Location, Distribution and Utilization of Insecticide Treated Nets (ITNs) in Cross River State, Nigeria

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Abstract

The examines location, distribution and utilization of insecticide treated nets in Cross River State. In order to achieve the objective of the study, the work was based on the distance decay model that intensity of ITNs use decreases as distance from the distribution center (Ugep) increases. Data for the study were collected from four rural communities, out of the nine communities that make up the study area through administration of questionnaire, in addition to oral interview and household net inspection. Distances of the studied communities were determined using a GIS software (ARCGIS 9.3).The relationship between intensity of ITNs use and distance fron the distribution center was determined using Pearson Product Moment Correlation. While the student t-test was used to test for significance relationships.. The correlation result reveals that intensity of ITNs use negatively though not significantly correlated with distance from Ugep (RxY = - .097; P>0.05), distance from Nko (RxY = -.101; P>0.05); negatively high but not significantly correlated with distance from Assiga (RxY = -115); P>0.05) and positively but highly significantly correlated with distance from Agoi (RxY = .325; P<0.05). It was found that location has implication for distribution and access to ITNs. Therefore, in order to achieve the Abuja target of 100% universal coverage, evaluating progress and measuring impact through continuous free distribution, retail audits, periodic household survey, expanding public knowledge and use of ITNs through targeted and multimedia approaches is advocated.

Introduction

Regional inequalities in the distribution of Insecticide Treated Nets is a major problem in Nigeria where the dichotomy between urban and rural areas continues to widen due to inadequate allocation of health resources. Okafor (2007) has affirmed that location has implications for distribution and one meaning of the latter is the extent to which places, individuals, or social classes share in the aggregate products of society. In a spatial context, distribution questions translate into who gets what where. Geographical location (or rather relative location) is important because people live in places. Location is one of the determinants of access to essential goods and services like ITNs. As a general rule, it has been stated that the greater the distance between two points, the lower is the probability that these points will be functionally related. In Nigeria, the few studies conducted showed that ITNs utilization in high risk groups is very low and have been attributed to various social, behavioral and economic barriers (Onwujekwe, 2000). The low coverage of health centers, especially in the vast majority of rural communities, cultural preferences, low income, lack of awareness about the benefits of ITNs, low staffing levels, poor infrastructure and limited demand creation efforts have hampered progress, as well as the high levels of poverty in the communities.

A survey carried out by the National malaria control programme in 2005 revealed that utilization of ITNs by children under-five was only 1.7% (WHO, 2000). Ensuring that the poor and vulnerable population benefit from malaria control interventions remains a challenge for malaria endemic communities. In Nigeria, free ITNs were distributed to children aged below five years in 2006 through immunization, antenatal care and mass campaigns. High and equitable coverage were reported after the campaigns in some districts, although national level coverage remained low, suggesting that understanding barriers to access remains important (Ibor, 2010).

Guyat and Snow (2002) noted that the ability of communities to pay for ITNs is dependent upon income of the population. A major constraint in the ownership and use of ITNs is the inability of the public and private sectors to deliver ITNs to remote rural populations. The coverage of the formal health service is very low and private sector involvement has made ITNs over the years unaffordable in the public market (Tulu, 2004). The infrastructure of distribution, including roads and communication is also inadequate. The distance people travel to obtain ITNs has also hindered access and utilization of this commodity as many people do not have the means of overcoming distance.

This is particularly true of rural third world settings where the density of western-type health facilities is often low, and where the majority of patients are likely to make the journey for treatment as pedestrians and where there are viable and usually more accessible alternate sources of medicine. The seasonality of malaria and the absence in some areas of nuisance biting mosquitoes may reduce demand for ITNs and consistent year round use in some areas (Binka et al., 1998; Worall et. al., 2003).   .

Although, the distribution and ownership of ITNs is improving through time, the access and utilization among households is not well known. Besides, data on proper utilization coverage of ITNs among priority and high risk people are grossly inadequate. There is also serious lack of information and knowledge about current levels of ITNs coverage by households. Joseph and Philips (1984) argued that accessibility to services is in part a function of the provision, distribution and location of service facilities. konx et al. (2004) opined that differential patterns of access to health resources provide an excellent example of the way in which spatial allocation of resources in societies can serve to intensify general disparities in the quality of life. Yet, only very scanty published work on ITNs is available and none seems to have been directed at identifying spatial factors such as location and distribution influencing the utilization of ITNs. This study was conducted to explore barriers to ownership and use of ITNs among the poorest populations, to identify strategies for improving coverage, and to make recommendations on how increased coverage levels can be sustained.

