Assessment of Socio-Economic Factors Influencing Travel Mode Choice in Tertiary Institutions in Gombe Metropolis, Nigeria

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Abstract: *This study investigated the influence of socio-economic factors on travel mode choice among staff and students of tertiary institutions in Gombe Metropolis, Nigeria. The study adopted survey research design. Both quantitative and qualitative approaches were employed to carry out the study. Four hundred (400) copies of a structured questionnaire representing the sample size of the study were administered. The questionnaire was administered with the help of trained field assistants. Both stratified and simple random sampling techniques were utilized to ensure a good representative of the sample size suitable for the study. Data obtained from the field survey were subjected to univariate, bivariate and multivariate analyses. The findings of this study revealed that, gender and age were among the major factors influencing travel mode choice in the study area. The findings also revealed that, the most commonly used mode of transportation in the study area was tricycle, followed by car and motorcycle. The study concluded that factors like genger, age and income among others were major determinants of mode choice in the study area. Therefore, the study recommends among others that government should through conditional cash transfer provide subsidies or financial incentives for students and staff from low-income backgrounds to ensure seamless academic activities within and outside the campuses. Also, the school managements should collaborate with Gombe State government through Gombe Line Transport Service provide shuttles buses in all the tertiary institutions in the state to cushion the effects of high transportation cost among staff and students.*

Key words: assessment, socio-economic factors, travel mode choice, tertiary institutions, gombe metropolis.

INTRODUCTION

Transportation is an important means of supporting people's activities and without movement it is impossible for them to fulfill their daily needs. People's daily needs are closely linked with the socio-economic characteristics such as age, income, gender, household size, sex, education and ethnicity. People carry out activities in different places due to physiological needs, social obligations, and personal desires (Eriksson, 2009). Solanke, (2014) reported that travel mode choice could be for different reasons either for working activity, education activity, recreation activity, social activity and shopping activities etc. Perhaps people are concern with the choice of travel modes according to their trip purpose.

Travel mode choices vary with an individual's socio-economic characteristics such as age, gender, and income level; transport availability; with journey purpose; and with attitude/value clusters (Solanke, 2014). Travel links the places where people move for their daily activities in the town. Mode choice simply refers to what mode of transportation people choose and how they use it to achieved satisfaction in their daily activities (Odeleye, 2008). The mode-choice decision implies which type of transport people use to make a trip. The choice of a particular mode of travel in urban areas is neither a static nor a random process. It is influenced either singly or collectively by many factors such as speed, journey length, comfort, convenience, cost, and reliability of alternative mode, the availability of specific travel modes, town size, age, composition and the socio-economic status of the persons making the journey (Hanson, 2015).

According to Temme (2017) travel mode choice is influenced commonly by measurable variables such as travel time, travel cost, travel distance, trip purposes, age, gender, income among others. Similarly, Gonzalez and Suarez (2013) asserted that comfort, convenience, safety and security, freedom, flexibility and psychological factors such as habits, lifestyle, beliefs, superstition and intermodal transfer influenced travel mode choice in university. Allard and Moura (2018) explained the role of comfort and convenience in modal choice using seat availability and number of intermodal transfers while Forward and Rutledge (2012) reported a variation in passenger's choice of travel mode is influenced by subjective beliefs such as freedom, safety, comfort and anxiety (Johansson *et al.,* 2006) reported the influence of comfort and flexibility as strong subjective that influenced travel mode choice between tricycle, motorcycle, cars and buses.

Tertiary institutions, as major trip generators, face significant challenges related to the travel mode choices. These challenges arise as a result of reliance on private and commercial vehicles on campuses that leads to traffic congestion, parking shortages, safety concerns, environmental impact among others (Al-Thawadi, Banawi & Al-Ghamdi, 2021; Balbontin, Nelson, Hensher & Beck, 2024). Figueiró, Neutzling and Lessa (2022) explained that the consequences of these issues are multifaceted and have a significant impact on the overall functioning and sustainability of tertiary institutions. But the use of mobility such as car dependency leads to increased travel time,

higher transportation costs, environmental degradation, health issues and social disruptions, affecting productivity, academic performance, and environmental health (Gallo & Marinelli, 2020).

