

Socio-Economic Factors Hindering Utilization of Insecticide Treated Nets in Households with Children under Five Years of Age in Rwentuha Town Council, Bushenyi District, Uganda

Abel Tumushabe¹, Francis Kazibwe²

Directorate of Graduate studies, Research and Innovations, Bishop Stuart University, Mbarara, Uganda

Email: essamakula@as.bsu.ac.ug

Faculty of Nursing and Health Sciences, Bishop Stuart University, Mbarara- Uganda

Email: info@bsu.ac.ug, ar@bsu.ac.ug

Abstract

Insecticide treated nets (ITNs) are the powerful tools used in prevention of malaria and this has attracted Government of Uganda to distribute free ITNs at household level using its village health facilities. Despite the distribution of free ITNs, there have been cases of malaria among children under five years of age. This makes the basis for examining the socio-economic factors hindering the utilization of the ITNs among such children in Rwentuha Town Council, Bushenyi District. The study used a cross-sectional design, employing quantitative method for data collection and analysis. Data was checked for competences and analyzed using STATA version 13 to generate both descriptive and inferential statistics using a binary regression analysis. The study found that education levels significantly hinder utilization of ITNs since its $P < 0.05$ ($P = .030$). It was also found that, the household size ($P = .008$); the seasons where participants were not using ITNs ($P = .011$) and the lighting system ($P = .021$) were also significant factors that could hinder the utilization of ITNs. The study affirms that there are socio-economic factors hindering utilization of insecticide in Rwentuha Town Council. These factors vary from household to another and hinder utilization differently which has made malaria persistent among the under five. The study recommends that plans be made to increase the number of free ITNs distributed to all households, increase in community education and public awareness on ITNs use

Key words: socio-economic factors, utilization, insecticide treated nets (ITNs), children under five, Rwentuha, Bushenyi, Uganda.

Corresponding author: Tumushabe Abel (tumuable18@gmail.com)

I. Introduction

Malaria is a life threatening disease that is caused by Plasmodium parasites [12]. It is transmitted through the bites of infected female Anopheles mosquitoes

Globally, about half of the population (3.2 billion people) is at risk of getting malaria .An estimated 214 million cases of malaria and 438,000 malaria deaths were enumerated in 2015.About 91% of these deaths occurred in Africa and from this, more than 70% of all the deaths occurred in children who are less than 5 years old [10].

Use of Insecticide treated nets is among malaria prevention measures used widely in many households [6]. Due to its central role in malaria prevention, ownership of ITNs has been emphasized in many African countries. For instance, ownership in Bioko Island in Equatorial Guinea was enhanced in 2007 where 110,000 ITNs were distributed to households.

In areas where ownership of ITNs has been enhanced, factors such as area of residence, knowledge on malaria transmission, presence of fever in a child, age, gender and occupational status of the household Reference [3], although the government has put much effort to have 90% coverage in ITNs, household ownership has remained seemingly high compared to utilization especially among under five years children. Malaria continues to be the leading

percent in 2014-2015 [8]. The proportion of under five children sleeping under a mosquito net was at 7.3 percent but has since reduced to 3.2 percent [18] . This is due to unknown socio-economic factors. There is still a wide gap between net possession and use in Uganda. Knowing the factors affecting ITNs utilization is essential to achieve the national targets of ITN use and zeroing down child deaths due to malaria [2]

In Bushenyi district and Rwentuha Town Council in particular, the rate of ITNs utilization among under-5 old children is very low, which is against the national target [15]. Though various predictors have been studied in the neighborhood areas, certain socio-economic factors hindering ITNs utilization to under-5 years old children have not been addressed well in Rwentuha Town Council. Scientific evidence is needed to uncover and support possible associations

and infants who are less than five years (5) years of age are at the high risk of getting infected if not protected [11]

head and the household size have been identified as significant determinants of use of ITNs. For instance, a study in Ethiopia by [13] found a unit increase in the size of household increased the odds of ownership of a net more than twice.

