

Modelling the Effect of Socio-economic Characteristics on Trip Generation by the Physically Challenged People (PCP) in Minna, Nigeria.

By

Ojekunle Joel Ademola, Owoeye Adelanke Samuel and Oluwole Matthew Sunday

Department of Transport Management Technology, School of Entrepreneurship and Management Technology, Federal University of Technology Minna, Niger State, Nigeria

Abstract

The socio-economic capacity and ability of individuals plays a major role in their trip generation to various activities centres across the urban space. However, this may vary from able bodies individuals to disabled and vulnerable people in the society. The need to investigate how socio-economic characteristics of Physically Challenged People (PCP) determine their trip generation informed this research. To carry out this study, a questionnaire survey from which data were gathered on the socio-economic and mobility attributes of the disabled. Structured questionnaires were purposively administered to 203 respondents (crippled and blind) in 4 Motor parks/terminals and 4 designated bus stops along the major traffic corridors selected in Minna. Descriptive and inferential statistics were used for data analysis. Findings revealed that 61.6% of respondents were male, 41.9% were within 15-30years, 39.9% were singles, and 43.8% have no formal education while 41.4% were engaged in the informal sector of the economy. The step-wise regression technique used to ascertain the influence of socio-economic characteristics on trip generation. Findings revealed that age, gender, marital status, occupation and income have significant influence on disabled trip generation but with a very weak R^2 of 17% explaining the variation in disabled people trips generation. This implies that socio-economic characteristics of disabled people do not play a significant role in their mobility in Minna. The paper suggested that paratransit transport system and infrastructure design and development should consider the peculiar needs of people with disabilities.

Key word: Socio-economic, Disable, Trip generation, Mobility

1.1 INTRODUCTION

Mobility means receiving transport services, going where and when one wants to travel, being up-to-date about the services, knowing how to use them, being able to use them and having the means to pay for them (Suen& Mitchell, 1998). For people with disabilities, such a goal offers many challenges. Research suggests that 13% of the populace experience mobility challenges in one form or the other, that is, they experience difficulties in accessing

some or all modes of transport (Henderson & Henderson; 1999, Jensen et al.; 2002 & Mitchell; 1995).

Cities around the world are characterised by a particular set of activities, which in reality account for the concentration of able and physically challenged people in them. Such activities are peculiarly urban arising from transportation, trading, manufacturing, finance and other tertiary activities (Solanke, 2014). The combination of all these activities helps to generate the spatial configuration of the city due to fact that their requirement are sometime functionally differentiated and spatially segregated. The spatial segregation of urban land use types creates spatial imbalance which necessitates spatial interaction for a functional interrelationships (Owoeye et. al. 2018).

Intra-urban trip generation represents an expression of individual's behaviour and as such it has the characteristics of being habitual. As a tradition it tends to be cyclic and the repetition occurs in distinct pattern (Bruton, 1975). It is noted that several factors affect the trip generation of urban residents in different neighbourhoods, these include; socio-economic characteristics of trip makers, level of transport infrastructure development, religion, culture, government policy on reproduction, city structure, location of household within city, accessibility to public transport, ownership of means of transport, among others (Owoeye et. al. 2018).

In urban trip generation studies, evidences really abound supporting the effects of trip maker's socio-economic characteristics. However in previous studies, emphasis is concentrated on able-bodied urban residents to the detriments of the physically challenged individuals thereby concealing the much desired variation in the phenomenon between cities (Ipingbemi, 2015). Moreover, while the effects of socio-economic characteristics of people in urban travels are fairly well known at individual city level among able-bodied in general, the phenomenon is yet to be well understood at regional settings among the disabled, especially in developing countries like Nigeria. In this study physically challenged person's is assumed to be disabled. The focus of the study is therefore, on modelling the effect of socio-economic characteristics of physically challenged people on trip generation in an emerging urban centre, Minna, Nigeria.

2.1 LITERATURE REVIEW

Virtually everybody will get old at some point in life; there are also people who are faced with mobility challenges caused by a number of factors, such as diseases or accidents. Others who live to old age will likely experience growing difficulties in functioning and vulnerability. The first World Report on Disabilities Mobility (2011) produced mutually by the WHO and the World Bank suggests that more than a billion people in the world today experience difficulty in accessing good Mobility. According to data from the world population prospects: the 2015 revision (United Nations, 2015) the number of older persons has increased substantially in recent years in most countries and region and that growth is projected to step up in the coming decades. The number of people with disabilities around the world is increasing at an unprecedented rate, not only in the developed/industrialized

countries, but also in the developing countries, such as China, India and Brazil (Xiaowei et al, 2013).

