

Research Paper

Possession, Attitude and Perception of Insecticide Treated Bednet among Pregnant Women in Gulu: a post conflict district in Northern Uganda

Abstract

Background

Insecticide Treated Net (ITN) is one of the main strategies to control malaria in Uganda. The Uganda Ministry of Health had set a target of 50% of households to be covered with ITN by the year 2007. Therefore the study was conducted to determine ITN possession among pregnant women who were living in internally displaced persons' (IDP) Camps where buildings offered little or no protection against mosquito.

Methods

We conducted a cross sectional study in 20 randomly selected camps. Probability proportion to size cluster sampling technique was used to determine the numbers of expectant mothers in the selected camps. Consecutive sampling method was used by moving to the next nearest household until the required number of respondents was generated from each camp. Data collection was attained by using well designed pretested questionnaires before the survey.

Results

42% of respondents (95% CI 1.54 – 1.61) possessed ITN. 98% of the respondents reported that it was good to use ITN. Factors associated with ITN possession were; being single/widowed/divorced (aOR 0.22, 95% CI 0.12 - 0.42, P-value 0.000); Not engaged in any form of business (aOR 0.62, 95% CI 0.39 - 0.98, P-value 0.041); Ever attended antenatal services (aOR 1.92, 95% CI 1.31 – 2.83, P-value 0.001); Having attained formal education (aOR 1.69, 95% CI 1.11 - 2.56, P-value 0.014).

Conclusion

More than half of the respondents lacked ITN which is below the set target by the Uganda Ministry of Health. Therefore government and other stakeholders must scale up free ITN distributions among the vulnerable groups if the Ministry of Health and the Roll Back Malaria Global Partnership Target is to be achieved.

Keywords: ITN, Possession, pregnant women, post conflicts, internally displaced persons camps.

Introduction

10 **Background**

11 Malaria is endemic in Uganda and constitutes a major public health challenge. An estimated
12 7.9 million malaria cases were reported in 2008 [1]. Surveillance reports show that
13 proportionate mortality ratio (PMR) due to malaria for all ages has increased progressively
14 from 20.2% in 1988 to 32.1% in 2004 [2]. Malaria infection during pregnancy is a major
15 cause of maternal anaemia, abortion, stillbirth, intrauterine growth retardation and low birth
16 weight, an important risk factor for neonatal and infant mortality [3 – 5]. An estimated
17 75,000–200,000 infant deaths annually are associated with malaria infection during
18 pregnancy [5].

19 Use of insecticide treated mosquito net (ITN) is an effective strategy for preventing malaria in
20 children and pregnant women [6]. In Uganda, currently ITN use is one of the mainstay
21 strategies for malaria control amongst others strategies like indoor residual spraying,
22 Intermittent Presumptive Treatment (IPT) and case detection and management [1]. In 2001,
23 the African heads of state met in Abuja and set a target of 60% ITNs coverage among the
24 vulnerable group of children and pregnant women [7]. The Roll Back Malaria global strategic
25 plan (2005 – 2015) had set a target of 80% universal coverage of ITN among people at risk
26 for malaria [8]. The Ministry of Health, Uganda had set a target of 50% of ITN coverage
27 among the vulnerable groups especially pregnant women and children under 5 years by the
28 year 2007 [1]. There has been promising signs of rapid scaling-up of ITNs coverage in many
29 African countries [9]. However, the target set by the Ministry of Health, Uganda was not met
30 as noted in annual health sector performance report of 2007 [1].

31 The poor bear the highest burden of malaria as they are at higher risk of becoming infected
32 with malaria because they live in dwelling that offer little protection from mosquitoes [10]. As
33 a result of the appalling life situation in the post conflict internally displaced persons' (IDP)
34 camps, it was necessary to conduct the study to determine attitude, perception and
35 possession of ITN among pregnant women.

36

37

38 **Methods**

39 **Study area**

40 We conducted a cross-sectional study using quantitative data collection technique in Gulu
41 district IDP camps from March 3 to 19, 2009. Gulu district is one of the districts affected by
42 the armed insurgency in northern Uganda since 1986. As of 2005, nearly 90% of the
43 population had relocated to camps and bednet coverage was low at only 25.5% (Ministry of
44 Health and World Health Organisation, 2005). The district has a municipality and two
45 counties (Aswa and Omoro). The district had 31 IDP camps [11] made up of grass thatch
46 huts or tents provided by the non-governmental organizations. There were 10,888
47 pregnancies [12] from July 2007 to June 2008.