Uganda is one the countries with malaria burden in Africa [9] Malaria is one of the most challenging diseases where delayed or complete lack of treatment leads to serious health complications like death [8]. The burden of malaria remains unacceptably high, especially among children under five and pregnant women. Malaria accounts for 25-40% of all outpatient visits at healthcare facilities in Uganda [8] Also, up to 20% of all hospital admissions and 15% of inpatient deaths are due to malaria [7] To prevent malaria related complications, household possession and use of ITNs has become a common practice in the country.

cause of death among children under five despite the ITNs intervention. One in four households across the country has at least one ITN and 12% own more than one. The proportion of households with a net has doubled from 13 percent in 2000-2001 to 26 between these factors and ITNs utilization among under-5 years old children to prevent malaria.

II. Research problem

Malaria continues to be a leading cause of child mortality and morbidity across Uganda. Despite the governments' involvement in ensuring that every under five years old child owns and sleeps under ITN. [4]. Utilization of ITNs by under-five requires that their respective households access and own nets. Whereas programs to ensure children access ITNs have been vigorous, utilization rates seem not to be a mirror of ownership rates. Though ITNs have been annually distributed in an effort to narrow malaria infections among under five children in Rwentuha town council, use of Insecticide Treated Nets among under five children has remained low compared to

household ownership [18]. This perhaps explains the escalating cases of malaria among the children under five. There is still limited information on the actual socio-economic factors explaining low use of ITNs compared to household [14]. A few studies done in the area have only analyzed ITNs accessibility, availability and ownership among children less than five years. No study has been done on the socio-economic factors for low utilization in the area.

III. Study Objective

The main objective was to identify the key critical socio- economic factors hindering the utilization of ITNs among the under-fives in Rwentuha Town Council, Bushenyi District.

IV. Conceptual Frame Work

The study looked at ITNs use as the dependent variable and socio economic factors hindering the utilization of ITNs as the independent variable as shown in Figure 1 below;

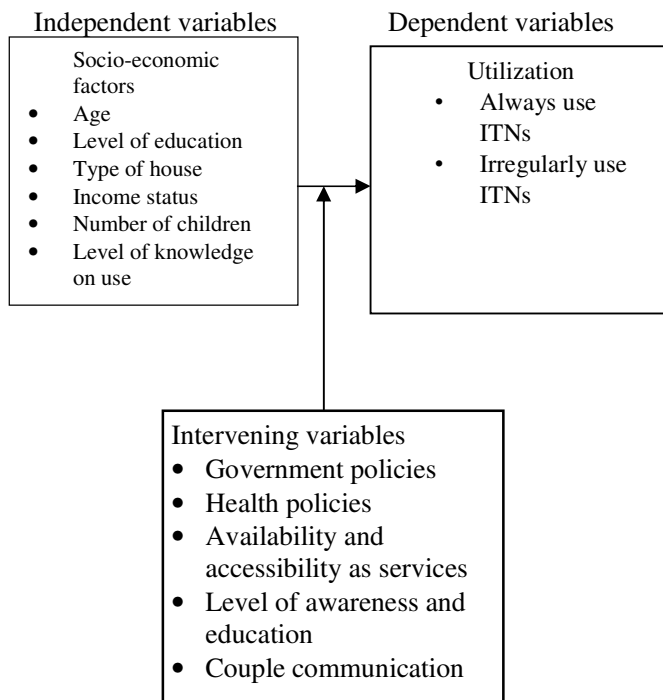


Figure 1: Conceptual Frame Work

The illustration in figure 1 shows the relationship between dependent and independent variables. It shows that there are socio-economic factors that hinder utilization of ITNs. The fact that all participants were owners of the ITNs and whose all children have ever suffered from malaria, dependent variables is intersected into two (always use ITNs & irregularly use ITNs).