According to Salisu (2024), travelers in tertiary institutions in Nigeria face a myriad of challenges related to mode choice. These challenges stem from a complex interplay of factors, including inadequate infrastructure, limited transportation options, economic constraints and sociocultural issues. The result is often a suboptimal transportation experience, leading to increased travel time, discomfort and environmental impacts. Gbadamosi (2023) explained that the socioeconomic factors significantly influence the mode of transportation chosen by tertiary institution students and staff in Nigeria. These factors, including family size, distance to institution and inadequate access to public transportation, impact the affordability, convenience and safety of different modes of transportation. The complex interplay of these factors often leads to suboptimal mode choices, affecting punctuality and overall well-being (Gbadamosi, 2023). The effects of suboptimal mode choices due to socioeconomic factors are multifaceted. For example, Adekeye (2017) reported that unreliable and time-consuming commutes negatively impact academic performance, financial burden, time management and safety. High transportation costs strain students' finances, especially from low-income backgrounds and overcrowded public transportation exposes them to risks and accidents.

Iloabanafor, Olawole and Eludoyin (2020) studied weekday trip patterns of students in Obafemi Awolowo University, Ile-Ife, Nigeria. The findings revealed that walking was the dominant mode for on-campus trips, while commercial buses were preferred for off-campus trips. However, challenges such as traffic congestion, inadequate infrastructure and high transportation costs were identified as significant barriers to efficient travel. Adekeye (2017) also explored the factors influencing mode choice among students at the University of Ibadan, Nigeria and revealed travel time, cost, comfort and safety as the primary determinants of mode choice. The research by Iloabanafor *et al.* (2020) and Adekeye (2017) identifies several research gaps in the context of tertiary institutions that this covered. These gaps include a deeper exploration of socioeconomic factors, such as income level, education level, occupation and household size and composition, as well as mode choice patterns, such as dominant modes, mode shares and trip purposes. Additionally, understanding the challenges faced by travelers in Gombe Metropolis, is crucial in developing effective transportation solutions. To address this research gap, this study provides valuable insights into the factors influencing mode choice in Gombe Metropolis with a view to recommending an effective trave mode in the tertiary institutions in Gombe state, Nigeria.

METHODOLOGY OF THE STUDY

Study Area
The study was conducted in Gombe metropolis of Gombe state in the North-East, Nigeria. The study area is the state capital and is considered a major urban center in Northeastern Nigeria. This

geographical limitation allows for a more in-depth analysis of socio-economic factors influencing travel mode choice within a specific urban environment. The study focused on the students and staff of Gombe State University and Federal College of Education Gombe. These institutions are considered the most prominent tertiary institutions in the metropolis, attracting students from diverse backgrounds and socio-economic strata. Studying these institutions can provide a good representative sample of the students and staff population in the Gombe metropolis.