Study area/ Materials and Methods

This research was conducted in Yakurr Local Government Area of Cross River State. Yakurr Local Government Area is located approximately between latitude 5^045' and 5^055' north of the equator and longitude 8^011' and 8^020' East of the Greenwich meridian and 120km (75 miles) North West of Calabar, the capital of Cross River State. Yakurr is located within the equatorial forest region of the tropics and falls within the malarious environments. The area is characterized by high temperature, rainfall and humidity The area has one urban center (Ugep) and comprises four fast growing villages namely; Idomi, Nko, Mkpani and Ekori and three smaller villages; Assiga, Nyima and Agoi. The people exhibit a very high degree of social homogeneity with strong political, cultural religious and linguistic affinity (Okoi-Uyouyo, 2002). It has a population of 196,450 persons (2006 National Population Census) and a land mass of about (4,800 hectare) that is 48km^2. The headquarters of Yakurr is Ugep which has neighboring villages surrounding her, nine kilometers North of it lies Ekori and to the North East of it are three other settlements of Agoi, Nko and Nkpani which lie twenty-five, sixteen and seven kilometers.

A little more than five kilometers south of it is the village of Idomi. Also are Asiga and Nyima in the South West, lying fifteen kilometers and twenty kilometers respectively.. The people were originally farmers but now have significant population of civil servants and traders due to current transition from agricultural to non agricultural services. The people practice the peasant systems of agriculture which includes shifting cultivation, mixed cropping and livestock farming. In the study area, ITNs are distributed free to households to reduce the transmission intensity of malaria and the type of net distributed is the Long-Lasting Insecticidal Net (LLINs). Yet, poor distribution system of ITNs occasioned by the remoteness of some communities has hampered progress in ownership and utilization among households in the study area.

Distances of sampled communities from ITNs distribution center (Ugep) were determined from the topographical map of the study area of scale 1:500,000. In order to determine the significance of distance relative to the intensity of ITNs utilization by communities studied, only route distance from ITNs distribution centre was used. Cost distance was ignored because ITNs were distributed free to households. The number of households utilizing ITNs in each communities was correlated against the route distance.

A multiple choice question items was used in the questionnaire to elicit information from the respondents. This was complemented by interactive session and personal interviews with the respondents. A total of 351 questionnaires were administered in four weeks. The Simple Random Sampling Technique was used in selecting four rural communities for the study. While the systematic sampling technique was adopted in the administration of the instrument. Applying this method, five (5) houses were skipped after a household has been sampled. This method was preferred because it was efficient and required less time, thus permitting data to be collected from a much larger sample.. The road network was further abstracted into a planner graph with links so that distance can be computed to determine physical links of sampled communities from ITN distribution center using a GIS software (ARCGIS 9.3).

Other ITN distribution and delivery mechanisms were identified and inventoried using the questionnaire. The inferential statistics, namely, the Pearson's Product Moment Correlation was used to analyze the hypothesis which states that ''The intensity of ITNs use decreases with increasing distance from distribution centre''. The Pearson's Product Moment Correlation was applied to determine whether utilization of ITNs decreases with increasing distance from the distribution center. The results are discussed below.

Results and discussion of findings

The result of the analysis as shown in Table 1 reveals that out of the 351 respondents, 107 persons representing 43.96% bought their nets from the social market. Although some of the respondents representing 21.62% reported that ITNs were given to them by friends and colleagues and not bought from the market, 198 persons representing 34.43% of the respondents affirmed that they obtained ITNs free from government. This means government has to scale up efforts in their target and delivery channels to ensure open equitable and sustainable access to ITNs. The table further reveals that 14.00% of the respondents obtained ITNs during standalone campaigns while 36 persons representing 23.29% of the respondents visited the general hospital to obtain ITNs. These are people who were not at home at the time of the free distribution. Whereas 109 and 130 persons obtained ITNs during immunization services and antenatal care representing 30.92% and 31.79% of the respondents respectively. The implication of these distribution channels is that access to ITNs may favour mostly the female gender. The assessment done on the reasons for not utilizing ITNs among households who own ITNs showed that 101 (30.80%) of the respondents said that sleeping under ITN cause increased heat , 43 (8.65%) attributed non-utilization of ITNs to small net size whereas 96.81% indicated that it was due to the problem of tacking while 63 of the persons representing 16.24% replied that ITNs disturbs sleep while only 36 persons representing 21.36% of the respondents were waiting for free distribution of ITNs by the government at the time of the survey and none of the respondents attributed non utilization of ITNs to cultural belief.