V. Methodology

The study was conducted in Rwentuha Town council, Bushenyi District. Bushenyi District borders Rubirizi District to the Northwest, Buhweju District to the northeast, Sheema District to the East, Mitooma

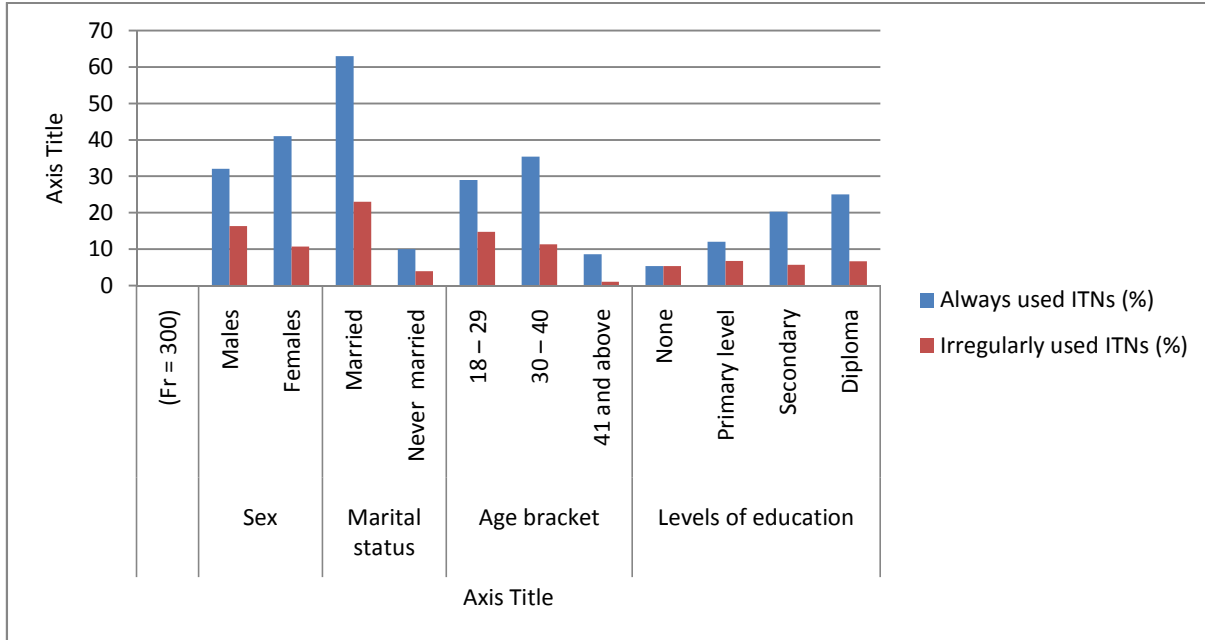


Figure 3: Utilization of ITNs by Demographics in Percentages

District to the south and Rukungiri District to the west. The coordinates of the district are: 00 32S, 30 11E. The town council continues to record a growing number of malaria cases among under five children yet free ITNs have been distributed amongst households as strategy to fight the disease in the area.

A cross-sectional design employing quantitative approach was used to collect data from heads of households. It involved the use of questionnaire to capture quantifiable responses on the socio-economic factors hindering the utilization of ITNs among under-five children at household level.

Randomized sampling technique was used to select 320 households of mothers who received ITNs yet their children have suffered from the malaria. Importantly, only households with mothers who accessed ITNs and whose children have had malaria were therefore interviewed. Through this group, quantitative data were received.

A questionnaire was the main method for collecting quantifiable data from parent/caretakers of children under-five. An administered questionnaire with both closed and open-ended questions was designed, translated to the local language and then be used to collect data from respondents. The tool was checked

for completeness, coded and entered into STATA version13 software for cleaning and analysis. Data was analysed to generate descriptive and inferential statistics which helped in the interpretation of findings. The generated findings were presented in statistical tables and figures.