48

49 **Sample size and Sampling**

50 We used the modified Sample size estimated by modified Kish and Leslie formula of 1965
51 with a 95% confidence level, a precision of 5%, an estimated proportion of the pregnant
52 women having ITN at 50% (proportion is unknown) and a conservative design effect of 2 to
53 cater for intra-cluster variability [13]. The calculated sample size was 769 pregnant mothers.
54 We selected twenty (20) IDP camps using simple random sampling as clusters for survey
55 with ten (10) IDP camps in each County. The name of the IDP camps in each county was
56 written on a piece of paper. The piece of paper was folded and put inside a non transparent
57 polythene bag for each county. The pieces of paper with the IDP camp name in them were
58 then picked once at a time without replacement from the polythene bag until the names of
59 the 10 IDP camps in each of the two counties were generated. We used probability
60 proportional to size cluster sampling method to determine the numbers of pregnant women
61 to be interviewed per IDP camp. We divided the population of pregnant women in each of
62 the IDP camps to be surveyed by the total numbers of pregnant women in all the clusters
63 and multiplying by the sample size (769) to get the numbers of pregnant women to be

interviewed per IDP camp. In each of the IDP camp, we first determined the centre of the camp. We then spun a bottle on the ground and the direction of movement was where the bottle top face. All the households in that direction were counted and given a number. Corresponding numbers were written on a piece of papers which were folded and placed in non transparent polythene bag. A piece of paper was then picked blindly from the non transparent polythene bag to determine the starting household. We then interviewed 769 pregnant women using consecutive sampling methods by moving to the next nearest household. Our inclusion criteria were pregnant women who gave self report of carrying pregnancy; were residents of the 20 selected IDP camps and present on the interview date after giving a written informed consent to participate in the study. The exclusion criteria were pregnant women who were seriously sick or were in labour. The study was approved by the Faculty of Medicine Research and Ethics Committee, Makerere University. The research and ethics committee also granted permission to study pregnant women less than 18 years old as emancipated minors.

Data collection, management and analysis

Data was collected using questionnaire which were administered by trained research assistants who were fluent in the local language (Acholi). The questionnaire was translated into Acholi with the help of an expert linguistic and back translated into English and pretested before administering to the study population. The collected data was entered into Epidata version 3.1 cleaned, edited and exported to STATA 11 for analysis. We calculated 95% confidence interval (CI) for factors associated with ITN possession and any p-value < 0.05 was taken as statistically significant. Any factor with p-value ≤ 0.2 at bivariate analysis was taken for multivariate analysis. Continuous variables were summarised using means and categorical variables were displayed into tables for general description.

90

91 **Results**

92 **Socio-demographic characteristics of the respondents**

93 A total of 769 pregnant women were interviewed with age ranging from 14 to 45 years with a
94 mean age of 25.3 years and standard deviation (SD) of 6.2. Majority of pregnant women
95 (70%) had primary education. Most pregnant women (62%) were cohabiting. Most
96 respondents (84%) were Multigravidae. Table 1 summarises the socio-demographic
97 characteristics of the respondents.

98

99 **ITN possession and use by respondents**

100 Slightly less than half of the pregnant women (42%) had at least an ITN. Majority of the
101 pregnant women (72%) were given ITN from health facilities. Most of the pregnant women
102 (85%) who owned at least an ITN had a high compliance of use in the last one week before
103 the survey. Table 2 summarises the results for ITN possession and use by respondents

104

105 **Respondents' perception and attitude toward ITN**

106 Majority of the respondents (98%) said it was good to use ITN. More than half of the
107 pregnant women (53%) reported the benefit of using ITN as it prevent mosquito bites while
108 slightly less than half (42%) of them indicated that ITN prevent malaria transmission. Majority
109 of pregnant women (97%) perceived ITN as effective at preventing mosquito bites. Most
110 respondents (96%) who had ITN were willing to continue using their ITN. About half of the
111 pregnant women (51%) were not willing to buy ITN and most of them (88%) cited lack of
112 money. Table 3 summarises the results for respondents' perception and attitude toward ITN.