Trip generation studies within the urban centres have long attracted the attention of researchers in the field of transport studies. Conventionally, several studies have been done on the relationship between socio-economic status on trip generation using surrogate measures like occupation, income, education level and auto-ownership amongst others (Bruton, 1975; Ayeni, 1979; Oyesiku, 1990; Kuppan and Pendyala, 2000). Ayeni (1979) argued that an examination of mobility pattern in a city should follow at least two approaches. The first approach involves an assessment of some determinants of trips at the household, firm or individual levels, while the second approach is centred on the capacity of the various land use to generate and attract trips.

Fadare & Hay (1990) stated that various trips exist in the socio-economic attributes of urban residents as a result of the density of their residential areas which has repercussions for their trip generation. Solanke (2014) in his study on the significance of socio-economic characteristics of residents on trips generation discovered that age, mode of travel, sex, occupation, length of stay, rent, number workers and income are significant in influencing trip generation within the city.

Goeverden & Hilbers (2001) noted that personal characteristics of the trip maker influence his demands upon quality and willingness to pay. In the same manner it has been established that urban residents with higher income make more trips and travel greater distance (Ayeni, 1974). Auto owners and the non-educated people make more trips than non-owners and the more educated when all trips are considered (Kansky, 1967; & Doubleday, 1977). Apart from difference in both time and space, various socio-economic factors combine to determine why, where, when and how of movement in metropolitan Lagos, Nigeria (Olayemi, 1977).

In general from the above, the significance of socio-economic characteristics of respondents in intra-urban trip generation cannot be overemphasized. However, concentration of previous study has been on a general note mostly on those that are not physically challenged but less emphasis has been placed on the plight of the disabled in contemporary cities in developing Countries. Thus constitute a gap in knowledge of urban travel studies. Attempt in this study is to contribute towards an existing gap in knowledge of urban trip generation by establishing the influence of socio-economic characteristics on disabled people trip generation in Minna, Nigeria.