VI. Results

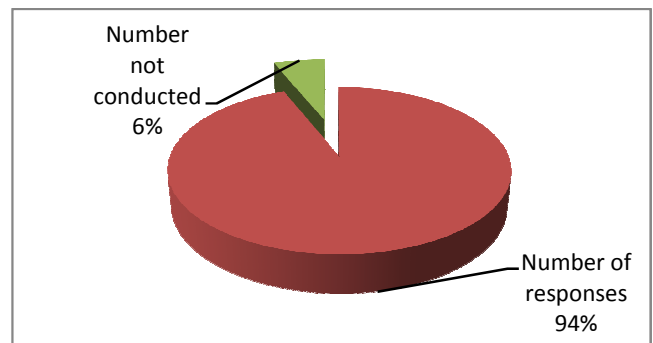


Figure 2: Response rate

Figure 2 shows that out of 320 participants that were proposed, 94% (300) were interviewed. This came as a result of saturation point which was reached before completion of the all numbers.

The demographics presented in Figure.3 show that out of 300 participants, 48.3% were males and 51.7% females. The findings revealed that out of 48.3% of total males, 32.0% could always use ITNs upon their children below age of five and 16.3% used the ITNs irregularly. It is also indicated that 41.0% of females always used ITNs and 10.7% irregularly used ITNs.

The study also found out that out of 86.0% of the married people, 63.0% always used ITNs upon their children below age of 5, as compared 23.0% married but use ITNs irregularly. Out of 14% of those who have never married, 10.0% always used ITNs as opposed to 4.0% that used ITNs irregularly. Within children below 5 years as opposed to 6.6%, 5.7%, 6.7% and 2.7% respectively who could irregularly use ITNs.

the age brackets, the use of ITNs was higher between participants between the age of 30 – 40. It is indicated that 35.4% always used ITNs as compared to 11.3% who irregularly used the same. Among participants within age bracket 18 – 29, the findings indicated that 29.0 could always use ITNs and 14.7% could irregularly use the same. Above the age of 41, the findings indicated that 8.6 would always use ITNs and 1.0% irregularly use the ITNs.

Education levels were also examined and found that 25.0% with diploma; 20.3% from secondary level; 12.0% from primary; 10.3% at degree level and 5.4% without any level would always use ITNs for their

Table I: Analysis for the Demographic parameters

Use of ITNs to a child ^a		B	Std. Error	Wald	df	Sig.
Yes	Intercept	.465	.502	.856	1	.355
	Sex	.052	.551	.009	1	.925
	Marital status	-.786	.439	3.208	1	.073
	Age bracket	-.008	.429	.000	1	.985
	Level of education	.446	.210	4.514	1	.034

Table II: The Likelihood Ratio Tests for Demographic parameters

Effect	Model Fitting Criteria		Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.	
Intercept	44.920	.849	1	.357	
Sex	44.080	.009	1	.925	
Marital status	47.184	3.113	1	.078	
Age bracket	44.071	.000	1	.985	
Level of education	48.638	4.567	1	.033	

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

From Table I and Table II, analysis shows that education levels significantly hinder utilization of ITNs since $P < .05$ ($P = .034 \& .033$).

Table III: Illustrating socio-economic factors and utilization of ITNs

Variable	Category (Fr = 300)	Always used ITNs (%)	Irregularly used ITNs (%)	Total
Religion	Muslim	16.3	7.4	23.7
	Christianity	56.7	19.6	76.3
Occupation	Formal employment	10.0	3.3	13.3
	Farmer	57.3	10.7	78.0
	Business	5.7	3.0	8.7
Household	Small (1 - 4 persons)	55.0	17.3	72.3

size	Large (5 and above)	18.0	9.7	27.7
Ownership of ITN	Woman	14.0	6.3	20.3
	Man	59.0	20.7	79.7
Income status	Low (below 100,000 a month)	34.3	12.0	46.3
	High (Above 100,000 a month)	38.7	15.0	53.7
Numbers less than age of 5	Less than 3	49.3	16.7	66.0
	More than 3	23.7	10.3	34.0
Gender of a child	A boy	42.7	18.0	60.7
	A girl	30.3	9.0	39.3
Seasons of the year	Hot season	19.0	8.7	27.7
	Rainy season	11.0	8.7	17.7
	None of the two	45.0	9.6	54.6
Type of House	Round house	3.3	3.0	6.3
	Not rounded	69.7	24.0	93.7
Lighting system	Local candles	7.7	6.3	14.0
	Electricity / solar	65.3	29.7	86.0