Geographically, Gombe metropolis lies between latitude 10^0 15'N and $11^0$10'E and longitude 10.250^0N and 11.167^0E. It shares common borders with Kwami, Akko and Yelmatu Deba Local Government Areas of Gombe state respectively. Gombe is located within Lower Benue Trough which is surrounded by the Pre-cambrian Basement Complex to the east and south. A series of sedimentary rocks have been deposited over the basement complex. The area is under line by the Gombe sandstone and Pindiga formation, there are estuaritic grits sandstone, kaolinite deltaic sandstone, shale and iron stones. There are also quite traces of marine shale and mad stone that belong to the palexene and cenomanian ages (Upper River Basin Development Authority at Dadinkowa Agro Metrological Station).
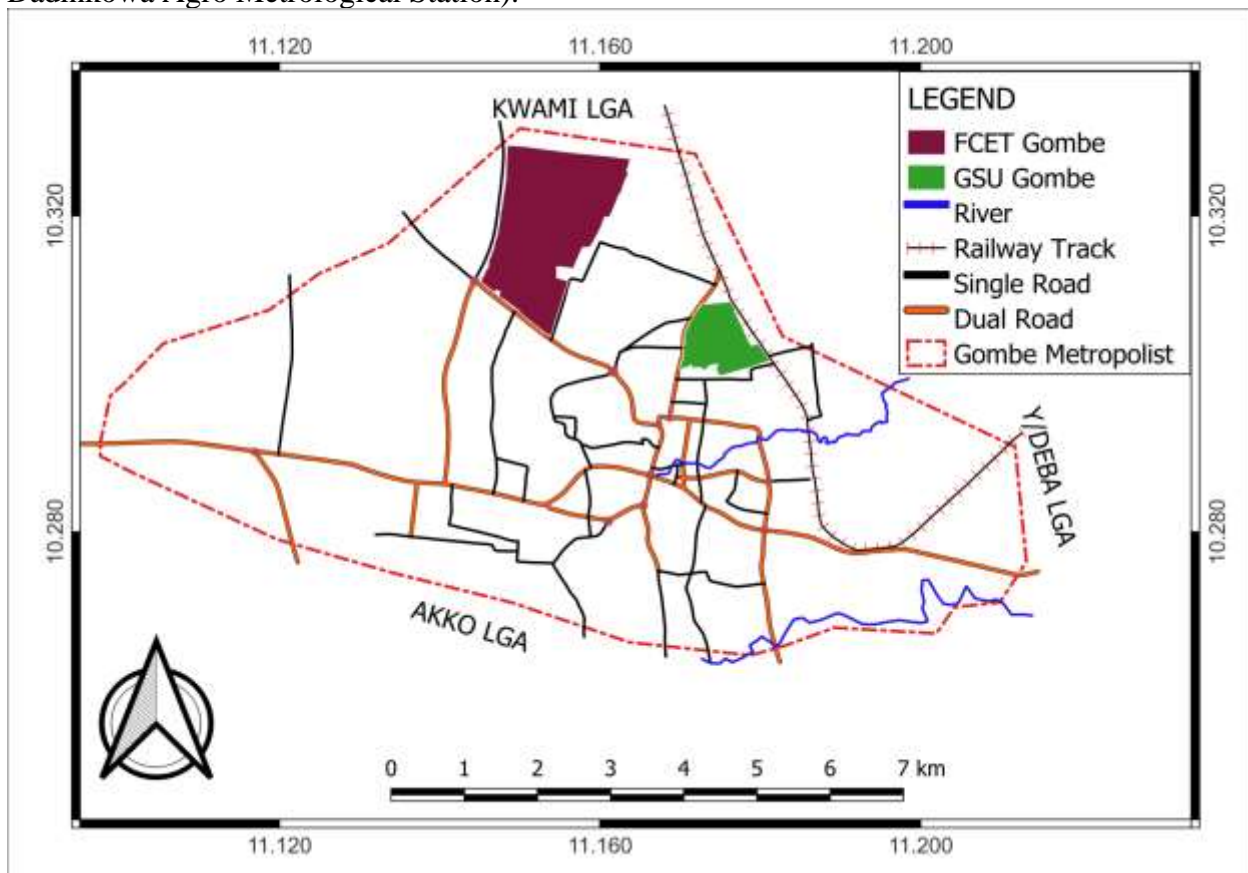

Figure 1: The Study Area in its Local Settings

Method of Data Collection

The study adopted survey research design. Both quantitative and qualitative approaches were employed to carry out the study. The qualitative insights from the exploratory phase inform the development of the quantitative survey, ensuring that it captures the relevant nuances of the study context. The quantitative analysis then provides empirical evidence to support policy recommendations and interventions.

The target population for this study comprises staff and students of Gombe State University (GSU) and Federal College of Education (FCE) in Gombe metropolis. The target population was selected because both staff and students at GSU and FCE Gombe are directly impacted by transportation choices within the Gombe Metropolis. Also, staff and students of GSU and FCE are considered relevant population because they are the primary users of transportation services within the selected tertiary institutions and their travel choices could be significantly influenced by socio-economic factors.

Both stratified and simple random sampling techniques were utilized to ensure a good representative of the sample size suitable for the study. Four hundred (400) respondents were considered as the sample size of the study. Therefore, four hundred (400) copies of a structured questionnaire representing the sample size of the study were administered. The questionnaire was administered with the help of trained field assistants. Data obtained from the field survey were subjected to univariate, bivariate and multivariate analyses using Statistical Package for Social Sciences (SPSS).

RESULTS AND DISCUSSION

Demographic characteristics of the respondents
Gender of respondents
Table 1 presents the sex of the respondents. The result revealed that majority 55.0% respondents were male and 45% were female. This means that majority of respondents are male in the study area. This finding validated the popular belief that due to religion and cultural values girl child education is very low in the northern region of the country. The role of gender in travel mode choice cannot be overemphasized. For instance, many women than men, for example, are less willing to take up trips or take modes as they perceive them as unsafe. There are also incidents of memory biases in terms of seeing or hearing something extremely unpleasant that might restrict women from taking public transport. Also, clothing of women, in different cultures can impact a lot on the choice of transport. Hence it is important to keep in mind the gender related issues as well, such as transport and street infrastructure to ensure women's high user group and make them as comfortable as it can be.