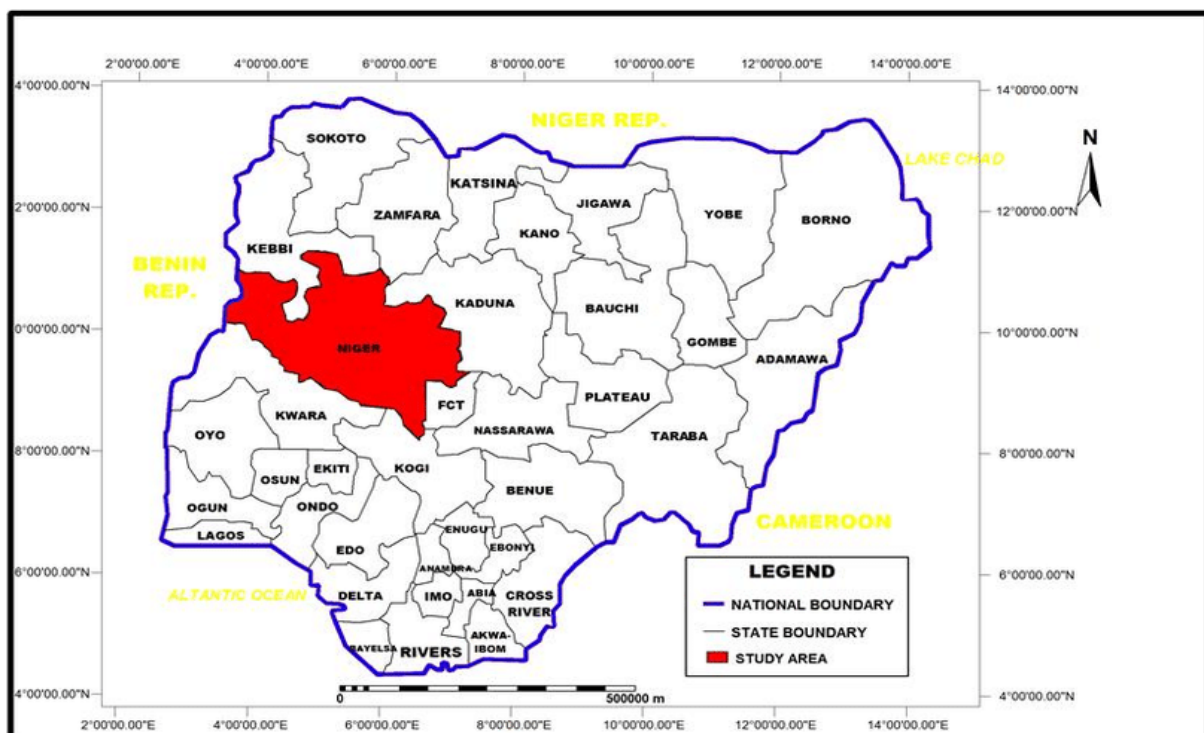
3.1 STUDY AREA

Minna is the largest city in Niger State which consists of Bosso and Chanchaga Local Government Area with an estimated population of 348,788 (SBS, 2011). The geographical coordinates are given as 9°36' 50" North and 6° 33' 25" East. It is the capital of Niger State and is 150 km away from the country's capital, Abuja. It consists of 2 major ethnic groups: The Nupe and the Gbagyi. Minna is connected to neighbouring cities by road. The city is served by Minna Airport as well. In terms of public transport, the major Motor Parks/Terminals in

Minna are Mobile Motor Park, Abdulsalam Motor Park, Niger State Transport Authority (NSTA) Motor Park, Kpankunga Motor Park, Gwadabe Motor Park, Peace Mass Transit (PMT) Motor Park, Kure New Market Motor Park and Minna central Motor Park while the Bus-Stops along the major traffic corridors in Minna are Tunga Bus-Stops, Mobile Bus-Stops, Kpankunga Bus-Stops, and Bosso Bus-Stops.

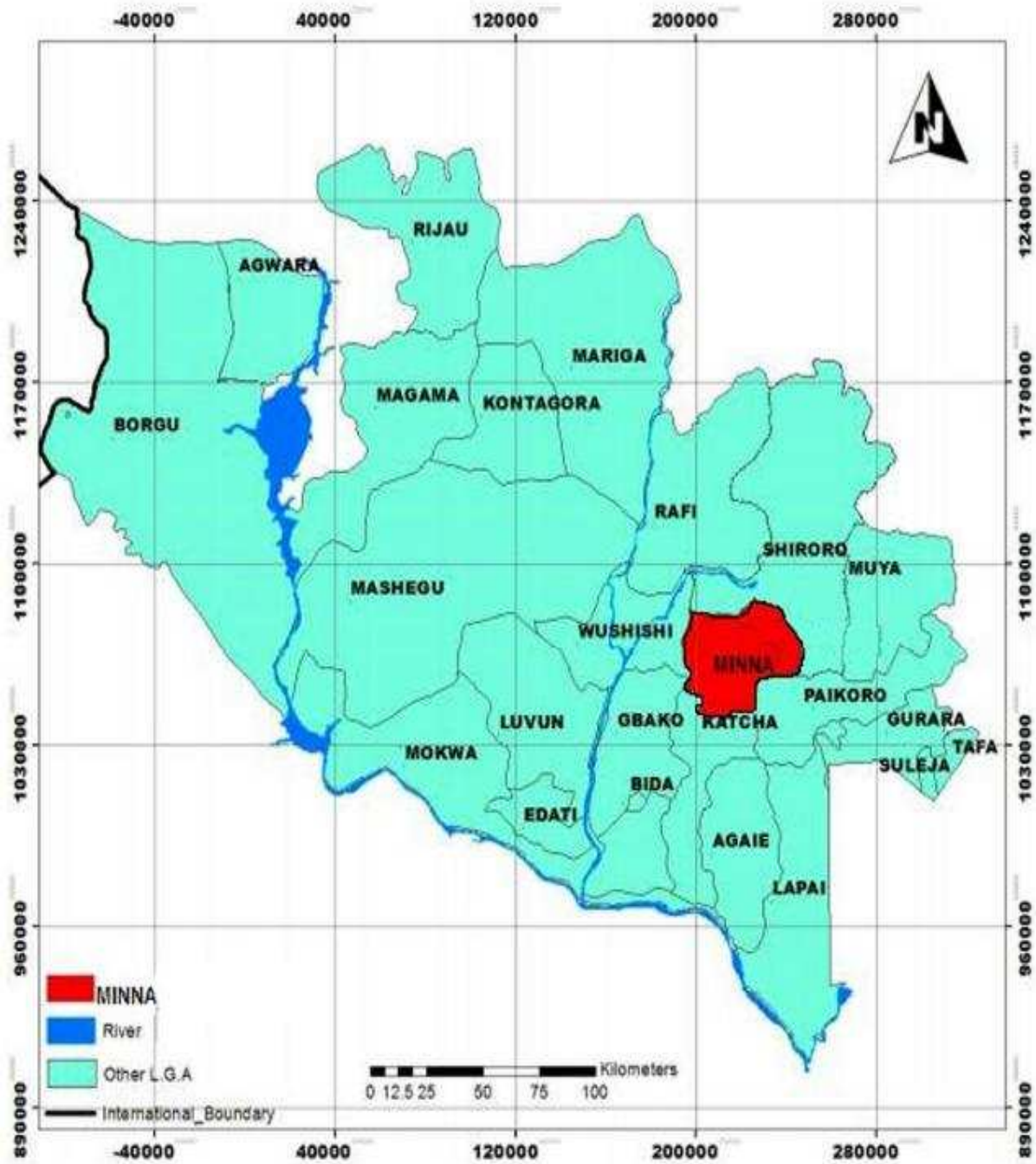
The most common modes of transportation in Minna is Road Transport. Motorcycles, buses, taxis, and tricycles are the most used carrying units for Mobility in Minna, Niger State. Although, motorcycle is the most flexible, which serves paratransit services (door-to-door) especially for people with disabilities, but it also appears to be the most dangerous in terms of the accident. It is the preferred mode of transport by many because of its ability to weave in and out of vehicles during traffic congestion.