Table IV: Analysis for the socio - economic factors

Use of ITNs to a child ^a		B	Std. Error	Wald	df	Sig.
Yes	Intercept	-2.271	1.838	1.526	1	.217
	Religion	.169	.327	.267	1	.605
	Occupation	.098	.306	.103	1	.748
	Household size	-.847	.317	7.113	1	.008
	Ownership of ITN	.246	.332	.547	1	.460
	Income status	-.537	.302	3.173	1	.075
	Number of children	-.120	.297	.162	1	.687
	Gender of children	.390	.302	1.669	1	.196
	Seasons of the year	.421	.166	6.421	1	.011
	Type of the house	.718	.554	1.681	1	.195
	Lighting systems	.864	.368	5.515	1	.019

Table V: The Likelihood Ratio Tests for socio- economic factors

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	242.140	1.549	1	.213
Religion	240.855	.264	1	.607
Occupation	240.694	.103	1	.748
Household size	247.679	7.088	1	.008
Ownership of ITN	241.129	.539	1	.463
Income status	243.848	3.257	1	.071
Number of Children	240.753	.162	1	.687
Gender of a child	242.289	1.698	1	.193
Season not using ITNs	247.048	6.457	1	.011
Type of House	242.243	1.653	1	.199
Lighting system	245.937	5.346	1	.021

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

From Table V, only three socio-economic factors were found significantly hindering the utilization of ITNs to children under the age of 5. These include the household size with $P < .05$ ($P = .008$); the seasons where participants were not using ITNs ($P = .011$) and the lighting system ($P = .021$).

Table III shows that there were more Christians (76.3%) who were interviewed as compared to Muslims (23.7%). It also shows that a large number of 56.7% of Christians could always use ITNs on their children and 16.3% of the Muslims did the same. A few numbers of the respondent Christians (19.6%) and Muslims (7.4%) could irregularly use ITNs on their children aged .5. The study was entirely conducted among participants with formal employment, farmers and business personnel. It shows that 57.3% farmers; 10.0% in formal employments and 5.7% business personnel could always use ITNs to children under the age of 5. Only 10.7% of the farmers; 3.3% from formal employment and 3.0% of the business personnel irregularly used ITNs.

The study also shows that most of ITNs were under the ownership of men as compared to women. In fact, 59.0% of men who owned ITNs used them regularly as compared to 14.0% women.

The study also reveals that 34.3% of the respondents with income below 100,000 and 38.7% above 100,000 a month would always use ITNs upon children under the age of five. On the other hand, 15.0% of the respondents with high level income (above 100,000 a month) and 12.0% of those below 100,000 a month could irregularly use ITNs on their children.

Table III also shows that most children sleep under the ITNs and this is justified by 49.3% (less than the age 3) who could always use the ITNs and 23.7% (more than the age of 3) did the same.

VII. Discussion

This study established the significance of the socio-economic factors towards ITNs hindrance among children under the age of five in Rwentuha Town Council. These factors include; level of education, religion, household size, income status, number of children below the age 5, gender of the child, occupation, ownership, season, type of house, and lighting system. Despite being factors hindering

essential utilization of ITNs, they can also be factors influencing utilization in another study. On the other hand, some factors can be presented significant more than others in a study, yet insignificant in another. It is due to this perspective that this study assessed dichotomous responses toward a dependent variable as regular and irregular utilization as presented conceptually.

The findings also bring to the attention of the gender of a child or children in which boys are mostly given priority as compared to girls by most men. However, pregnant mothers always value all children the same for the purposes of growth and values attached to them in future. The findings to this study are similar to what [17] present from the Sub-Saharan Africa. That due to values attached to boys, fathers like protecting boy children as compared to girls. However, the scholars leave a question whether all boys are protected or it is a section of boys whose parents especially fathers consider important and to be protected against such disease. This question was however not answered in this study and thus the need for an investigation.