Table 1: Gender

SN	Gender	Frequency	Percentage
1	Male	207	55.0
2	Female	170	45.0
	Total	377	100.0

Source: Field survey, 2024

Age group of respondents

Analysis of the age group of the respondents in Table 2 indicated that 46.0% of the respondents were between the age range of 18-30 years; 29.0% were between the ages of 31–45 years; 15.0% were between the age groups of 46–60 years; and 10.0% were above 60 years. This revealed that most of the respondents 46.0% fell between the ages of 18 - 30 years. This indicated that most of the respondents were adults and their opinions could be reliable for the study. The relationship between age and travel behavior is multi-faceted. For instance, this age groups are regarded as economically active years, hence people who are within these age bracket might likely embark on a number of trips and may choice modes that are considered faster. Young people, for example, are far less likely than adults to make any type of independent trips. Teenagers on the other hand, want to travel anywhere and everywhere without a specific agenda, they probably need a reason to get out of their homes. Adults tend to travel out for necessity or for recreational purposes. Older people have the desire to walk or bicycle and spare their time in a qualitative way, but there might be physical constraints. Hence attitude towards specific modes also varies generationally, with older generations more familiar with, if not predisposed towards transit (Reilly & Landis, 2003).

Table 2: Age group of respondents

SN	Age of the Respondents	Frequency	Percentage
1	18-30 years	168	46.0
2	31-45 years	97	29.0
3	46-60 years	83	15.0
4	Above 60 years	30	10.0
	Total	377	100.0

Source: Field survey, 2024

Marital status of respondents

The marital status of the research respondents was grouped as; single, married, divorced, and widowed. The analysis based on marital status as shown in Table 3 revealed that, 43.0% respondents were single, 32.0% were married, 15.0% had divorced, and 10,0% respondents were widowed. This revealed that the majority of the respondents in the tertiary institutions in Gombe metropolis 43.0% were single. This is more plausible because undergraduate studentships are more associated with single people. While this figure is substantial, it is important to note that the majority of respondents were married, constituting 32% of the sample.

Zerihun *et al.* (2017), noted that, the marital status of an individual to some extend determines the number of trips and modal choices. This finding suggests a diverse demographic profile within the study area, with a notable presence of both single and married individuals. It is crucial to consider the potential implications of this finding on various aspects of the study area, such as social dynamics, economic activity, and healthcare needs. Further research may be necessary to delve deeper into the factors influencing the distribution of marital status within the population and its potential impact on the overall well-being of the community.

Table 3: Marital status of respondents

SN	Marital Status	Frequency	Percentage
1	Single	157	43.0
2	Married	107	32.0
3	Divorced	30	15.0
4	Widow	83	10.0
	Total	377	100.0

Source: Field survey, 2024

Monthly income of respondents
Income is one of the determinants of socio-economic status, which puts individuals into social classes and groups. According to Table 4, 43.0% of respondents had monthly income between N70,000 – N90,000, 32.0% had monthly income between N90,001 - N120,000, 15.0% had monthly income between N120,001 - N150,000, 10.0% had monthly above N150,001. This indicates that the majority of the respondents earned between N70,000 – N90,000 per month. From their income levels, most of the respondents falls within low-income earners. It is important to note that individual car ownership, vehicle type, the necessity of trips, and modal choice are often motivated by income. Individual income status has a strong impact on the mode choice. For instance, high-income earners are more likely to place a higher value on the comfort and convenience associated with the private auto, particularly for non-work trips. Ownership of the vehicles and the access to license also plays a major role in travel behavior, regardless of what the purpose of the trip is. The poor ones would always like to stay nearer to their workplaces and reduce their travel costs, which is very unlikely in the case of the rich ones. They would live far away from their workplaces, and drive to their workplaces. Also, sometimes when the poor use the public transits, access to it is another major issue, as because, still in many places the feeder services are not that strong and expensive also if compared to what a normal poor person can afford for travel (Guzman & Oviedo, 2018). Hence the travel behavior and mode choice are very well reflected upon by the income factor.

Table 4: Monthly income of respondents

SN	Income of respondents	Frequency	Percentage
1	70,000 – 90,000	157	43.0
2	90,001 – 120,000	107	32.0
3	120,001 – 150,000	83	15.0
4	150,001 – above	30	10.0
	Total	377	100.0

Source: Field survey, 2024

Employment status of the respondents
The employment status of respondents is presented in Table 5. The result reveals that, 43.0% were employed while 57.0% were unemployed, and 15.3%. This means that majority of respondents were unemployed in the study area. Occupational engagement is a fundamental reason why people own cars and move from one place to another. Employed people might have greater demands on their time and thus, prefer quicker and more convenient modes of transportation, as private car, compared to slower or less convenient modes. Also, the location of their work places has a great impact on the mode choice and again the affordability and time compared to their income is a strong determinant of the same.