Figure 1: Map of Niger State in the context of Nigeria



Source: Department of Transport Management Technology, FUT Minna (2018).

Figure 2: Map of Minna in the context of Niger State.



Source: Department of Transport Management Technology, FUT Minna (2018).

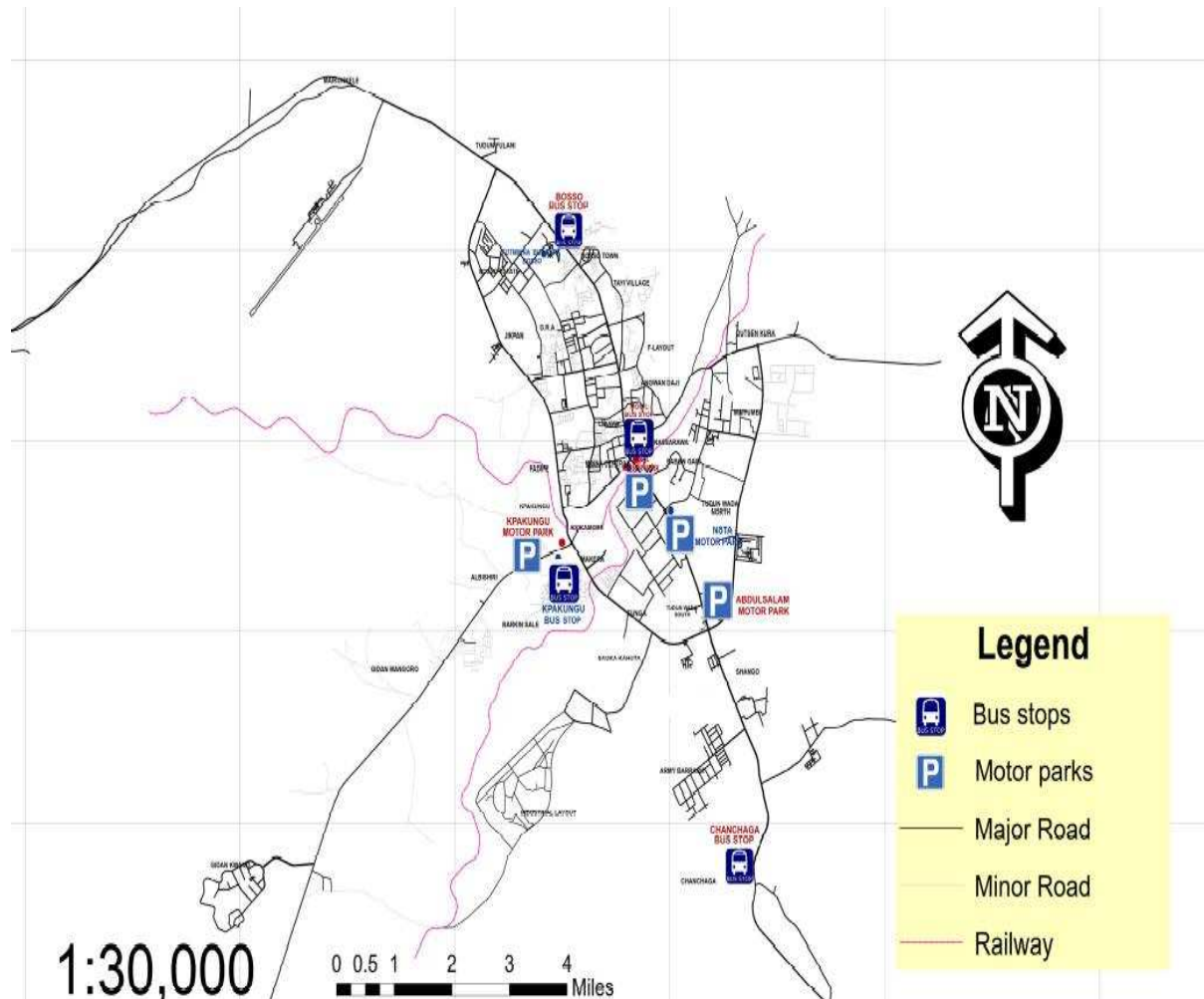


Figure 2: Street Guide Map of Minna Showing Selected Terminals/Motor Parks, Bus-Stops, Source: Authors Field Work (2018)

Table1: Method of questionnaires distribution and administration

S/N	Motor Parks/Terminals	Sample Size	Bus Stops	Sample Size
1.	Niger State Transport Authority	34	Chanchaga	9
2.	Abdulsalam Abubakar	13	Kpakungu	21
3.	Kpakungu	39	Mobile	25
4.	Mobile	48	Bosso	14
	Total	134	Total	69

Source: Author's field survey, 2018

4.1 METHODOLOGY

A cross sectional survey approach from which data were gathered on the socio-economic and mobility challenges of physically challenged people was obtained from primary and secondary data. The primary data were collected through the administration of questionnaires using purposive sampling technique and field observations. Secondary data was sourced from journals, books and online publications. The study is not neighbourhood specific but city–

wide, requiring a sample size for each motor parks/terminals and bus stops in order to make generalization about the entire city. The study is limited to the cripple and the visual impaired individuals in Minna. Four (4) Motor parks/terminals and four (4) designated bus-Stops along the major traffic corridors were purposively selected in Minna. Selected motor parks/terminals and bus stop have high concentration of disabled and they are located on major traffic corridor in the study area. The traffic corridors includes; Niger State Transport Authority, Abdulsalam Abubakar motor park, Kpakungun and Mobil for motor parks/terminals while the Bus stops include, Chanchaga, Kpakungu, Mobil and Bosso. Two hundred and three (203) copies of the questionnaire were purposively administered on disabled people. (The blind and cripple) in Minna metropolis because these are disabilities that can be easily recognized physically. The questionnaires were used to gather information on the demographic and socio-economic variables of the respondents.

Model specification of Study/ Variables and their Measurement

The main aim of trip generation model is to identify a functional relationship between travel, land use, and socio-economic characteristics of a trip maker (Okoko, 2006). In trip generation modeling, two major zones are recognized; (i.e. origin zones and, destination zones). The rate of trip making within an area depend on primarily land use and therefore the function of trip generation is to establish a meaningful relationship between land use and trip making activities so that changes in landuse can be used to predict subsequent changes in transportation demand. Also, some factors are also considered to influence the trip generation rate e.g. age, sex, level of education of household head, family size, number of cars per family etc. Trip generation equation have as their dependent variable the number of trips generated per person for different trip purposes, while the independent variables are the land-use and socio-economic factors that are considered to affect trip-making. Techniques that can be used to analyze trip generation models include; multiple linear regression models, trip-analysis and cross classification or category analysis. Multiple regression model was chosen for this study.

