they spent between 30 minutes to 1 hour, 5.6% spent 1 to 2 hours, while 4.8% opined that they spent more than 2 hours. During the survey, respondents attributed the lesser time on trips via the BRT to a reduction in the number of vehicles on the road, hence a reduction in traffic congestion, which has been a major cause of longer travel times. It was also discovered that the restrictions on movement made it impossible for people to make more trips, thus reducing the number of vehicles on the road. This assertion corroborated the findings of Aderibigbe and Gumbo (2022), which revealed a significant reduction in the number of respondents during the pandemic and travel time during the pandemic.

Table 6: Travel time after the pandemic

Characteristics	Frequency	Percentage of total
Less than 30 mins	101	25.90
30 mins - 1 hr	120	30.77
1 hr - 2hrs	129	33.08
2hrs and above	40	10.25

Source: Author's Field Survey

As shown in Table 6, commuters revealed that the travel time after the pandemic increased due to the increase in traffic due to lifting restrictions on movement, forcing and encouraging more people to resume economic activities. 33% revealed that the travel time is between 1 hour and 2 hours, 25.9% indicated that theirs is less than 30 minutes, while 10.2% revealed that the travel time is more than 2 hours.

Table 7: Pearson Chi-square in Travel time variation before, during and after the pandemic

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-square	701.812[a]	9	.000
Likelihood Ratio	687.882	9	.000
Linear by Linear Association	326.309	1	.000
N of valid cases		390	

Source: Author's Field Survey.

The chi-square test in Table 7 indicates a significant disparity in respondents' travel time before, during, and after the pandemic.

4.5. Analysis of factors influencing trip frequency of respondents before, during and after the pandemic

Regression analysis was employed to ascertain the key determinants affecting the usage of Bus Rapid Transit (BRT) before, during, and after the pandemic. The formula utilised for this analysis is:

$$Y = a + b1\ x1 + b2\ x2 + \ldots\ldots\ldots + bn\ xn + e,$$

where *Y* represents the dependent variable. The dependent variables, in this case, represent

Y= Trip frequency of Respondents

x1, x2, x3... xn represent the independent variables

a, b are constants

e is the error term

The proposed factors used during the research are providing seats and shelters at stations/stops, seat availability, safety, driver attitude, travel stability, travel time and reliability, ease of boarding and alighting.

Table 8: Regression result before the Pandemic (Modal summary)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.959[a]	.919	.917	.277	.919	616.576	7

Model Summary

Model	Change Statistics	
	df2	Sig. F Change
1	381	.000

a. Predictors: (Constant), Provision of seats and shelters at stations/stops, Seat Availability, Erratic Air Conditioning, Driver Attitude, Travel Stability, Travel Time and Reliability , Ease of boarding and Alighting

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	330.062	7	47.152	616.576	.000[b]
	Residual	29.136	381	.076		
	Total	359.198	388			

a. Dependent Variable: Trip frequency of respondents before the pandemic

b. Predictors: (Constant), Provision of seats and shelters at stations/stops, Seat Availability, Erratic Air Conditioning, Driver Attitude, Travel Stability, Travel Time and Reliability , Ease of boarding and Alighting

Table 9: Regression analysis to identify factors influencing trip frequency before the pandemic

Model	B	Std. Error	Beta	t	Sig.
(Constant)	-461	.088		-5.227	.000
Seat Availability	.448	.035	.428	12.959	.000
Travel Stability	.289	.033	.400	8.772	.000
Driver Attitude	.271	.047	.332	5.724	.000
Ease of boarding and Alighting	.139	.061	.137	2.275	.023
Safety	-.025	.047	-.022	-.533	.594
Travel Time and Reliability	.009	.050	.008	.180	.858
Provision of seats and shelters at stations/stops	-.224	.059	-.233	-3.780	.000

Source: Author's Field Survey

Information in Tables 8 and 9 shows the regression analysis on factors influencing the use of the Bus Rapid Transit (BRT) before the pandemic. A total of 7 predictors/independent variables listed below were highlighted: seat availability, travel stability, driver attitude, ease of boarding and alighting, safety, travel time and reliability, and provision of seats and shelters at bus stations. Tables 8 and 9 display findings from the multiple regression analysis, highlighting five significant variables that impact the patronage level of Bus Rapid Transit (BRT): availability of seats, travel stability, driver attitude, ease of boarding and alighting, and provision of seats and shelters at bus stations. The model summary in Table 8 indicates a coefficient of determination (R^2) of 0.919, suggesting that these five independent variables account for approximately 91.9% of trip frequency variability. Moreover, the ANOVA analysis

yielded a significant overall regression (F=616.576, p=0.00), affirming the collective influence of all variables in the model. Additionally, the regression coefficient, standard error of estimates, and t-tests provide further insights into the regression analysis.