The findings from this study show that the use of ITNs is higher within certain age bracket, 30 – 40 and reduces with other ages. Thus, age influences and hinders the utilization of ITNs among children under the age of 5. According to [17], age of the care givers to the children matters most towards healthcare, breastfeeding and the support to grow. It is also significant to utilization of the ITNs as compared to most factors within the household. In reference [17], despite being important towards the utilization of various items within the home environment, age is not positively significant like education of mothers. The scholars note that education is vital to most situations in a family as compared to the rest of the factors.

The findings from this study show that education is important towards the utilization of ITNs and this stretches from secondary level to the university level. The study shows that it is education that influences women and men to continue their attachment to seek for information about health, and its significance is essential up to the end. However, less education also is shown hindering utilization of the ITNs and this is

also associated to some of the educated according to those that agree with irregular use of ITNs. In reference [18], the utilization of ITNs among under five children in Uganda is higher among the educated groups as compared to the uneducated persons. It is also presented that people living in rural areas has limited opportunities in use of ITNs as compared to the urban dwellers. The scholars find a positive and significant association between ITNs' use and education. The highly educated persons utilize ITNs more than the rest of the persons in any community although a section of the educated persons fall similar victims towards hindering the practice. This is because of their knowledge about dangerous nature of the diseases and the approach to prevention using ITNs.

What is important to this study is the fact that it was conducted from the rural areas, among educated and non-educated. Observation from Table III reveals the fact that even uneducated people were regularly using ITNs. However, there is a large margin between the two categories. In agreement to the findings by [16], it is better to infer that education, is positively associated to utilization of ITNs. This utilization is however a subject to levels of education rather than uniform significance.

The findings to this study also show that the house hold size and number of people in it hinders the utilization of the ITNs although majority in such households regularly utilize ITNs. If the household is small, the number in such household can easily overwhelm the sources like income to buy the net to be used by the children. In fact, as the number of the children in the household increase, heads find it hard to buy additional nets as government free nets grow old. In line with what [2] present, there is agreement between the two studies. The number of young children in a household determines the use of mosquito bed nets. The households with children less than five years of age are more likely to use bed nets than those with children over five years. The fact that this study was conducted from the rural areas and where more than 5 children were witnessed within households, it is one of the reasons why some individuals in the households never use the nets and thus a reason to be infected with malaria. The findings are also related to what [16], present from Ethiopian that the fewer the number of children under the age of five years, the more likelihood to sleep

under ITNs. This is because parents are more likely to participate in malaria prevention activities when children are still young than when children are old. In fact, the older children are either thrown out from the parents' bedroom or parents' house to join boys' quarters.

The study also critiqued sleeping arrangement in a house which increase the chances to either sleep in the net or not. In some cases, households who slept on floors are less likely to use ITNs compared to those sleeping on beds. This is because a floor has no placements for holding a net as compared to a bed. This finding can be compared to what [5] present from Nigeria where most pregnant mothers sleeping on the floor would hardly deliver due to malaria. In comparison to their counter parts, women sleeping on the bed are more respected by their husbands and can deliver since they are protected by the net. In their study from Nigeria, it is presented that the urban area has high use of ITNs among pregnant women compared to the rural areas despite the fact that the rural areas has higher levels of ownership of ITNs. Therefore, the increase in ownership of ITNs does not necessarily means an increase in ITNs utilization. Rather, utilization or hindrance to utilization is a result of contextual factors which are embedded within the sleeping arrangements and attitude towards the usefulness of the bed.

Lastly, the lighting systems were also associated with practices that hinder the utilization of ITNs and this is common with candle lighting which is common system in rural areas. The findings from this study have a greater association with what [17], found among women in Kimanyedde Sub-County where women feared buying mosquito nets with the view that they can be easily burnt by candles as their children go to sleep. Besides, in case one is holding a candle, the blowing of windy air inside the house can easily make the lighting candle burn the net, which in long run set the whole house on the blended. In Mukono District, [2], shows that most women prefer the use of ITNs since their houses are fully electrified. The socio-economic factors hindering utilization of ITNs in this study are much related to what other scholars present from different contexts. As already noted, while effort towards utilization of mosquito nets has increased stemming from international and national levels upon pregnant mother and children; and whereas many people claim having been adapted

sleeping under the net practices; malaria is still the leading cause of death in Africa among mother and children. While there is an increasing number of people accessing net from the government facilities and buying the nets from individual shops, the increasing cases of malaria is a justification of gaps in utilization.