For this study, the model estimates urban trips generated by the disabled in Minna. This helped to establish a functional relationship between travel, land use and socio-economic characteristics of commuters in Minna. Therefore, the multiple linear regression model equation is expressed as:

$$Y = a_0 + \sum_{i=1}^n b_i x_i + e$$

This could be expanded to accommodate n number of predictor variables as follows:

$$Y = a_0 + b_1x_1 + b_2x_2 + b_3x_3 + \dots b_nx_n + e$$

$$Y = F(x_1+x_2+x_3+x_4+x_5+x_6+x_7+x_8+x_9) + e \dots\dots\dots (1)$$

Y = Number of daily trips made by respondents, while X_1 to X_{12} are the independent variables. The independent variables are listed as follows:

X_1 = Gender

X_2 = Age

X_3 = Education qualification

X_4 = Marital status

X_5 = Family size

X_6 = Occupation

X_7 = Average monthly income

X_8 = Car-ownership

X_9 = Number of cars

e = Error term of prediction

$Y = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + a_4X_4 + a_5X_5 + a_6X_6 + a_7X_7 + a_8X_8 + a_9X_9 + e$ Equation (2)

Where: Y= dependent variable

x_n = Independent variables

a_0 = Constant

a_n = Coefficient of independent variables

5.1 INTERPRETATION OF RESULTS

The result is presented under two headings; the demographic and socio-economic characteristics and regression analysis of the effects of socio-economic characteristics on respondents trips.

Table 1: Socio-economic Characteristics of Respondents

Age of Respondents	Frequency	Percentage (%)
<15years	22	10.8
15-30years	85	41.9
31-45years	40	19.7
46-60years	36	17.7
>60years	20	9.9
Total	203	100
Gender of Respondents		
Male	125	61.6
Female	78	38.4
Total	203	100
Marital Status		
Single	81	39.9
Married	52	25.6
Separated	9	4.4
Divorced	14	6.9
Widowed/widower	47	23.2
Total	203	100
Educational Background		

No Formal Education	89	43.8
Primary Education	31	15.3
Secondary Education	48	23.6
Tertiary Education	27	13.3
Others	8	3.9
Occupation	203	100
Student	32	15.8
Formal	22	10.8
Informal	84	41.4
Retired	5	2.5
Unemployed	49	24.1
Others	11	5.4
Total	203	100

Source: Author's Fieldwork (2018)

Demographic and Socio-economic Characteristics of the Disabled

The demographic and socio- economic variables as shown in Table 1 indicated that 10.8% of the respondents were less than 15 years, 41.9% were between 15-39% years and 19.7% were between 31-45 years. While respondents between 17.7% and 9.9% accounted for 46-60 years and above 60 years respectively. In term of gender distribution, about 67% of respondents were males while 38.4% were females. Moreover, marital status revealed that about 40% of respondents were single, 25.6% were married, 4.4% separated, 6.9% divorced while 23.2% were widowed or widower.

The educational background of respondents indicated that 43.8% had no formal education, 15.3% had primary education, 23.6 had secondary education, 13.% had tertiary education while, other forms of education constituted the remaining 3.9%. the occupational characteristics of people with disability showed that majority of them were in the informal sector (41.4%), students accounted for 15%, the formal sector account for 10.8%, 2.5% were retired, 24.1% were unemployed. While 5.4% were employed in the other sector of the economy.

Effects of Socioeconomic Characteristics on the Mobility of the Respondents

In examining the effects of socioeconomic characteristics of people with disabilities and physically challenged in the study area, the number of daily trips made by respondents was the variable to be predicted. 9 socio-economic characteristics were identified and represented as the independent variables. Regression model was employed to do the analysis. The formula for the regression model is stated as:

$$Y = F(X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + X_7 + X_8 + X_9) + e \dots\dots\dots (1)$$

Y = Number of daily trips made by respondents, while X_1 to X_{12} are the independent variables. The independent variables are listed as follows:

X_1 = Gender

X_2 = Age

X_3 = Education qualification

X_4 = Marital status

X_5 = Family size

X_6 = Occupation

X_7 = Average monthly income

X_8 = Car-ownership

X_9 = Number of cars

e = Error term of prediction

$$Y = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + a_4X_4 + a_5X_5 + a_6X_6 + a_7X_7 + a_8X_8 + a_9X_9 + e \dots\dots\dots \text{Equation (2)}$$

Where: Y= dependent variable

x_n = Independent variables

a_0 = Constant

a_n = Coefficient of independent variables

Hence, using the equation (2) above. The data were subjected to Stepwise Multiply Regression Analysis using 9 variables and only 5 variables which are age, gender, marital status, occupation and average monthly income were retained as in Table 1.