Table 5: Employment status of the respondents

SN	Employment Status	Frequency	Percentage
1	Employed	157	43.0
2	Unemployed	220	57.0
	Total	377	100.0

Source: Field survey, 2024

Household Composition
The analysis of household composition of respondents as presented in Table 6, indicated that 56.0% of the respondents were family members and 44.0% were households. This means that majority of respondents were family member in the study area. If a household is a family, interrelationships might have a large impact on every individual's choice. If household members are unrelated, they may share information, or tastes but their behavior is generally expected to be less interdependent. The greater the number of children in a family, the more likely the adults are to avoid transit because they have to pay a fare for every person. The number of schools going children also influences mode choice in the house.

Table 6: Household Composition

SN	Household Composition	Frequency	Percentage
1	Household	168	44.0
2	Family member	209	56.0
	Total	377	100.0

Source: Field survey, 2024

Socio-economic factors influencing travel mode choice in Tertiary Institutions in Gombe Metropolis.

This objective assessed the socio-economic factors influencing travel mode choice in tertiary institutions in Gombe metropolis. Table 7 presents the mean and standard deviation of respondents' opinions on the factors influencing travel mode choice in Gombe metropolis. The overall mean rating of the eight items was found to be 2.56875, indicating that the respondents generally agreed that socio-economic factors moderately influence travel mode choice. Gender as a factor influencing travel mode choice (2.66), Age (2.65), Marital status (2.64), Income (2.60), Occupation (2.58), Social status (car ownership) (2.55). The mean score of two items were within the range of 2.49 to 2.38, indicating that the respondents considered level and rank 2.49 and Others (health, security, peer group etc.) (2.38) as the least socioeconomic factors that influences travel mode choice. The findings presented in Table 7 reveal a mixed picture of socioeconomic factors in the study area. While certain aspects of transportation infrastructure and accessibility appear to be moderately developed, others, particularly convenience and accessibility, lag behind. This discussion will delve deeper into these findings, drawing on relevant literature to provide context and potential explanations. The moderate level of public transportation availability suggests that while services are present, they may not be sufficient to meet the needs of all respondents. This could lead to reliance on private vehicles, especially for those living in remote areas or with irregular commuting patterns. Previous studies have shown that the availability of public transportation can significantly influence urban development and social equity (Cervero & Koetzly, 1997). The moderate availability of personal vehicles indicates that a significant portion of the population has access to private transportation. This can provide greater flexibility and convenience but can also contribute to traffic congestion and environmental pollution. Studies have consistently demonstrated the correlation between income levels and vehicle ownership (Litman, 2008). The moderate affordability of transportation suggests that costs are manageable for many respondents but may pose challenges for those with lower incomes. The affordability of transportation can significantly impact access to employment, education, and healthcare opportunities (Puentes-Leiva et al., 2018).

Table 7: Socio-economic factors influencing travel mode choice

Socio economic Factor	Mean	Std. Deviation	Ranking	Overall mean
Gender	2.66	1.237	1	
Age	2.65	1.262	2	
Marital status	2.64	1.155	3	
Income	2.60	1.168	4	**2.56875**
Occupation	2.58	1.244	5	
Social status (car ownership)	2.55	1.128	6	
Level and rank	2.49	1.230	7	
Others (health, security, peer group etc.)	2.38	1.239	8	

Source: Field survey, 2024; **Key**: M = mean, and SD = Standard Deviation
Scale: *Very low (1.00 – 1.5); Low (1.51 – 2.49); Moderate (2.50 – 3.49); High (3.50 – 4.49) and Very High (4.50 – 5.00).*

Various modes choices used by travelers to and from their institutions in the study area.
Table 8, shows that the various travel modes used in the study area. The results indicate moderate various travel mode used in the area of tricycle, car and motorcycle, walking, bus and taxi and bicycling with mean values of (M= 3.01, std. deviation = 0.986), (M= 3.00, std. deviation = 1.079), (M= 2.99, std. deviation = 1.093), (M= 2.98, std. deviation = 1.056) and (M= 2.94, std. deviation = 1.020) ranked 1st to 5th respectively. Table 13 provides insights into the various travel modes utilized by residents in the study area. The results indicate a moderate preference for a range of modes, including tricycle, car and motorcycle, and active transportation options like cycling and walking. The moderate usage of tricycles suggests that they play a significant role in the transportation system, particularly for shorter distances and in areas with limited public transportation options. This result corresponds with the findings of Peker *et al*. (2024) who highlighted the importance of tricycles as a flexible and affordable mode of transportation in many developing countries. The moderate usage of bicycling and walking indicates a growing interest in active transportation options. Studies have shown that promoting active travel can contribute to improved health, reduced congestion, and a more sustainable transportation system (World Health Organization, 2018).

