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Application of Trip Model in Cost, Distance and Time in Access to Social Infrastructure by Households in Opobo/Nkoro Region, Nigeria

Samuel, Dagogo[1], Akue, Leka-Oscar[2] and Ogboeli Goodluck Prince[3]

[1& 2] Department of Urban and Regional Planning, Rivers State University, Port Harcourt. Nigeria
[3]Institute of Geoscience and Environmental Management, Rivers State University, Port Harcourt
Email address: gogosam2005@yahoo.com. dagogo.samuel1@ust.edu.ng. lekaakue@yahoo.com, goodluck.ogboeli@ust.edu.ng

ABSTRACT

Healthcare is a prioritized need an individual and households. It is a major indicator to quality of life and good governance which are related to outcomes of accessibility to its facilities. The study adopted a survey research method with quantitative approach. The Multi-stage Sampling Technique was applied which involved first identification of communities with and without PHC. Second was to purposively selecting 30% of communities with and without PHC facilities randomly. Third, 30% of the population of these communities with and without PHC Facilities was determined from the 1991 (NPC) data as projected to 2023 applying the Exponential Population Projection Model at a growth rate of 6.5% and household sample size was derived from Krejcie and Morgan Model (1970). Finally, this was distributed in corresponding percentage of the population of each of the selected communities to determine the number of households to sample randomly. A total of 31 households were sampled based on the percentage, 23 households for communities with PHC and 8 households for communities without PHC. The study aimed at assessing travel distance, time and cost of trips to PHC facilities by households in Opobo/Nkoro region. The objectives were to determine the travel distances, time and costs to PHC facilities in the study area. The Multiple Regression Model (MRM) was applied in hypotheses testing in determination of relationships between variables (travel distance, time and costs) and frequency of trips to PHC facilities in the study. Data were collected by structured questionnaire for means and frequency of trips related data, the Stock-watch for travel time data and GPS speedometer for distance traveled. The Statistical Package for Social Sciences (SPSS) was employed to analyze data and information presented in descriptively. Also, Geographic Information Systems (GIS) were applied in production and geo-referenced of maps. It was found that increased travel distance, time and cost increased inability or reduced ability of households' access to PHC facility. Also as a result of dilapidated and abandoned PHC facilities, households in communities with PHC spent more money to access PHC facilities by the use of out-board engine fiber speed boats, hand-pulled canoes as a result of longer travel time, distance.

Key Words: Accessibility, Healthcare, Distance, Time and Cost

Introduction

Accessibility is fundamental to utilization of social infrastructure in functionality of human society. However, there are obvious variations in access affects utilization in communities and countries in relation to distance, time and cost factors. The focus in this mobility, particularly vehicle travel distance, time and cost of mobility to Primary Healthcare (PHC) Facilities. In some regions of the world, distance, time and costs of trips to social infrastructure relied on local standards. The World Bank (2017) noted that more than three and half billion people lack access to essential healthcare facilities. Also, Sara (2018) affirmed, as many as 57 million currently lived in rural areas in America and remote geographic locations, small size, limited workforce, physician shortages and financial resources often pose a unique set of challenges for rural healthcare facilities. 'In United Kingdom the average home to hospital in rural region of West Somerset is 18.5miles and 17% of population in England lives in rural regions with better access to healthcare'.

Opobo/Nkoro region is riverine of 20 rural communities with 141,590 people presently as projected from the 1991 National Population Census (NPC) data and 6 (30%) communities having PHC facilities (Rivers State Ministry of Budget and Economic Planning Statistics, Manpower and Research Department, 2003- RSMBEP). The communities spatially developed organically with a fast growing population presently (figure. 1.1). The major occupation is fishing. The study aimed at assessing travel distance, time and cost of trips to PHC facilities by households in Opobo/Nkoro region. It involved both communities with and without PHC and the various means of transport available to access PHC by households within and around complex networks of creeks and rivers.