Table 1: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
Age	.227 ^a	.052	.047	1.714	.052	10.937	1	201	.001
Gender	.290 ^b	.084	.075	1.688	.032	7.051	1	200	.009
Marital Status	.356 ^c	.127	.113	1.653	.043	9.723	1	199	.002
Occupation	.385 ^d	.149	.131	1.636	.022	5.109	1	198	.025
Income	.413 ^e	.170	.149	1.619	.022	5.195	1	197	.024

Source: Author's Computer Analysis, 2018.

The model yielded a low R^2 as the values varies from 0.052 at step 1 to 0.17 at step 6. Moreover, the model is statistically significant at 0.05 as indicated in Table 1. This shows a low level of explanation as the coefficient of determination from 5.2% in model 1 to 17.0% in model 6. The coefficient of determination R^2 (17.0%) obtained in the last model explains the amount of variation in the dependent variable as a result of variation in the independent variables. That is 17.0% of changes in dependent variable (total number of trips) is explained by the independent variables (socioeconomic variables) in the model under the period of consideration. While, the remaining 83% is accounted for by other factors which the study

has not investigated. The result further shows that socio-economic characteristics of physically challenged or people with disabilities are not enough to predict their trips.

The analysis of the multiply regression shows that five (5) socioeconomic variables (age, gender, marital status, occupation and average monthly income) retained in the model are too weak and quite inadequate to estimate trip generated by people with disabilities or physically challenged people in the study area. Therefore, irrespectively of their socioeconomic status, it does not significantly contribute to the travel pattern of the people with disabilities in Minna due to their impairment which certainly limit their mobility.

Table 2:

Model	Coefficients			T	Sig.
	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta		
(Constant)	11.123	.528		21.052	.000
Age	-.047	.011	-.407	-4.337	.000
Gender	-.856	.240	-.238	-3.561	.000
Marital Status	.369	.104	.338	3.540	.000
Occupation	-.206	.084	-.172	-2.450	.015
Average Monthly Income	-.011	.005	-.149	-2.279	.024

Source: Author's Computer Analysis, 2018.

The model derived from this study is presented below:

$$Y = 11.123 + (-0.047) X_2 + (-0.856) X_1 + (-0.396) X_4 + (-0.206) X_6 + (-0.011) X_7$$

From Table 2 the value 11.123 is the constant of the model which is the value of the dependent variable when the independent variables are zero. -0.047 is the coefficient of X_2 (Age) which means that the amount of change in Y as a result of a unit change in X_2 . The value -0.856 in the model is the coefficient of X_1 (Gender). It shows a negative relationship. This means that the amount of change in Y as a result of a unit change in X_1 . The value 0.369 in the model is the coefficient of X_4 (Marital status) it shows a positive relationship confronting to a prior expectation. Also, the value -0.206 is the coefficient of X_6 (Occupation) this shows an inverse relationship which means an increase in X_6 results to -0.206 in Y (total number of trips). Lastly, -0.011 which is the coefficient of X_7 (average monthly income) shows the amount of changes in Y (total number of trips) as a result of a unit change in X_7 .

Therefore, the result of the regression analysis as shown in Table 2 indicates that age, gender, marital status, occupation and average monthly income were the major socio-economic characteristics which affect trips making of people with disabilities or physically challenged people in Minna and were statistically significant based on their probability value .

6.1 Conclusion

It is widely assumed that most disabilities impose considerable challenges, such as lack of mobility, low participation in their socioeconomic activities, limitations in finding and holding employment, isolation and difficulty in integrating with able bodied people. People with disabilities do have to face all of these challenges and others but such challenges are not imposed by their disabilities rather the inefficiency of the transport system, as well as a societal discrimination. Thus, creating challenges by denying people the means to exercise their capabilities. Furthermore, considering the people with disabilities in transportation is an important civil rights issue. It is critical to the independence of people with disabilities and their ability to contribute economically, socially, and politically. Discrimination should be highly discouraged. Finally, was discovered that socio-economic characteristics of people with disabilities does not have a significant effects on the number of trips generated by respondents in the study area.