Table 10: Model summary during the pandemic

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.967[a]	.935	.933	.243	.935	777.779	7

Model Summary

Model	Change Statistics	
	df2	Sig. F Change
1	381	.000

a. Predictors: (Constant), Provision of seats and shelters at stations/stops, Seat Availability, Erratic Air Conditioning, Driver Attitude, Travel Stability, Travel Time and Reliability , Ease of boarding and Alighting

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	321.165	7	45.881	777.779	.000[b]
	Residual	22.475	381	.059		
	Total	343.640	388			

a. Dependent Variable: Trip frequency of respondents during the pandemic

b. Predictors: (Constant), Provision of seats and shelters at stations/stops, Seat Availability, Erratic Air Conditioning, Driver Attitude, Travel Stability, Travel Time and Reliability , Ease of boarding and Alighting

The regression analysis on Tables 10 and 11 during the pandemic identified the influence of four variables: travel stability, safety, travel time, and availability of seats and shelters at bus stations, influencing the number of trips made by commuters through the BRT system. Furthermore, the model summary result in table 10 showed that the coefficient of determination R2 is 0.935, implying that about 93.5% of BRT usage during the pandemic is explained by the combined influence of the four independent variables selected by the regression model. The findings from Adetayo et al. (2023) and Somuyiwa & Adebayo (2009) also corroborated the assertations that factors such as safety and comfortability in terms of seating, travel time and reliability are significant factors influencing the patronage and use of the BRT services.

Table 11: Regression analysis to identify factors influencing trip frequency during the pandemic

Model	B	Std.Error	Beta	t	Sig.
(Constant)	-.326	.078		-4.200	.000
SeatAvailability	-.020	.030	-.019	-.650	.516
TravelStability	.133	.029	.169	3.920	.000
DriverAttitude	-.044	.042	-.055	1.060	.290
EaseofboardingandAlighting	.079	.054	.080	1.465	.144
Safety	.165	.041	.148	4.002	.000
TravelTimeandReliability	.153	.044	.145	3.512	.000
Provisionofseatsandsheltersatstations/stops	.513	.052	.544	9.838	.000

Source: Author's Field Survey

Table 12: Regression result after the pandemic (model summary)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.972[a]	.944	.943	.261	.944	919.494	7

Model Summary

Model	Change Statistics	
	df2	Sig. F Change
1	381	.000

a. Predictors: (Constant), Provision of seats and shelters at stations/stops, Seat Availability, Erratic Air Conditioning, Driver Attitude, Travel Stability, Travel Time and Reliability , Ease of boarding and Alighting

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	436.889	7	62.413	919.494	.000[b]
	Residual	25.861	381	.068		
	Total	462.751	388			

a. Dependent Variable: Trip frequency of respondents after the pandemic

b. Predictors: (Constant), Provision of seats and shelters at stations/stops, Seat Availability, Erratic Air Conditioning, Driver Attitude, Travel Stability, Travel Time and Reliability , Ease of boarding and Alighting

Table 13: Regression analysis to identify factors influencing trip frequency during the pandemic

Model	B	Std. Error	Beta	t	Sig.
(Constant)	- 1.397	.083		16.807	.000
Seat Availability	.044	.033	.037	1.346	.179
Travel Stability	.159	.031	.194	5.121	.000
Driver Attitude	-0.59	.045	-.064	1.331	.184
Ease of boarding and Alighting	.532	.058	.463	9.236	.000
Safety	.569	.044	.440	12.845	.000
Travel Time and Reliability	.147	.047	.120	3.141	.002
Provision of seats and shelters at stations/stops	-.169	.056	.155	-3.025	.003

Source: Author's Field Survey

The regression result for factors influencing the patronage level of respondents after the pandemic in Tables 12 and 13 showed the influence of five (5) significant variables in influencing the trip frequency of respondents using the BRT system. The variables include travel stability, ease of boarding and alighting, safety, travel time reliability and provision of seats at bus stations. Based on the modal summary in Table 12, the combined influence of these variables explained about 94.4% of the influencing number of trips made by passengers using the BRT.