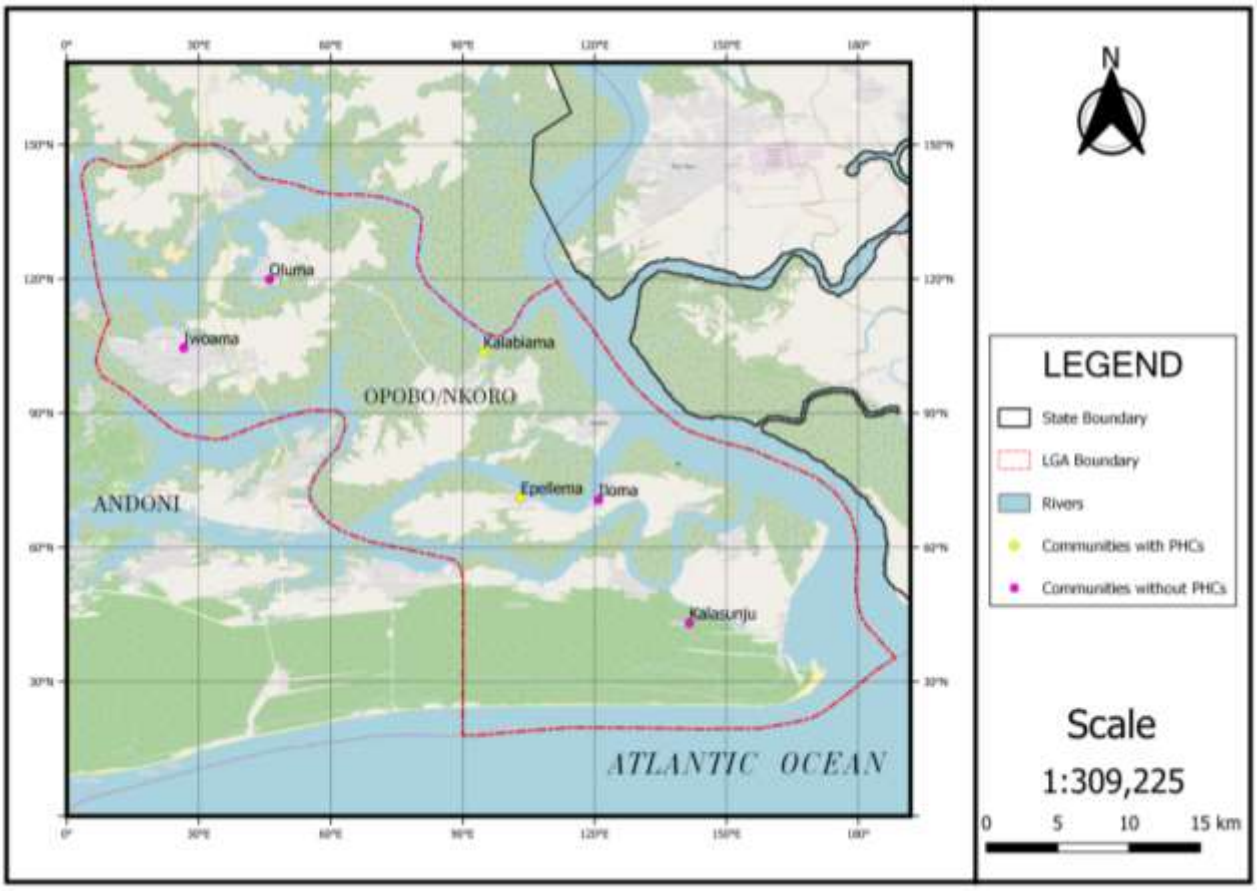

Figure 1.2: Spatial Distribution of PHC Facilities Sampled in Opobo/Nkoro LGA

Source: Researchers' Field Survey, 2023

Plate 1: Dilapidated and Abandoned PHC Facility in Epellema Community in Opobo/Nkoro LGA

Source: Researcher's Field Survey, 2023

Issue:

The contiguous island communities in Opobo/Nkoro region are located within the creeks and rivers directly linked to the Atlantic Ocean (see fig. 1.1) and by this geographic location vulnerable to physical and environmental constraints that impede movement. This region has communities at the coasts where most families in the community engage in fishing activities, sand harvesting, subsistence farming or coconut harvesting and others. People who engaged in such activities are vulnerable to several diseases and deserve even access to healthcare facilities promptly. According to Elisa (2020) a

healthcare equity system where all individuals have equitable access to quality health outcomes is far from the people Opobo/Nkoro. In record, observation shows absence of healthcare facilities in most communities in the region and the facilities are in bad state in communities that have (see plate1).