113

114 **Bivariate results for socio-demographic characteristics associated with ITN** 115 **possession**

116 Factors associated with ITN possession at the Bivariate level were; no formal education (OR
117 0.61, 95%CI 0.44 – 0.86 and P-value 0.004), no antenatal visit (OR 0.51, 95%CI 0.37 – 0.71
118 and P-value 0.000), not having any form of business (OR 0.58, 95%CI 0.40 – 0.83 and P-
119 value 0.003), being single/widow/divorce (OR 0.19, 95%CI 0.09 – 0.42 and P-value 0.000)
120 and pregnancy of 6 months and above (OR 1.50, 95%CI 1.12 – 2.01 and P-value 0.007).
121 Table 4 summarises the Bivariate results for socio-demographic characteristics associated
122 with ITN possession.

123

124 **Multivariate logistic regression analysis of socio-demographic predictors of ITN** 125 **possession**

126 Factors which affects ITN possession were; being single/widow/divorce (aOR 0.22, 95% CI
127 0.12 – 0.42, P-value 0.000), not having any form of business (aOR 0.62, 95% CI 0.39 – 0.98,
128 P-value 0.041), Have attended antenatal service (aOR 1.92, 95%CI 1.31 – 2.83, P-value
129 0.001) and having formal education (aOR 1.69 95%CI 1.11 – 2.56 and P-value 0.014).

130

131 **Discussion**

132 **ITN possession and use**

133 Our study showed that ITN possession was low at 42% among pregnant women in post
134 conflict IDP camps of Gulu district. These were quite below the target set by Ministry of
135 Health of 50% ITN coverage among the vulnerable group by the year 2007 [1], the Roll Back
136 malaria global partnership of 60% ITN coverage among vulnerable groups by 2005 [14] and
137 the Roll Back Malaria global strategic plan of 80% coverage among the population (2005 –
138 2015) [8]. The Uganda Demographic and Health Survey of 2006 indicate that 34% of
139 households had ITN. The report further reveals that 41.8% of IDP households had ITNs.
140 However, only 20.9% of the pregnant women had slept under their ITN the night prior to the
141 survey [15].

142 Majority of the ITN owned by the respondents were given from health facilities for free.
143 Therefore, there is need to stock up ITN at the health facilities so that pregnant women who
144 go for antenatal visit the first time are given ITN. Other studies also indicates that majority of
145 ITN owned by respondents were given through mass campaign [16]. The respondents who
146 did not possess ITN gave various reasons for not possessing ITN. Majority of the
147 respondents were not given ITN from the health centres where they had gone for antenatal
148 visit. These could be due to stock out of ITN from the health facilities. The distributions of
149 ITN among the IDP population in northern Uganda were spearheaded by Non Governmental
150 Organisations (NGOs). The NGOs activities were always programme specific which may
151 make certain places not to be covered. Similar result was reported in other study in which
152 the main reason given for not owning a net by pregnant women was lack of access to nets
153 [17].

154 In Uganda, Ministry of Health has design two strategies for ITN distributions. The first one is
155 going to scale which needs fast distribution and high proportion of population reached. The
156 main distribution mechanism was mass campaigns or community distribution through public
157 sector and civil society targeting households with children under five and or the poor. The
158 second component is replacement which needs sustainable long term distribution
159 mechanisms. Here, the health facility based distribution targeted to pregnant women was
160 being used [1]. It is evidence that these strategies have not help much in improving ITN
161 possession by pregnant women who were living in the IDP camps. The majorities of
162 pregnant women had at least attended antenatal services once or were multigravidae. All
163 these conditions should have made at least the pregnant women to have an ITN if these
164 strategies were working properly. Therefore there is need to redesign strategies to ensure
165 that ITN possession by pregnant women is increased.

166 The majority of respondents who owned at least an ITN had high compliance with ITN use in
167 the last one week prior to the survey. This was a surprise since the study was conducted in
168 the dry season when temperature would go very high. This could be because the pregnant

169 women value the protective benefit of ITN. Others studies done in Nigeria indicate that ITN
170 use by pregnant women were low [18, 19]. While a study done in Ghana showed that
171 compliance with ITN use was high during the wet and cool season, but lower in the hot and
172 dry season [20].