5. Conclusion

The advent of COVID-19 instigated significant shifts in people's lives, inevitably impacting transportation systems. The extent of these changes remains uncertain and defies prediction at present. However, this uncertainty shouldn't deter us from observing emerging trends, envisioning potential scenarios, and devising strategies to enhance preparedness for the future. The COVID-19 crisis compels us to fortify our readiness for forthcoming pandemics while offering an opportunity to devise a more resilient, sustainable, and socially equitable transportation infrastructure. Crucially, we must reconceptualise future transportation systems to prioritise individuals' needs over mere vehicular considerations, ensuring their efficacy regardless of pandemic circumstances.

Practical Implications: The COVID-19 pandemic has significantly altered the usage patterns of the BRT system in Lagos State, highlighting the need for adaptive strategies in public transportation planning. Policymakers should consider the identified factors influencing trip frequency, such as seat availability, travel stability, and safety, to enhance the resilience and efficiency of the BRT system. Implementing measures to improve these factors can help maintain and even increase patronage levels in future crises. *Scientific Implications*: This study contributes to the growing body of literature on the impact of COVID-19 on public transportation systems. It provides empirical evidence from a developing country context, which has been underrepresented in previous research. The findings underscore the importance of considering socio-economic and contextual factors in transportation studies. Future research should explore the long-term effects of the pandemic on public transportation and investigate the potential for integrating digital technologies to improve service delivery and user experience. *Limitations and Future Research*: While this study provides valuable insights, it is limited by its reliance on self-reported data, which may be subject to biases. Future research should incorporate more objective measures of transportation usage and consider longitudinal studies to track changes over time. Additionally, exploring the impact of other variables, such as government policies and economic conditions, on transportation patterns would provide a more comprehensive understanding of the factors at play.

Acknowledgement

Ethics approval and consent to participate

Not applicable.

Availability of data and material

The data are available on request.

Competing interests

The author declares no conflict of interest or competing interests.

Funding

This work received no funding.

Citation information

Aderibigbe, O.-O. B. (2024). Impact of COVID-19 on bus rapid transit system usage in Lagos State, Nigeria: A comparative analysis. *Journal of Sustainable Development of Transport and Logistics, 9*(1), 72-84. doi:10.14254/jsdtl.2024.9-1.6

References

Adebambo, S., & Adebayo, I. T. (2009). Impact of bus rapid transit system (BRT) on passengers' satisfaction in Lagos Metropolis, Nigeria. *International Journal of Creativity and Technical Development*, *1*(3), 106-119.

Aderibigbe, O. O., & Gumbo, T. (2022). Variations in Mode Choice of Residents Prior and during COVID-19: An Empirical Evidence from Johannesburg, South Africa. *Sustainability*, *14*(24), 16959. https://doi.org/10.3390/su142416959

Amiegbebhor, D., & Boluwatife, P. (2018). The Lagos bus rapid transit: Review of users' perception. *American Journal of Humanities and Social Sciences Research (AJHSSR)*, *2*(11), 88-108.

Anable, J., & Marsden, G. (2022). UK Transport and Travel Adaptation Study (TRANSAS). *Presentation at the ITF Roundtable "Shaping Post-Covid Mobility in Cities", 8 June 2022*, https://youtu.be/eR5XxTyFRes.

Atubi, A. O. (2006). Road Traffic Accident Patterns in Lagos State from 1970 to 2001. *Unpublished Ph. D. Thesis, University of Nigeria, Nsukka, Department of Geography*.

Barajas, J. M. (2021). The roots of racialised travel behavior. *Advances in Transport Policy and Planning*, *8*, 1-31. https://doi.org/10.1016/BS.ATPP.2021.06.007.

Barbieri, D. M., Lou, B., Passavanti, M., Hui, C., Hoff, I., Lessa, D. A., ... & Rashidi, T. H. (2021). Impact of COVID-19 pandemic on mobility in ten countries and associated perceived risk for all transport modes. *PloS one*, *16*(2), e0245886. https://doi.org/10.1371/journal.pone.0245886

Buehler, R., & Pucher, J. (2022). Cycling through the COVID-19 pandemic to a more sustainable transport future: Evidence from case studies of 14 large bicycle-friendly cities in Europe and North America. *Sustainability*, *14*(12), 7293. https://doi.org/10.3390/su14127293.