The major challenge among others is the difficulty in trips making by people living in these communities accessing healthcare facilities in times of needs as a result of environmental constraints deterred regular utilization of this facilities. The emphasis is that not all communities in the region have healthcare facilities and needs are general.

Literature Review:

Travel Distance

Distance covers to PHC facility for healthcare has weighty implication in relation to travel time and cost. PHC providers offer a broad range of services and treat a wide spectrum of medical issues. These factors are interconnected and must be completely functional for a household's health needs to be guaranteed. Hence the absence of one as at when due constitutes an impedance in household measure of access to healthcare regardless of urban or rural areas. In this perspective, Peters, Garg, Blom, Waiker, Brieger and Rahman (2008), asserts that access to healthcare facilities is a multidimensional process involving the quality of care, geographical accessibility, availability of the right type of care for those in need, financial accessibility and acceptability of service. Geographic accessibility is (physical and temporal) distances and time between the location of users and the providers of services while financial (economic) accessibility is linked to the costs of services in relation to individuals' socio-economic status. Geographical distance is usually measured in kilometer (km). Distance is one factor among several factors that influence household trips to healthcare facilities. Hannah et al (2013) established in United Kingdom (UK) the threshold distance of between 24 miles (38.9km) and 50 miles (81km) to a specialist hospital services, 10miles (16.2km) to screening service, 4 miles (6.5km) to family planning clinic and 2.5 miles (4.1km) to primary healthcare. These parametres are still considered providing poor access to health care facility. They maintained that standard estimates of remoteness of households from healthcare facility have not been established theoretically or empirically. Finally, they concluded that a household which is beyond 5km from a healthcare facility and 25km from hospital is remote based on straight line distance determinants. In another study Claire (2018) affirmed rural American households live an average of 10.5 miles (6.5km) from the nearest hospital compared to 5.6 miles (9.1km) for suburban and 4.4 miles (7.1km) for urban area

Travel Time

In Rivers State, most riverine communities are located on islands and do not have road transportation access to primary healthcare facilities. The essence of the Primary Healthcare as declared is to facilitate accessibility by households living in communities to address their health problems. Accessibility which is a function of costs of travel, distance travel and availability of the means of transport at the right time stands void if the goal of PHC cannot be achieved. The basic elements for achieving the goal of PHC such as providing, promotive, preventive, curative and rehabilitative healthcare services were accentuated by UNICEF (2018), in 'a vision for Primary Healthcare in the 21th century'. The emphasis was on the importance of community access to these elements as at when due.

Hannah et al (2013) averred that straight line distance to PHC facility is an accurate predictor of drive time. Delphine (2015) affirmed that households in rural England take at least 57 minutes on average to reach their nearest hospital by public transport which is almost twice as long as their urban counterparts at 33minutes. Similarly, in another study which considered local traffic patterns it was found that rural Americans have an average travel time of 17 minutes to the nearest hospital, while those in suburban and average travel time of 12 minutes (Ayia, 2018). This was attributed in partly to much greater variation in rural areas (Claire, 2018) and in broader study affirmed rural American travel 17minutes compared to 12 minutes in suburban and 10 minutes in urban areas by roads. In all an average travel time by road was determined as 34 minutes by road.

Travel Cost

The Global Health Statistics in Eric *et al* (2018) indicated that private health expenditure (PHE) in 2012 remained as high as 62.4% in low income countries and 66% in lower income countries and in lower middle income countries compared with 40.7% in higher income countries. It noted again that out-of-pocket payment of total PHE for this same period remained as high as 77.6% for low income countries and 86.7% for low middle income countries compared with 38.5% in high income countries. It concluded that the proportion of PHE depicts that the large global population continue to face financial burden to healthcare facilities due to out-of-pocket. In response, WHO in 2015 resolved to tax member states to ensure universal health financing through the removal of out-of–pocket for accessing healthcare facility. To this end, the use of prepayment system was recognized as effective means to remove financial burden to access health facility especially among the poor and vulnerable population.