To determine the relationship between the intensity of ITNs use and distance from the distribution centre, the Pearson's product Moment correlation coefficient was applied and the results are shown in tables 2 and 3.

TABLE 1: Provision and distribution of ITNs to households/reasons for non-utilization of itns

Locations	Bought from the market		Distributed free by government		Given to me not bought		Total
Ugep	64	(31.84)	120	(59.70)	17	(8.46)	201
Nko	9	(9.00)	78	(78.00)	13	(13.00)	100
Agoi	13	(65.00)	-	-	7	(35.00)	20
Assiga	21	(70.00)	-	-	9	(30.00)	30
Total	**107**	**(43.96)**	**198**	**(34.43)**	**46**	**(21.62)**	**351**

Distribution of ITNs to households

Locations	during standalone campaign	During immunization	During antenatal services	Visit to general Hospital		Total
Ugep	65 (32.34)	63 (31.34)	68 (33.83)	5	(2.48)	201
Nko	7 (7.00)	29 (29.00)	50 (50.00)	14	(14.00)	100
Agoi	2 (10.00)	4 (20.00)	2 (10.00)	10	(33.33)	20
Assiga	2 (6.66)	13 (43.33)	10 (33.33)	5	(16.67)	30
Aggregate	**76 (14.00)**	**109 (30.92)**	**130 (31.79)**	**36**	**(23.29)**	**351**

Reasons for non-utilizing of ITNs

Location	cause of heat	Net too small	Tacking problem	Disturbs sleep	Cultural belief		Not Distributed	Total
Ugep	60 (29.55)	26 (12.94)	78 (38.81)	26 (12.94)	-	-	11 (5.47)	201
Nko	20 (20.00)	15 (15.00)	33 (33.00)	32 (32.00)	-	-	- -	100
Agoi	2 (10.00)	- -	1 (5.00)	2 (10.00)	-	-	15 (75.7)	20
Assiga	19 (63.33)	2 (6.67)	6 (20.00)	3 (10.00)	-	-	- -	30
Aggregate	**101 (30.80)**	**43 (8.65)**	**118 (24.20)**	**63 (16.24)**	**-**	**-**	**36 (21.36)**	**351**

Source: researcher's field work, 2010.

NOTE: The values in brackets are the percentages.

Table 2:Summary of result showing the intensity of ITNs use and distance from distribution center

Parameter	r	level of significance
Intensity/Ugep	- 0.097	Ns
Intensity/NKo	- 0.101	Ns
Intensity/Agoi	0.325*	S
Intensity/Assiga	- 0.115	NS

Notes: S = significant; NS = not significant
* = significant at the 5% level.
Source: computed from Appendix III, researcher's fieldwork.

The results indicated above shows that the intensity of ITNs used reduces with distance but the rate of decrease is not statistically significant because ITNs are distributed free to households. These results further indicate and inverse relationship (r is negative) between the route distance as the independent variable and intensity of ITNs use as the dependent variable for some of the studied communities. However, the intensity of ITNs used tends to have a direct relationship (r is positive) with distance for one of the sampled communities (Agoi). The correlation result further reveals that intensity of ITNs use negatively though not significantly correlated with distance from Ugep (RxY = - .097; P>0.05), distance from Nko (RxY = -.101; P>0.05); negatively high but not significantly correlated with distance from Assiga (RxY = -115); P>0.05) and positively but highly significantly correlated with distance from Agoi (RxY = .325; P<0.05) in the area under study (table 2). In order to determine whether or not the relationship indicated by coefficients in table 2 is statistically significant the student's t-test was used. The coefficient which is significant at the 5% level is asterisked on table 3.

This is the community on which a definite conclusion can be made to the effect that distance has a significant influence on distribution and utilization, due to it location further away from ITNs distribution centre and the lack of infrastructure of distribution such as motorable roads. The deplorable road condition that links the community with the local government headquarters may discourage ITNs distributors to penetrate the area. However, Ugep and Nko recorded the lowest negative correlation coefficients for the actual distance, followed by Assiga community, indicating that the degree of association is weak. This was attributed to the fact that ITNs are distributed free to household and only members of households who were not at home at the time of free distribution travel to nearby government hospitals to obtain ITNs. These are people who have the income to overcome economic distance. The result further reveals that Nko which in closer and more connected to Ugep with a trunk A road use more ITNs than any other community in the area. The furthest and remotest are Agoi and Assiga (see fig: 1). This implies that intensity of ITNs use decreases with increasing distance from the distribution centre. Thus, this leads to the rejection of the null hypothesis in favour of the alternative hypothesis that the intensity of ITNs use decreases with increasing distance from the distribution center.