173 Most of the ITN owned by respondents were washed four times and above. Majority of the
174 ITN owned by the respondents were not retreated. Only a few respondents had their ITN
175 retreated. ITN retreatment helps in restoring the protective value of ITN as the chemical will
176 be potent enough to kill or repel mosquitoes. Similar result was reported in a study done in
177 Luwero district of central Uganda where only about half of pregnant women reported a net
178 re-treatment with an insecticide within the last 6 months [21]. It is evidence that ITN
179 retreatment service is lacking in Uganda. Therefore, there is need to scale it up so that those
180 in need can access them to have their ITN retreated to restore its protective value.

181

182 **Perception and attitude toward ITN**

183 Most of the respondents reported that it was good to sleep under ITN while a few stated that
184 it was not good to sleep under ITN. The following benefits were revealed by the majority of
185 respondents who agreed that it was good to sleep under ITN; ITN prevent mosquitoes bite,
186 ITN prevent malaria and others (bed bugs, cockroaches and other crawling insects, provide
187 warmth during cold weather). Other study also shows that pregnant women who associated
188 bed net with beneficial value were more likely to use [22]. Respondents who think that it was
189 not good to sleep under ITN gave the following reasons; ITN being hot at night, not being
190 aware whether ITN is good and getting malaria despite sleeping under ITN. Other study
191 shows that the most common reasons for non-use of net were hot weather, absence of the
192 owner of net, a leaking roof and an absence of mosquitoes [20]. While a study conducted in
193 Mbarara district of Uganda indicates that there were doubts about bed net efficacy in
194 preventing malaria. The barriers that were expressed for bed nets used were difficulty to
195 keep free from holes, being inconvenient by increasing heat and sweating, causing

196 suffocation and difficulty in buying nets for large family [23]. Other studies indicate that
197 participants used bed nets when mosquitoes were plentiful and keep them in the dry season
198 [23, 24].

199 In our study the majority of the respondents reported that they will continue using their ITN
200 while a few stated otherwise. The reasons given for not continuing using ITN were that ITN
201 causes itching of the eyes, ITN being torn already, the weather is still hot and there is no
202 mosquito at the moment. In other study pregnant women gave various reasons for not using
203 an ITN during pregnancy or discontinuing use after pregnancy were lack of an ITN,
204 perceived inconvenience of the ITN e.g., hot, bad smell and difficult to tie and perceive
205 absence of mosquitoes [22].

206 Majority of the respondents knew that ITN is a factory treated net to kill or repel mosquitoes.
207 This high level of awareness is quite good for public health intervention. This could probably
208 explain why majority of those who owned ITN had high compliance sleeping under it in the
209 week prior to the survey. Few of the respondents were either not sure or they did not know
210 that their ITN had been factory treated prior to distributions. Almost half of the ITN owned by
211 the respondents had developed holes. These ITN could have developed holes as a result of
212 becoming old which meant it had outlived its usefulness or due to overcrowding in the house
213 that rendered ITN use an impracticable. The IDP houses were small grass thatched huts
214 which made the ITN to be tied at night and removed in the morning to provide space in the
215 house making it a real inconvenience. This would therefore render the ITN to lose its
216 protective values. The mosquitoes would therefore be able to gain access to the pregnant
217 woman who is sleeping under and could transmit to her malaria parasite.

218

219 **Factors associated with ITN Possession**

220 Single/widow/divorce pregnant women were less likely to possess ITN than pregnant women
221 who were married/cohabiting. This could be due to lack of social support that
222 married/cohabiting pregnant women received from their husbands who encouraged them to

223 acquire and use ITN for personal protection. Other studies have reported similar findings [25,
224 26]. A study in Kinshasa shows that male partners were supportive of ITN use by their
225 pregnant wives [27].

226 Also, pregnant women who indicated that they were not engaged in any form of business
227 were less likely to possess ITN than those who indicated that they were involved in some
228 form of business. However, pregnant women whose household incomes were between
229 Shillings 30,000 to 500,000 per month were more likely to own an ITN than the rest. This is
230 due to lack of money to purchase an ITN as reported by more than half of the respondents
231 who were not willing to buy ITN. Other studies have reported cost a hindering factor to ITN
232 ownership and use [28 - 31]. Previous studies have found that free distribution of ITNs has
233 resulted in substantial increase in net coverage compared to subsidize [29, 32]. Therefore it
234 might be necessary to have a mass and free distribution of ITNs to achieve the targets of
235 Roll Back Malaria (RBM) as suggested by other study [33]. While another study suggested
236 that free mass distribution of ITN allows for equitable ownership which makes pregnant
237 women more likely to use them regardless of their socio-economic status [34]