Methodology

The study adopted a survey research method with quantitative approach. The Multi-stage Sampling Technique was applied which involved first identification of communities with and without PHC. Second was to purposively selecting 30% of communities with and without PHC facilities randomly. This was 2 (Epelema and Kalabiama) and 4 (Iwoama, Oluma, Iloma and Kalasunju) communities from communities with and without PHC respectively. Third, 30% of the population of these communities with and without PHC Facilities was determined from the 1991 (NPC) data as projected to 2023 applying the Exponential Population Projection Model at a growth rate of 6.5% and household sample size was derived from Krejcie and Morgan Model (1970). Finally, this was distributed in corresponding percentage of the population of each of the selected communities to determine the number of

households to sample randomly. A total of 31 households were sampled based on the percentage, 23 households for communities with PHC and 8 households for communities without PHC.

The Multiple Regression Model (MRM) as stated below was applied in hypothesis testing in determination of relationships between variables of the study. The MRM as stated below considered Access as a dependent variable and Travel distance, time and costs as independent variables.

$Y = f(X_1)$, i = 1……. n)

$Y = f(X_1,X_2,X_3$……..Xn)

$Y = a+ b_1X_1+ b_2X_2+b_3X_3+ \cdots b_nX_n+e$.....eq (1)

$Y_i = a+ b_1X_{1i} + b_2X_{2i} +b_3X_{3i} + \cdots b_nX_{ni} +e_i$.....eq (2)

Y_{1i} = frequency of trips to primary health care facilities.

X_{1i} = travel distance.

X_{2i} = travel time

X_{3i} = travel cost

Where

X_1, X_2, X_3……..X_n are independent variables

b_1, b_2, b_3……..b_n are multiple regression coefficient of independent variables

a = is the intercept on the y – axis

e_i = is the error terms.

y = dependent variable (Access).

Data were collected by structured questionnaire for means and frequency of trips related data, the Stock-watch for travel time data and GPS speedometer for distance traveled. The Statistical Package for Social Sciences (SPSS) was employed to analyze data and information presented in descriptively. Also, Geographic Information Systems (GIS) were applied in production and geo-referenced of maps.

Data

Table 1: Monthly Average Cost of Accessing PHC Facility by Households in Opobo/Nkoro Communities with PHC

S/N	Fare in Naira (₦)	Opobo/Nkoro												
		Means of Transport									**Total Respondents**	**%**	**Total Naira (₦)**	**Ave. Naira (₦)**
		OBE	**HPC**	**MC**	**OBW**	**BC**	**B**	**T**	**F**	**PC**				
1	< 1,000 (500)	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1,000	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2,000	-	-	-	-	-	-	-	-	-	-	-	-	-
4	3,000	-	-	-	-	-	-	-	-	-	-	-	-	-
5	4,000	-	-	-	-	-	-	-	-	-	-	-	-	-
6	5,000	-	-	1	-	-	-	-	-	-	1	14.2	5,000	5,000
7	6,000	-	-	-	-	-	-	-	-	-	-	-	-	-
8	7,000	-	3	-	-	-	-	-	-	-	3	42.9	21,000	21,000
9	8,000	-	-	-	-	-	-	-	-	-	-	-	-	-
10	9,000	-	-	-	-	-	-	-	-	-	-	-	-	-
11	10,000	-	-	-	-	-	-	-	-	-	-	-	-	-

12	11,000	3	-	-	-	-	-	-	-	-	3	42.9	33,000	33,000
13	11+	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	**3**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**7**	**100**	**59,000**	**19,666**

Source: Researcher's Field Survey, 2023

***Out board engine fiber Speed boat **(OBE),** Hand pulled canoe **(HPC),** Motorcycle **(MC),** Out-board engine wooden boat **(OBW),** Bicycle **(BC),** Bus **(B),** Taxi **(T**), Foot **(F**), Private car **(PC)**

Table 2: Monthly Average Cost of Accessing PHC Facility by Households in Opobo/Nkoro Communities without PHC