VIII. Conclusion

This study concluded that there are socio-economic factors hindering utilization of ITNs within households with children below five years of age. These factors include: gender of the household head, age of household head, level of education, religion, household size, income status, number of children below 5, gender of the child, age of the child. These factors prevent the proper coverage of all household members and therefore this will mean that presence of an insect treated nets in a household may not an indication of their usage. The utilization of ITNs remains lower than ownership. This therefore calls for more efforts to boost ITNs across all communities.

IX. Recommendations

Since this study points out that expectant mothers and children under five years of age were the beneficiaries of the free distribution of ITNs, the government of Uganda through the Ministry of Health should plan to have an increase in number of free ITNs distributed to households. Such a strategy can eliminate the possibility of the adults using ITNs made for the young children who may not have the first priority for using the nets due to scarcity of ITNs in the household. This will help to reduce the number of adults from using the insecticide treated nets that are meant to be used by the young children who may not have a chance to get them due to the availability of less insecticide treated nets in their households.

Behavior change strategy through campaigns at the community level should be used to provide a platform for both the healthcare workers to learn about the perceptions of caregivers in order to know them better and also to use that opportunity to educate caregivers how to properly use ITNs and their importance in malaria prevention among the under-fives.

The government through Ministry of Health should make sure that there is increased sensitization among

the community members to be aware of the need to sleep in the insecticide treated nets especially the vulnerable groups.

ACKNOWLEDGEMENT

Special thanks go to my supervisor Prof. Kazibwe Francis for his tireless and invaluable guidance, positive criticisms and suggestions through which learning was accomplished towards the completion of this paper .In addition, I would like to thank my colleagues taking the same course for their valuable discussions, seminars and support. I also thank lecturers at Bishop Stuart University for their support given to me.

Conflict of interests

None.

Funding

None.

REFERENCES

- [1] Anikwe, C. C., Irechukwu, J. C., Okorochukwu, B. C., Ikeoha, C. C., Obuna, J. A., Ejikeme, B. N., & Anikwe, I. H. (2020). Long-Lasting Insecticide-Treated Nets : Assessment of the Awareness and Utilization of Them among Antenatal Clinic Attendees in Abakaliki , Southeast Nigeria, 2020.
- [2] Batwala, P. Magnussen, K. S. Hansen, and F. Nuwaha, (2011) "Cost-effectiveness of malaria microscopy and rapid diagnostic tests versus presumptive diagnosis: Implications for malaria control in Uganda," *Malaria Journal*, vol. 10, article no. 372.
- [3] Dowhaniuk, N. (2021). Exploring country-wide equitable government health care facility access in Uganda. *International Journal for Equity in Health*, 20(1), 1–19. <https://doi.org/10.1186/s12939-020-01371-5>
- [4] Finlay, J. Butts, H. Ranaivoharimina, (2017) "Free mass distribution of long-lasting insecticidal nets lead to high levels of LLIN access and use in Madagascar, 2010: A cross-sectional observational study," *PLoS ONE*, vol. 12, no. 8, Article ID e0183936.