Table 8: Various Traveling Mode Used by Travelers in the Study Area

Various Travel Mode used	Mean	Std. Deviation	Ranking	Overall mean
Tricycle	3.01	.986	1	
Car and motorcycle	3.00	1.079	2	
Walking	2.99	1.093	3	**2.984**
Bus and taxi	2.98	1.056	4	
Bicycling	2.94	1.020	5	

Source: Field survey, 2024; **Key**: M = mean, and SD = Standard Deviation

Scale: Very low used (1.00 – 1.5); Low used (1.51 – 2.49); Moderate used (2.50 – 3.49); High used (3.50 – 4.49) and Very High used (4.50 – 5.00).

Relationship between socio-economic factors and travel mode choice in tertiary institutions in Gombe metropolis

Regression analysis was carried out to determine the influence of socio-economic factors travel mode choice in tertiary institutions in Gombe metropolis. Table 9 and 10 shows the factors and challenges experienced by the travellers on mode choice in tertiary institutions in the study area. The R^2 value of .531 indicates that factors and challenges experienced by the travellers explained 53.1% variance in the mode choice with F (2,377), 215.267, $p < 0.001$.

The findings also revealed that gender, age, marital, income, employed and household (β = .126, $p < 0.001$), (β = .116, $p < 0.001$), (β = .136, $p < 0.001$), (β = .65, $p < 0.001$), (β = .64, $p < 0.001$) and (β = .66, $p < 0.001$) positively predicted mode choice in tertiary institutions in Gombe metropolis. Findings further revealed the model tested is significant at $p < 0.001$ thus; there is significant evidence to conclude that there is a relationship between gender, age, marital, income, employed and household by the travellers in two tertiary institutions on mode choice in Gombe metropolis. However, income levels, access to resources, and the availability of transportation options can significantly influence travel mode choice. Studies have demonstrated that individuals with lower incomes are more likely to rely on public transportation or active transportation (Puentes-Leiva *et al*., 2018).

Table 14: Relationship between socio-economic factors and travel mode choice in tertiary institutions in Gombe metropolis

Model Summary			ANOVA[a]			Coefficients[a]	
						Unstandardized Coefficients	
model	R	R Square	df	F	Sig.	B	Sig.
1	.730[a]	.533	4	7.730	.000[b]	2.164	.000
			709			-508	.000

Predictors: (Constant), socio-economic factors

Table 10: Individual Contribution of Socio-economic Factors on Mode Choice in Tertiary Institutions in the Study Area

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	.843	.177		4.761	.000
Gender	.126	.27	.96	1.577	.000
Age	.116	.26	.91	1.575	.000
Marital status	.136	.28	.101	1.777	.000
Income status	.65	.014	.78	1.156	.000
Employed status	.64	.013	.77	1.155	.000
Household composition	.66	.015	.79	1.157	.000

Dependent variable: Mode choices

CONCLUSION AND RECOMMENDATIONS

This study, investigated the influence of socio-economic factors on travel mode choice for tertiary institutions in Gombe metropolis with a view to recommending effective transport modes in the tertiary institutions in Gombe state, Nigeria. The findings of this study revealed that; majority of respondents are male. Also, majority of respondents were within the age of 18-30years. Gender and age were among the major factors influencing travel mode choice in the study area. The findings also revealed that the most commonly used mode of transportation in the study area was tricycle, followed by car and motorcycle, walking, bus/taxi and bicycling. These modes of transportation were utilized at moderate levels, as indicated by the mean values and standard deviations. The study concluded that factors like income status, employed status, and household status among others are major determinants of mode choice in the study area. Therefore, the study recommends among others that government should through conditional cash transfer provide subsidies or financial incentives for students and staff from low-income backgrounds to ensure seamless academic activities within and outside the campuses. Also, the school managements should collaborate with Gombe State government through Gombe Line Transport Service provide

shuttles buses in all the tertiary institutions in the state to cushion the effects of high transportation cost among staff and students.

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