238 Respondents who had gone for antenatal visit were almost twice as likely to possess ITN as
239 their counter parts that had not gone for antenatal visit. During antenatal services, women
240 undergo health education session which will encourage them to acquire and use ITN. Also,
241 some ITN may be given as an incentive to encourage pregnant women to attend antenatal
242 services. Other study shows that provision of the LLINs to women free of charge at their first
243 antenatal clinic visit increased the reported use of bed nets dramatically the night before
244 enrolment [27].

245 Our finding indicates that respondents who had formal education were more likely to
246 possess ITN than those who had no formal education. This is most likely due to increased
247 awareness about ITN and its benefits as a result of sensitisation by teachers. Similar result
248 was reported in a review by Singh *et al* [35]. However, another study indicates that education
249 was not associated with ITN ownership [26].

250

251 **Conclusion**

252 More than half of the respondents do not possess ITN which is quite below the target set by
253 the Roll Back Malaria Global Partnership and the Ministry of Health Uganda. Most of the
254 respondents who did not possess an ITN stated that they were not given during their
255 antenatal visit to the health facilities. Therefore government and other stakeholders must
256 scale up free ITN distributions among the vulnerable groups if the Ministry of Health and the
257 Roll Back Malaria Global Partnership Target is to be achieved. Also, economic
258 empowerment of pregnant women will make them able to purchase ITN as it has been
259 shown that respondents who do not own some business were less likely to possess an ITN.
260 Also, ITN retreatment services were low among pregnant women in the IDP camps.
261 Therefore, ITN retreatment services should be provided to those who need them so that they
262 can retreat their ITN which will allow the net to regain its protective value.

263

264 **Competing interests**

265 The authors declare that they have no competing interests.

266

267 **References**

- 268 1. Ministry of Health - Uganda. Annual Health Sector Performance Report. 2007
- 269 2. Mbonye AK, Bygbjerg IC & Magnussen P. Intermittent preventive treatment of
270 malaria in pregnancy: a new delivery system and its effect on maternal health and
271 pregnancy outcomes in Uganda. Bulletin of the World Health Organization. 2008;
272 86:81-160
- 273 3. Menendez C. Malaria during pregnancy: a priority area of malaria research and
274 control. *Parasitol. Today*. 1995; 11:178-183
- 275 4. Steketee RW, Wirima JJ, Campbell CC. Developing effective strategies for malaria
276 prevention program for pregnant African women. *Am J Trop Med and Hygiene*.
277 1996; 55 (1Suppl):95-100
- 278 5. Steketee WR, Bernard LN, Monica EP & Menendez C. The Burden of Malaria in
279 Pregnancy in Malaria-Endemic Areas. *Am. J. Trop. Med. Hyg.* 2001; 64:28-35