Dai, J., Liu, Z., & Li, R. (2021). Improving the subway attraction for the post-COVID-19 era: The role of fare-free public transport policy. *Transport Policy*, *103*, 21-30. https://doi.org/10.1016/j.tranpol.2021.01.007

De Haas, M., 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. *Transportation research interdisciplinary perspectives*, *6*, 100150. https://doi.org/10.1016/J.TRIP.2020.100150.

Eisenmann, C., Nobis, C., Kolarova, V., Lenz, B., & Winkler, C. (2021). Transport mode use during the COVID-19 lockdown period in Germany: The car became more important, public transport lost ground. *Transport policy*, *103*, 60-67. https://doi.org/10.1016/j.tranpol.2021.01.012

Fernando, M., & Alfageme, M. S. (2023). Shaping post-Covid mobility in cities: summary and conclusions.

Heinen, E., & Chatterjee, K. (2015). The same mode again? An exploration of mode choice variability in Great Britain using the National Travel Survey. *Transportation Research Part A: Policy and Practice*, *78*, 266-282. https://doi.org/10.1016/J.TRA.2015.05.015.

Kumar, A., Zimmerman, S., & Agarwal, O. P. (2012). International experience in Bus rapid transit implementation: Synthesis of lessons Learned from Lagos, Johannesburg, Jakarta, Delhi, and Ahmedabad.

Lee, J., Baig, F., & Pervez, A. (2021). Impacts of COVID-19 on individuals' mobility behavior in Pakistan based on self-reported responses. *Journal of Transport & Health*, *22*, 101228. https://doi.org/10.1016/j.jth.2021.101228.

Lindemann, S. (2021). What is the average survey response rate. https://pointerpro.com/blog/average-survey-response-rate/

Martinez-Zarzoso, I., & Nowak-Lehmann, F. D. (2007). Is distance a good proxy for transport costs? The case of competing transport modes. *The Journal of International Trade & Economic Development*, *16*(3), 411-434. https://doi.org/10.1080/09638190701527186

Mobereola, D. (2009). Lagos bus rapid transit: Africa's first BRT scheme. *Sub-Saharan Africa Transport Policy Program Urban Transport Series: Discussion Paper*, (9).

Mogaji, E. (2020). Impact of COVID-19 on transportation in Lagos, Nigeria. *Transportation research interdisciplinary perspectives*, *6*, 100154. https://doi.org/10.1016/j.trip.2020.100154

Olufemi, A. H., Kareem, A. O., & Nicholas, O. C. (2023). A Study of Customer Service, Ambient condition and Customer Patron-age in the Public Transport Sector in La-gos State, Nigeria. *International Journal of Social Science and Human Research*, *6*(05), 3047-3054. https://doi.org/10.47191/ijsshr/v6-i5-69.

Porter, G., Murphy, E., Adamu, F., Dayil, P. B., De Lannoy, A., Han, S., ... & Van der Weidje, K. (2021). Women's mobility and transport in the peripheries of three African cities: Reflecting on early impacts of COVID-19. *Transport policy*, *110*, 181-190. https://doi.org/10.1016/j.tranpol.2021.05.025

Schneider, R. J. (2013). Theory of routine mode choice decisions: An operational framework to increase sustainable transportation. *Transport Policy*, *25*, 128-137. https://doi.org/10.1016/J.TRANPOL.2012.10.007.

Wirasinghe, S. C., Kattan, L., Rahman, M. M., Hubbell, J., Thilakaratne, R., & Anowar, S. (2013). Bus rapid transit–a review. *International Journal of Urban Sciences*, *17*(1), 1-31. https://doi.org/10.1080/12265934.2013.777514

Journal of Sustainable Development of Transport and Logistics (ISSN: 2520-2979) is published by **Scientific Publishing House "CSR", Poland, EU** and **Scientific Publishing House "SciView", Poland, EU**
Publishing with JSDTL ensures:
• Immediate, universal access to your article on publication
• High visibility and discoverability via the JSDTL website
• Rapid publication
• Guaranteed legacy preservation of your article
• Discounts and waivers for authors in developing regions
Submit your manuscript to a JSDTL at https://jsdtl.sciview.net/ or submit.jsdtl@sciview.net