- [5] Hetzel, M, Gideon, G, Lero, N, Makita, L, Siba, P & Mueller, I (2012), 'Ownership and usage of mosquito nets after four years of large-scale distribution in Papua, New Guinea', *Malaria Journal*, vol.11 no.192.
- [6] Kateera, C. M. Ingabire, E. Hakizimana, (2015). Long-lasting insecticidal net source, ownership and use in the context of universal coverage: *A household survey in eastern Rwanda*, *Malaria Journal*, vol. 14, no. 1, article no. 390, 2015.
- [7] Lechthaler, F., Matthys, B., Lechthaler-Felber, G., Likwela, J. L., Mavoko, H. M., Rika, J. M., ... Lengeler, C. (2019). Trends in reported malaria cases and the effects of malaria control in the Democratic Republic of the Congo. *PLoS ONE*, *14*(7), 1–20. <https://doi.org/10.1371/journal.pone.0219853>
- [8] Ministry of Health (2014), Uganda Malaria Indicator Survey 2014–15 (2014–15 UMIS) available at microdata.worldbank.org/index.php/catalog/2520/download/36646.
- [9] Ministry of Health 2017, Uganda. Annual health sector performance report 2016/7. 2017. Kampala, Uganda.
- [10] Papaioannou, I., Utzinger, J., & Vounatsou, P. (2019). Malaria-anemia comorbidity prevalence as a measure of malaria-related deaths in sub-Saharan Africa. *Scientific Reports*, *9*(1), 1–9. <https://doi.org/10.1038/s41598-019-47614-6>
- [11] Roberts, D., & Matthews, G. (2016). Risk factors of malaria in children under the age of five years old in Uganda. *Malaria Journal*, *15*(1), 1–11. <https://doi.org/10.1186/s12936-016-1290-x>
- [12] Sato, S. (2021). Correction to: Plasmodium—a brief introduction to the parasites causing human malaria and their basic biology (*Journal of Physiological Anthropology*, (2021), 40, 1, (1), 10.1186/s40101-020-00251-9). *Journal of Physiological Anthropology*, *40*(1), 1–13. <https://doi.org/10.1186/s40101-021-00254-0>
- [13] Singh, G. Brown, and S. J. Rogerson, (2013). Ownership and use of insecticide-treated nets during pregnancy in sub-Saharan Africa: a review, *Malaria Journal*, vol. 12, no. 1, article no. 268.
- [14] Strachan, A. Nuwa, D. Muhangi, A. P. Okui, M. E. H. Helinski, and J. K. Tibenderana, (2016). What drives the consistent use of long-lasting insecticidal nets over time? A multi-method qualitative study in mid-western Uganda, *Malaria Journal*, vol. 15, no. 1, article no. 1101.
- [15] Taremwa, Ivan M., Ashaba, S., Adrama, H. O., Ayebazibwe, C., Omoding, D., Kemeza, I., ... Hilliard, R. (2017). Knowledge, attitude and behaviour towards the use of insecticide treated mosquito nets among pregnant women and children in rural Southwestern Uganda. *BMC Public Health*, *17*(1), 4–11. <https://doi.org/10.1186/s12889-017-4824-4>
- [16] Taremwa, Ivan Mugisha, Ashaba, S., Ayebazibwe, C., Kemeza, I., Adrama, H. O., Omoding, D., ... Hilliard, R. (2020). Mind the gap: scaling up the utilization of insecticide treated mosquito nets using a knowledge translation model in Isingiro district, rural south western Uganda. *Health Psychology and Behavioral Medicine*, *8*(1), 383–397. <https://doi.org/10.1080/21642850.2020.1814782>
- [17] Tassew, R. Hopkins, and W. Deressa, (2017). Factors influencing the ownership and utilization of long-lasting insecticidal nets for malaria prevention in Ethiopia, *Malaria Journal*, vol. 16, no. 1, 2017.
- [18] Ucaacon, J. Achan, P. Kutwabami, A. R. Odoi, and N. J. Kalyango, (2011). Prescribing practices for malaria in a rural Ugandan hospital: Evaluation of a new malaria treatment policy, *African Health Sciences*, vol. 11, pp. S53–S59.
- [19] Wanzira, H. Katamba, A. E. Okullo, B. Agaba, M. Kasule, and D. Rubahika, (2017). "Factors associated with malaria parasitaemia among children under 5 years in Uganda: a secondary data analysis of the 2014 Malaria Indicator Survey dataset," *Malaria Journal*, vol. 16, no. 1.
- [20] WHO, (2012). *The World Malaria Report-2011*. Washington DC: World Health Organization