However, the closer the community to the distribution centre (Ugep), the higher the intensity of utilization and the further the community from the distribution centre, the lower the intensity of use. This may be attributed to poor distribution system which may be occasioned by the deplorable road condition of some communities and their remoteness. This is particularly true of most rural areas in Nigeria where the infrastructure of distribution and communication is inadequate. The result is in agreement with the findings of Okafor (2007) who reported that location has implication for distribution because it enables us to understand the extent to which people and places share in the aggregate product of the society.

The result obtained from the analysis of the relationship between intensity of ITNs use and distance from the distribution centre was further summarized in a correlation matrix as shown below:

TABLE 3: Correlation matrix showing intensity of ITNs use and distance from itns distribution centre

	Intensity of ITNs use	Ugep	Nko	Agoi	Assiga
Intensity	1.000				
Ugep	-.097	1.000			
Nko	-.101	.212	1.000		
Agoi	.325*	-.508	-.149	1.000	
Assiga	-.115	-.672	-.048	.801	1.000

Source: researcher's Field Work, 2010.

The correlation matrix (table 3) of the dependent variable (intensity of ITNs use) and independent variables (distance from Ugep, distance from NKo, distance from Agoi and distance from Asigha) shows that there is no collinearity problem between the independent variables. The correlation matrix also shows that the highest correlation is distance from Agoi and that this relationship is positively significant at 0.05 level of precision. The relationship between the dependent variable (intensity of ITNs use) and the independent variables-distance from Ugep (x_1), distance from Nko (X_2), distance from Agoi (X_3) and distance from Assiga (X_4) was weak.
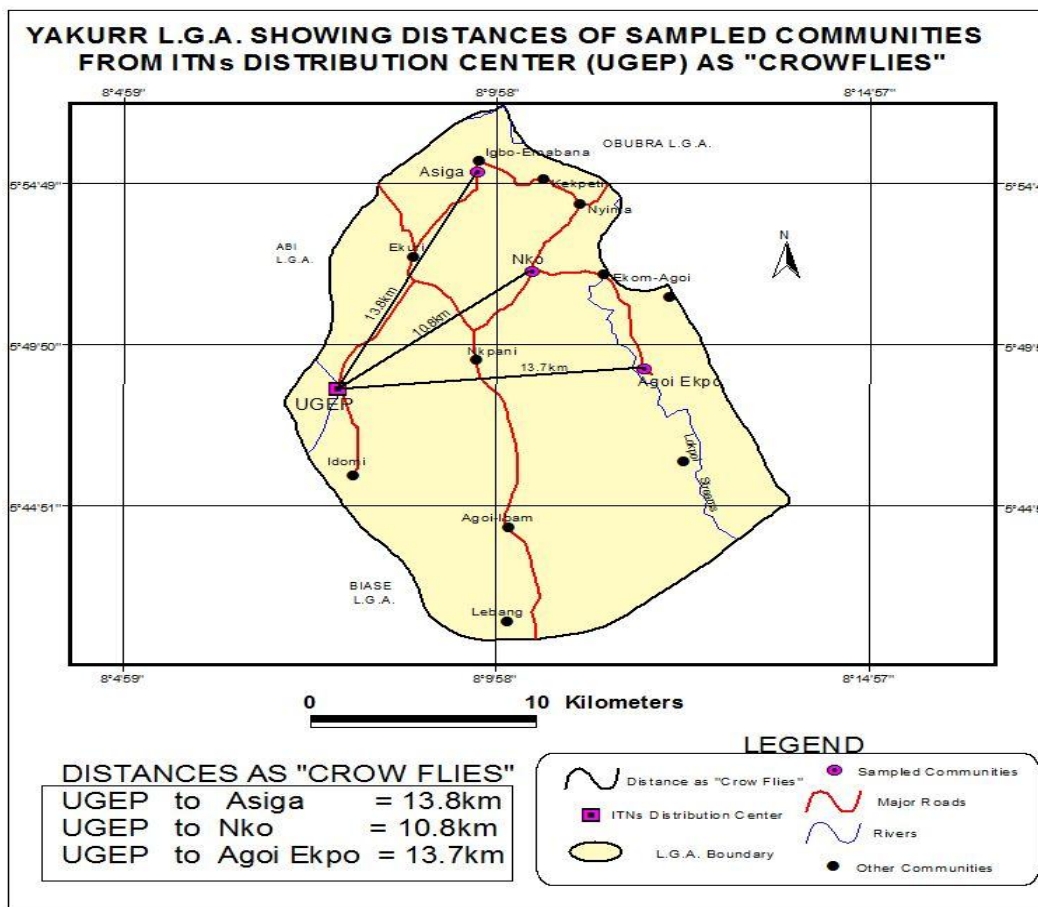

Fig. 1: Map of the study area showing distances of sampled communities from ITNs distribution centre.