S/N	Fare in Naira (₦)	Opobo/Nkoro												
		Means of Transport									**Total Respondents**	**%**	**Total Naira(₦)**	**Average (₦)**
		OBE	**HPC**	**MC**	**OBW**	**BC**	**B**	**T**	**F**	**PC**	**N**			
1	<1,000 (500)	1	-	1	-	-	-	-	-	-	2	18.1	1,000	500
2	1,000	1	-	-	-	-	-	-	-	-	1	9.1	1,000	1,000
3	2,000	-	3	-	-	-	-	-	-	-	3	27.3	6,000	6,000
4	3,000	3	-	-	-	-	-	-	-	-	3	27.3	9,000	9,000
5	4,000	-	-	-	-	-	-	-	-	-	-	-	-	-
6	5,000	2	-	-	-	-	-	-	-	-	2	18.1	10,000	10,000
7	6,000	-	-	-	-	-	-	-	-	-	-	-	-	-
8	7,000	-	-	-	-	-	-	-	-	-	-	-	-	-
9	8,000	-	-	-	-	-	-	-	-	-	-	-	-	-
10	9,000	-	-	-	-	-	-	-	-	-	-	-	-	-
11	10,000	-	-	-	-	-	-	-	-	-	-	-	-	-
12	11,000	-	-	-	-	-	-	-	-	-	-	-	-	-
13	11+	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	**7**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**11**	**100**	**27,000**	**5,400**

Source: Researcher's Field Survey, 2023

***Out board engine fiber Speed boat **(OBE),** Hand pulled canoe **(HPC),** Motorcycle **(MC),** Out-board engine wooden boat **(OBW),** Bicycle **(BC),** Bus **(B),** Taxi **(T),** Foot **(F),** Private car **(PC)**

Table 3: Average Distance Covered by Households in Accessing PHC Facility in Opobo/Nkoro Communities with PHC

S/N	Means of Transport (MT)	Opobo/Nkoro																
		Distance Covered in Kilometres (km)													**Total Respondent**	**%**	**Total (km)**	**Average (km)**
		Less 1 (.5km)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**				
1	**OBE**	-	-	3	-	-	-	-	-	-	-	-	-	-	3	25	2	2
2	**HPC**	3	-	-	-	-	-	-	-	-	-	-	-	-	3	25	1.5	1.5
3	**MC**	1	-	-	-	-	-	-	-	-	-	-	-	-	1	8.3	0.5	0.5
4	**OBW**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	**BC**	1	-	-	-	-	-	-	-	-	-	-	-	-	1	8.3	0.5	0.5
6	**B**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	**T**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	**F**	-	4	-	-	-	-	-	-	-	-	-	-	-	4	33.3	4	4
9	**PC**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	**Others**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total(MT)	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**12**	**100**	**8.5**	**1.7**

Researcher's Field Survey, 2023

***Out board engine fiber Speed boat **(OBE),** Hand pulled canoe **(HPC),** Motorcycle **(MC),** Out-board engine wooden boat **(OBW),**

Bicycle **(BC),** Bus **(B),** Taxi **(T**), Foot **(F**), Private car **(PC)**

Table 4: Average Distance Covered by Households in Accessing PHC Facility in Opobo/Nkoro Communities without PHC

S/N	Means of Transport (MT)	Opobo/Nkoro																
		Distance Covered in Kilometres (km)													**Total Respondent**	**%**	**Total (km)**	**Average (km)**
		Less 1 (.5km)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**				
1	**OBE**	-	-		-	-	-	1	2	-	-	-	-	-	3	37.5	20	6.7
2	**HPC**	-		-	-	-	3	-	-	-	-	-	-	-	3	37.5	5	5
3	**MC**	1	-	-	-	-	-	-	-	-	-	-	-	-	1	12.5	0.5	0.5
4	**OBW**		-	-	-	-	-	-	1	-	-	-	-	-	1	12.5	7	7
5	**BC**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	**B**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	**T**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	**F**	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	**PC**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	**Others**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total(MT)	**2**	**1**		-	-	**1**	-	**1**	-	-	-	-	-	**8**	**100**	**14**	**3.5**

Source: Researcher's Field Survey, 2023

***Out board engine fiber Speed boat **(OBE),** Hand pulled canoe **(HPC),** Motorcycle **(MC),** Out-board engine wooden boat **(OBW),**