- 280 6. ter Kuile FO, van Eijk AM, Filler SJ. Effect of sulfadoxine-pyrimethamine resistance
281 on the efficacy of intermittent preventive therapy for malaria control during
282 pregnancy: a systematic review. *JAMA*. 2007; 297:2603–2616
- 283 7. World Health Organization: World Malaria Report. Geneva: World Health
284 Organization; 2005
- 285 8. Roll Back Malaria global strategic plan 2005 – 2015. Downloaded on 29/9/2013 from
286 http://www.rollbackmalaria.org/forumV/docs/gsp_en.pdf
- 287 9. Noor AM, Mutheu JJ, Tatem AJ, Hay SI & Snow RW. Insecticide treated net
288 coverage in Africa: mapping progress in 2000- 2007. *Lancet*. 2009; 373:58-67
- 289 10. Kimani EW, Vulule JM, Kuria IW & Mugisha F. Use of insecticide-treated clothes for
290 personal protection against malaria: a community trial. *Malaria Journal*. 2006; 5:63
- 291 11. United Nation High Commissioner for Refugee unpublished data from Gulu office
292 2008.
- 293 12. Gulu district Health Management and Information System record. Unpublished data
294 from July 2007 - June 2008.
- 295 13. Kish L, ed: Survey Sampling. John Wiley and Sons, Inc: New York 1965.
- 296 14. Roll Back Malaria Global Strategic Plan 2005-2015. Downloaded on 31/3/2011 at
297 http://www.rollbackmalaria.org/forumV/docs/gsp_en.pdf.
- 298 15. Uganda Bureau of Statistics report (2007) Uganda Demographic and Health Survey
299 2006
- 300 16. Kilian Albert, Hannah Koenker, Ebenezer Baba, Emmanuel O Onyefunafoa,
301 Richmond A Selby, Kojo Lokko and Matthew Lynch. Universal coverage with
302 insecticide-treated nets – applying the revised indicators for ownership and use to
303 the Nigeria 2010 malaria indicator survey data. *Malaria Journal*. 2013, 12:314
- 304 17. Mebrahtom B & Wakgari D. Use of insecticide treated nets by pregnant women and
305 associated factors in a pre-dominantly rural population in northern Ethiopia. *Tropical*
306 *Medicine and International Health*. 2008; 13(10):1303–1313
- 307 18. Dare OO & Badru OB. Promoting the use of insecticide treated materials at the
308 community level: experience from the ITN-oriade initiative. *Intl Quart Commun*
309 *Health Edu*. 2001; 20(3):281–95.
- 310 19. Yusuf OB, Dada-Adegbola HO, Ajayi IO & Falade CO. Malaria prevention practices
311 among mothers delivering in an urban hospital in southwest Nigeria. *J Vector Borne*
312 *Dis*. 2008; 45:217–224
- 313 20. Binka FN, Kubaje A, Aduik M, Williams LA, Lengeler C, Maude GH, Armah GE,
314 Kajihara B, Adiamah JH & Smith PG. Impact of permethrin impregnated bednets

on child mortality in Kassena-Nankana district, Ghana: a randomized controlled trial. *Tropical Medicine and International Health*. 1996; 1:147-154

21. Kiwuwa MS & Mufubenga P. Use of antenatal care, maternity services, intermittent presumptive treatment and insecticide treated bed nets by pregnant women in Luwero district, Uganda *Malaria Journal*. 2008; 7.

22. Van Eijk AM, Blokland IE, Slutsker L, Odhiambo F, Ayisi JG, Bles HM, Rosen DH, Adazu K & Lindblade KA. Use of intermittent preventive treatment for malaria in pregnancy in a rural area of western Kenya with high coverage of insecticide-treated bed nets *Tropical Medicine and International Health*. 2005; 10:1134-1140

23. NUwaha F. Factors influencing the use of bed nets in Mbarara municipality of Uganda. *Am J Trop Med Hyg*. 2001; 65:877- 82

24. Alaii JA, Van Den Borne HW, Kachur SP, Mwenesi H, Vulule JM, Hawley WA, Meltzer MI, Nahlen BL & Phillips-Howard PA. Perceptions of Bed Nets and Malaria Prevention Before and After a Randomized Controlled Trial of Permethrin-Treated Bed Nets in Western Kenya. *Am. J. Trop. Med. Hyg*. 2003; 68:142-148

25. Audrey P, Eboni T, Nku D, Duvall S, Tabala M, Meshnick S & Behets F. Bed net ownership, use and perceptions among women seeking antenatal care in Kinshasa, Democratic Republic of the Congo (DRC): Opportunities for improved maternal and child health. *BMC Public Health*. 2008; 8:331

26. Emmanuela EA, Humphrey DM, Jorg H, Gabone O & Damas LM. Knowledge, attitudes and practices regarding malaria and mosquito net use among women seeking antenatal care in Iringa, south-western Tanzania. *Tanzania Journal of Health Research*. 2011; 13(3)

27. Audrey P, Eboni T, Nku D, Duvall S, Tabala M, Mwandagalirwa K, Meshnick S & Behets F. Free distribution of insecticide treated bed nets to pregnant women in Kinshasa: an effective way to achieve 80% use by women and their newborns. *Tropical Medicine and International Health*. 2009; 14(1):20 - 28

28. Osero JS, Otieno MF, Orago AS: Mothers' knowledge on malaria and vector management strategies in Nyamira District, Kenya. *East Afr Med J*. 2006; 83(9):507-514.