7. 1 Recommendation

The following recommendations were made to mitigate the challenges people with disability faced in contemporary a African society in which Minna is not an exception;

- i. the transport needs and the challenges faced by diverse impairment groups should be incorporated into transport planning and design in the study area.
- ii. there is the need for effective monitoring and urgent implementation of disabled people legislation act to ensure disabled people get a consistent high level of service.
- iii. the National Orientation Agency of Nigeria (NOAN) should create an enlightenment campaign to educate drivers and the general public on the peculiarities, challenges and needs of disabilities in our society.
- iv. various regulating and planning agencies prohibit use of undesignated terminals and bus stops which does not favor disabled people.
- v. a functional terminals and bus stops that will enhance the maximum utility of the terminal facilities should be made available to take care of the needs and challenges of disabled people.
- vi. efficient and effective Paratransit transport system should be provided and made comfortable, affordable and accessible for the disabled.
- visit. Robust legislation and policy should be enacted to ameliorate the suffering of the disabled in the society.

Reference

- Ayeni, B. (1979). Concepts and techniques in urban analysis. Croom Helm Ltd. London.
- Bruton, M., 1975. Introduction to Transportation Planning. Hutchinson, London.
- Doubleday, C., 1997. Some studies of the temporal stability of person trip generation models. *Transport. Res.*, 11: 225-263.
- Fadare, S. O., & Hay, A. M. (1990). Housing densities, life style and travel behaviour in Third World City: the example of Ibadan. *Nigerian Journal of Economic and Social Studies*, 32(2), 177-191.
- Goeverden, V.D. and H.D. Hillbers, 2001. A pattern-card of travel demand. Proceeding of the 9th World Conference on Transport Research. COEX, Seoul, Korea, July 22-27
- Henderson, S. & Henderson, B. (1999). Transport Provision for Disabled People in Scotland. Development Department Research Programme Research Findings No.76. Edinburgh: Scottish Executive.
- Ipingbemi, O. (2015). Mobility Challenges and Transport Safety of People with Disabilities (PwD) In Ibadan, Nigeria. Department of Urban and Regional Planning, Faculty of the Social Sciences, University of Ibadan, Ibadan, Nigeria.
- Jensen, G., Iawarssin, S. & Stahl, A. (2002). Theoretical understanding and methodological challenges in accessibility assessments. Focusing the environmental component: an example from travel chains in urban public bus transport. *Disability and Rehabilitation*, 24, 5, 231-242.
- Kansky, K.J., Travel patterns of urban residents. *Transport. Sci.*, 1, 1967, 261-285.
- Kuppan, A.R. and R.M. Pendyala, 2000. An exploratory analysis of commuters' activity and travel patterns. Proceedings of the 79th Conference of Transportation Research Board. Washington, DC.
- Mitchell, C. G. B. (1995). 'Definitions of accessibility'. 7th International Conference on Transport and Mobility for Elderly and Disabled People. Conference Proceedings, Vol 1, 17-20.
- Okoko, E. E. (2006). Urban transportation planning and modeling. Millennium Publishers, Akure, Nigeria.
- Olayemi, D.A., 1997. Intra-city person travel in metropolitan Lagos: Study of commuting in a fast growing capital of a developing country. *Geoforum*, 8:19-27.
- Oyesiku, O.O., 1990. Inter-urban travel patterns in Nigeria. A case study of Ogun State. Unpublished Ph.D. Thesis, University of Benin, Nigeria.

- Owoeye, A.S., Fadare S.O., and Ojekunle J.A., (2018). Households' socio-economic characteristics and urban travel behaviours in Minna metropolis, Nigeria. International journal of research publication. 9 (1), 2018. http://ijrp.org/paper_detail/292
- Solanke, M. O. (2014). Socio-economic determinants of intra-urban trips generation in Ogun State, Nigeria. Current Research Journal of Social Sciences, 6(1), 15-20.
- Xiaowei Hu, Jian Wang & Lei Wang. (2013). School of Transportation Science and Engineering, Harbin Institute of Technology; 13th COTA International Conference of Transportation Professionals. Understanding the travel behavior of elderly people in the developing country: a case study of Changchun, China.