Bicycle **(BC),** Bus **(B),** Taxi **(T**), Foot **(F**), Private car **(PC)**

5: Average Time Taken by Households in Accessing PHC Facility in Opobo/Nkoro Communities with PHC

S/N	Means of Transport (MT)	Opobo/Nkoro																
		Time in Hour (hr.)													**Total Respondent**	**%**	**Total (hr.)**	**Average (hr.)**
		Less 1 (.5hr.)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**				
1	**OBE**	-	1	2	-	-	-	-	-	-	-	-	-	-	3	25	3	1.5
2	**HPC**	-	-	-	3	-	-	-	-	-	-	-	-	-	3	25	3	3
3	**MC**	1				-	-	-	-	-	-	-	-	-	1	8.3	3	3
4	**OBW**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	**BC**	1	-	-	-	-	-	-	-	-	-	-	-	-	1	8.3	0.5	0.5
6	**B**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	**T**		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	**F**	2	2	-	-	-	-	-	-	-	-	-	-	-	4	33.3	1.5	0.8
9	**PC**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	**Others**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total (MT)	**3**	**2**	**1**	**1**	-	-	-	-	-	-	-	-	-	**12**	**100**	**9.5**	**1.9**

Source: Researcher's Field Survey, 2023

***Out board engine fiber Speed boat **(OBE),** Hand pulled canoe **(HPC),** Motorcycle **(MC),** Out-board engine wooden boat **(OBW),**

Bicycle **(BC),** Bus **(B),** Taxi **(T**), Foot **(F**), Private car **(PC)**

Table 6: Average Time Taken by Households in Accessing PHC Facility in Opobo/Nkoro Communities without PHC

S/N	Means of Transport (MT)	Opobo/Nkoro																
		Time in Hour (hr.)													**Total Respondent**	**%**	**Total Hour (hr.)**	**Average Hour (hr.)**
		Less 1 (.5hr.)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**				
1	**OBE**	1	2	1	-	-	-	-	-	-	-	-	-	-	4	50	3.5	1.2
2	**HPC**	-	1	2	-	-	-	-	-	-	-	-	-	-	3	37.5	3	1.5
3	**MC**	1	-	-	-	-	-	-	-	-	-	-	-	-	1	12.5	0.5	0.5
4	**OBW**	-	-	-	-	-		-		-		-	-	-	-	-	-	-
5	**BC**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	**B**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	**T**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	**F**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	**PC**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	**Others**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total (MT)	**2**	**2**	**2**	-	-	-	-		-	-	-	-	-	**8**	**100**	**7**	**2.3**

Source: Researcher's Field Survey, 2023

***Out board engine fiber Speed boat **(OBE),** Hand pulled canoe **(HPC),** Motorcycle **(MC),** Out-board engine wooden boat **(OBW),** Bicycle **(BC),** Bus **(B),** Taxi **(T**), Foot **(F**), Private car **(PC)**

Table 7: Model summary of relationship between travel time, travel distance, travel cost and inaccessibility

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.420[a]	.176	.165	2.741
a. Predictors: (Constant), Travel Time (hr), Travel Cost, Travel Distance (km)				

Source: SPSS output, version 22

Results:

The table 1: presented the monthly average cost of accessing PHC facility in Opobo/Nkoro communities with PHC facilities and it showed that 42.9% of households at a transport fare category of ₦11,000 spent an average sum of ₦33,000 by the use of out-boards engine fiber speed boats means of transport. Also 42.9% of households used hand-pulled canoes spent average sums of ₦21, 000 in ₦7, 000 transport fare category while 14.2% of respondents at the fare category of ₦5, 000 paid average sum of ₦5, 000 for using motorcycles as means of transport to PHC facilities. Households in general expended average sum of ₦19, 666 to access PHC facilities by the use of out-board engine fiber speed boats, hand-pulled canoes and motorcycles as means of transport. Similarly, table 2: showed the cost of accessing PHC by means by households in communities without PHC. The basic means were out-board engine fiber boats, hand-pulled canoes and motorcycles. 18.1% of households paid an average sum of ₦500 by motorcycles and out-board engine fiber boats as means of transport. Same percentage of households in ₦5,000 fare category spent an average sum of ₦10,000 by the use of out-board engine fiber boats only. In fare categories of ₦2, 000 and ₦3, 000 households paid average sums of ₦6,000 and ₦9,000 using hand-pulled canoes and out-board engine fiber boats respectively. All households paid an average sum of ₦5, 400 by the use of out-board engine fiber boats, hand-pulled canoes and motorcycles to access PHC facilities in communities that have no PHC facilities.