29. Noor AM, Omumbo JA, Amin AA, Zurovac D & Snow RW. Wealth, mother's education and physical access as determinants of retail sector net use in rural Kenya. *Malar J*. 2006; 5:5

30. Guyatt HL, Ochola SA & Snow RW. Too poor to pay: charging for insecticide-treated bednets in highland Kenya. *Trop Med Int Health*. 2002; 7(10):846-50

- 350 31. Pulford, J., Hetzel, M.W., Bryant, M., Siba, P.M. & Mueller, I. Reported reasons for
351 not using a mosquito net when one is available: a review of the published literature.
352 *Malaria Journal*. 2011; 10:83.
- 353 32. Maxwell, C.A., Rwegoshora, R.T., Magesa, S.M. & Curtis, C.F. Comparison of
354 coverage with insecticides-treated nets in a Tanzanian town and villages where
355 nets and insecticides are either marketed or provided free of charge. *Malaria*
356 *Journal*. 2006; 5:44
- 357 33. Panter-Brick C, Clarke SE, Lomas H, Pinder M. & Lindsay SW. Culturally compelling
358 strategies for behaviour change a social ecology model and case study in malaria
359 prevention. *Social Science and Medicine*. 2006; 62:2810-2825
- 360 34. Thawani N, Kulkarni MA & Sohani S. Factors Associated with Coverage and Usage
361 of Long-Lasting Insecticidal Nets in Madagascar *Journal of Tropical Medicine*. 2009
- 362 35. Singh Megha, Graham Brown and Stephen J Rogerson. Ownership and use of
363 insecticide-treated nets during pregnancy in sub-Saharan Africa: a review. *Malaria*
364 *Journal* 2013, 12:268
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Tables

Table 1: Socio-demographic characteristics of respondents

Variable	Frequencies	Percentage
	n	(%)
<i>Age</i>		
14 - 25	423	55
26 - 45	346	45
<i>Level of Education</i>		
No Formal education	198	26
Primary	541	70
Secondary	026	04
Tertiary	002	00
<i>Marital Status</i>		
Married	232	30
Single	058	08
Cohabiting	477	62
Divorced	001	00
Widowed	001	00
<i>Gravidity</i>		
Multigravidae	648	84
Primigravidae	121	16
<i>Gestation Age in months</i>		
1 – 5 months	341	45
6 – 10 months	420	55
Have gone for antenatal visit		
Yes	511	67
No	255	33
Having experience child death immediately after birth		
Yes	105	16
No	534	84
Have ever experience miscarriage		
Yes	126	16
No	639	84
Having some business		
Yes	147	19
No	620	81
Having salary paying job		
Yes	007	01
No	761	99
Household monthly income		
0.00 to 5,000 Shillings	529	69
5,001 to 10,000 Shillings	077	10
10,001 to 29,999 Shillings	056	07
30,000 to 500,000 Shillings	107	14

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388 Table 2: ITN possession and pattern of use by pregnant women

Variables	Frequencies (n)	Percentage (%)
<i>Owning an ITN</i>		
Yes	324	42
No	445	58
<i>Sources of ITN</i>		
Given from Health Centre	233	72
Given by NGO	041	13
Bought it Myself	041	13
Others	008	02
<i>Numbers of ITN owned</i>		
2 or more ITN	082	11
1 ITN	242	31
No ITN	445	58
<i>ITN usage in the last one week before survey</i>		
Low Compliance	023	07
Moderate Compliance	024	08
High compliance	265	85
<i>ITN washed</i>		
No	062	19
Yes	262	81
<i>Numbers of time ITN washed</i>		
1 Time	029	11
2 Times	049	19
3 Times	044	17
4 Times and above	140	52
<i>ITN retreatment</i>		
Yes	039	12
No	285	88
<i>Reasons for not having ITN</i>		
I have given to children	006	01
No reason	013	03
I have not gone for antenatal visit	024	06
Burnt	038	09
Not bought	042	10
ITN is old	059	14
ITN torn	087	20
Not given from health centres	164	38

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400 Table 3: Respondents' perception and attitude toward ITN
401