Clearly, distance is a barrier to ITNs use in the study area because intensity of use decreases with increasing distance from the distribution center. Olumiji (2003) and Ibor (2010) have rightly observed that even within the same settlement, rural households traveled to locations of varied distances for health services and that service providers are economically rational. This implies that settlements with short distances to health services may have access to them than those with long distances. They further stressed that the road conditions of a place, travel cost, travel time, waiting time and characteristics of illness may influence utilization of health resources or services. Distance may be a constraint to ITN use by constituting a barrier to it distribution. Insecticide Treated Nets (ITNs) distributors (especially profit-motivated ones) may want to minimize the aggregate distance people travel to obtain ITNs (Zimmerman and Vorrtam, 2003; Ibor,2010). Free service distributors may also be constraint to distribute subsidies to the remote rural populations especially in areas where the infrastructure of distribution is inadequate and where there is no effective monitoring strategy to compel distributors to reach the remote endemic communities.

This was aptly noted by Worrall et al (2003) that there is no guarantee that the poorest of the poor will be reached by universal subsides as factors such as lack of information, access problems and lack of infrastructure of distribution like motorable and good road to reach the remote areas may constitute barriers. A larger number of studies have shown a regular decline in contact with increasing distance in road condition, journey to hospital and by extension distribution of subsides (Okofor, 2007, Adejuyigbe, 1977, Iyun 1983 and OLujimi, 2003, Ibor 2010). The results of their works corroborate this finding as it was revealed that distance is a barrier to ITN use. This therefore implies that even when services are mobile or are provided at the door-steps of consumers, distance may constitute a barrier especially in the rural areas where the infrastructure of distribution is lacking.

Furthermore, inadequate distribution of ITNs may lead to non-owning of ITNs by some households, the findings from this study has shown that majority of the households were waiting for free distribution without attempts to purchase from social market. Lack of information was given as a reason for non-owning and utilization of ITNs .our finding further reveals that the poor rural communities tend to suffer the effect of malaria than others, partly due to increased transmission intensity and existing poor access to preventive and curative health services. Hence, priority in ITN distribution and household health education should be given great emphasis. Similarly, people who can afford the price at social markets should be motivated to make use of the social marketing as an alternative means of owning Insecticide Treated Net (ITNs). Moreover, there are still untreated nets in the public markets which are sold to consumers. This condition is believed to minimize the efficacy of nets and increase risk of malaria infection. Therefore, periodic assessment of ITNs and impregnation or retreatment services should be encouraged and pursued vigorously by the concerned authorities. The use of immunization programmes and antenatal services as distribution channels may create social inequality in access mostly in favour of the female gender.

Although, nets that were bought from the market were somehow untreated and nets paid for were more likely to be used (36%) than those acquired free of charge 61%, ownership was uneven among households due to weak distribution system. The utilization of ITNs only during certain periods or seasons as confirmed by some of the respondents and with loads of mosquitoes might expose vulnerable group to infection as malaria infection persist throughout the year in the studied area. Hence, intensive household education and periodic and regular supply of ITNs should be encouraged. The motivation of people for consistent utilization through routine health education is suggested.

Conclusion

The study has shown that location has implication for distribution and access to ITNs. The intensity of ITNs use decreases with increasing distance but the rate of decrease is not statistically significant for most communities. The greater the distance between two places, the lower the probability that these two places will be functionally related in terms of service distribution, even when services are not supplied at a particular location as is the case with ITNs. Distance was seen as a barrier to the distribution and utilization of ITNs though influenced by other intervening variables. Notwithstanding, the coverage of ITNs in the area is encouraging compared to most findings in the country. Although the set target of universal coverage is yet to be attained, the success so far achieved is commendable. It is however imperative to adopt result-oriented strategies in distribution and use existing awareness about mosquito bite as a cause of
malaria to increase utilization of ITNs.

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