An illustration by table 3 showed an average distance covered by households in communities with PHC facilities using different means of transport. It revealed most (33.3%) of households covered an average distance of 4kms by foot and 25% of households covered an average distance of 2kms by out-board engine fiber speed boats to access PHC facilities. Also, 8.3% of households plied motorcycles and another set of households at same percentage use bicycles as means of transport to cover an average distance of 0.5km. 25% households also used hand-pulled canoes as means of transport and covered 1.5kms. In generally, households covered an average distance of 1.7kms to access PHC facilities by hand-pulled canoes, bicycles, out-board engine fiber speed boats and motorcycles.

In table 4 it was revealed most households (37.5%) used board out-board engine fiber speed boats and cover an average distance of 6.7km and at the same percentage households covered an average distance of 5kms using of hand-pulled canoes as means of transport to access PHC facilities. In all, households cover average distance of 3.5kms in accessing PHC facilities using hand-pulled canoes; out-board engine fiber speed boats and motorcycles as means of transport.

Table 5 showed 25% and 8.3% of respondents expended an average time of 3 hours by hand-pulled canoes and motorcycles as means of transport respectively to access PHC facilities. Most (33.3%) of households use foot means of transport in 0.8hour and by out-board engine fiber speed boat as means of transport. Also, 25% of households have access to PHC facilities in 1.5 hours in average. All households by the use of hand pulled canoes, foot, bicycles, motorcycles, out-board engine fiber speed boats as means of transport to and from PHC facilities spent average access time of 1.9 hours in communities with PHC facilities. However, in communities without PHC it was revealed that 50% of households who made trips by out-board engine fiber boats as means of transport spent an average time of 1.2 hours and those who use hand-pulled canoes means of transport spend an average time of 1.5 hours to get to PHC facilities. The rest 12.5% of respondents who use motorcycles as means of transport spent average time of 0.5 hours to access PHC facilities. Households generally expended an average time of 2.3 hours to access to PHC facilities.

Given the factors of hypotheses relating the independent variables on the dependent variable in MRM the coefficient of determination (R^2), the square of the correlation coefficient was ascertained. This was the ratio of the sum of the squares due to regression and the total sum of square. Then this was used to compute for the dependent variable based on the combined effects of the independent variables. As shown on table 7, the combined effect on inaccessibility is moderate and positive as indicated by the regression coefficient of 0.420. Again, the coefficient of determination (R Square) is 0.176 while the Adjusted R Square is 0.165 which means approximately 17% of difficulties in accessing PHC facility were as a result of the combined effects of travel time travel distance and travel cost. It means there was no significant relationship between the travel cost, travel distance, travel time and inaccessibility of healthcare facilities in Opobo/Nkoro communities.

Plat 2 and 3: Hand-pulled Canoe and out-board engine fiber speed boats used as means of transport in communities with and without PHC facilities

Source: Researcher's Field Survey, 2023

Conclusion

Accessibility to PHC by households in selected riverine communities in Rivers State as assessed in this study has highlighted some salient issues in accessing PHC facility by people living in this peculiar area of the state. The riverine communities in Rivers State are basically islands communities with more of vulnerable population group engage in fishing and less formal education. They use multi-modal transportation system through the meandering creeks, rivers and sea in conjunction with land to access PHC facility at all times. Travel distances, time and cost were found having positive relationship with frequency of trips to PHC facility by households in the communities. In other words, increased travel distance, time and cost increased inability or reduced ability of households' access to PHC facility. In view with Eric *et al* (2018) households in communities with PHC spent more money to access PHC facilities by the use of out-board engine fiber speed boats, hand-pulled canoes as a result of longer travel time, distances. Also, in these communities PHC facilities were dilapidated prompting households to make trips to communities with functional PHC facilities.

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