Variables	Frequency	Percentage
	n	%
<i>Is it Good to use ITN</i>		
No	013	02
Yes	740	98
<i>Reasons for not being good to sleep under ITN</i>		
Hot at night	007	54
I do not know if it is good	005	38
I still get malaria even if I sleep under ITN	001	08
<i>Benefits of using ITN</i>		
Others	036	05
Prevent Malaria	306	42
Prevent Mosquito	383	53
<i>ITN effective at preventing mosquito bites</i>		
No	019	03
Yes	742	97
<i>Will you continue using ITN</i>		
No	012	04
Yes	301	96
<i>Reasons for not continuing ITN use</i>		
Causes itching of the eye	001	08
Is torn	001	08
Still hot	004	34
No mosquitoes at the moment	006	42
<i>Knew whether their ITN was treated</i>		
Not sure	039	12
No	044	14
Yes	241	74
<i>Willingness to buy ITN</i>		
Yes	374	49
No	382	51
<i>Reasons for not willing to buy ITN</i>		
Others	012	03
Still have ITN	034	09
No money	330	88
<i>ITN developing holes</i>		
Yes	149	46
No	175	54

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404 Table 4: Bivariate results for socio-demographic characteristics and possession of ITN
405

	Frequency	Have an ITN		OR	95% CI	P-Value
Variable	n	Yes	No			
<i>Age group</i>						
14 - 25	418	184	234	1.00		
26 - 45	345	138	207	0.85	0.63 - 1.13	0.264
<i>Have formal education</i>						
Yes	569	258	311	1.00		
No	196	066	130	0.61	0.44 - 0.86	0.004
<i>Antenatal visit</i>						
Yes	511	243	268	1.00		
No	255	081	174	0.51	0.37 - 0.71	0.000
<i>Experience of child death immediately after birth</i>						
Yes	105	049	056	1.00		
No	534	226	308	0.84	0.55 - 1.28	0.412
<i>Experience of miscarriage</i>						
Yes	126	057	069	1.00		
No	639	266	373	0.86	0.59 - 1.27	0.453
<i>Having some business</i>						
Yes	147	078	069	1.00		
No	620	246	374	0.58	0.40 - 0.83	0.003
<i>Having Salary Paying job</i>						
Yes	007	003	004	1.00		
No	761	322	439	0.97	0.22 - 4.39	0.974
<i>Household monthly income</i>						
1 st Quartile (0.00 to 5,000 Shillings)	529	211	318	1.00		
2 nd Quartile (5,001 to 10,000 Shillings)	077	034	043	1.19	0.74 - 1.93	0.476
3 rd Quartile (10,001 to 29,999 Shillings)	056	021	035	0.90	0.51 - 1.60	0.729
4 th Quartile (30,000 to 500,000 Shillings)	107	058	049	1.78	1.17 - 2.72	0.006
<i>Gravidity</i>						
Primigravidae	126	048	078	1.00		
Multigravidae	641	276	365	0.81	0.55 - 1.21	0.303
<i>Marital Status</i>						
Married/Cohabiting	708	316	392	1.00		
Single/Widow/Divorce	059	008	051	0.19	0.09 - 0.42	0.000
<i>Months of pregnancy</i>						
1 - 5 Months	341	125	216	1.00		
6 - 10 Months	420	195	225	1.50	1.12 - 2.01	0.007

407 Table 5: Logistic regression analysis of socio-demographic predictors of ITN possession
408

Variables	Crude OR	95% CI	P-Value	Adjusted OR	95% CI	P-value
Being Single/widow/divorce	0.22	0.10 - 0.48	0.000	0.22	0.12 - 0.42	0.000
No business	0.62	0.43 – 0.90	0.012	0.62	0.39 – 0.98	0.041
Have attended Antenatal service	1.92	1.39 – 2.66	0.000	1.92	1.31 – 2.83	0.001
Have formal education	1.69	1.19 – 2.39	0.003	1.69	1.11 - 2.56	0.014

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453 **List of IDP Camps in Gulu District as of June 2008 and Clusters**

Camp Name	County NAME	Sub-county NAME	Parish NAME	Popn (2008) Individuals	Women of child bearing age (15 – 49 years) (23% of the population)	Women expected to become pregnant (5% of the population)	IDP Camps Selected	Proportion of pregnant women selected in each IDP camp for survey
Oroko	Aswa	Palaro		3,439	791	40	Yes	28
Palaro	Aswa	Palaro	Labworomor	7,435	1710	86	Yes	60
Cet Kana	Aswa	Bungatira	Atiaba	1,272	293	15	No	
Koro-abili	Omoro	Koro	Pageya	7,316	1683	84	Yes	59
Corner Agula	Omoro	Lalogi	Lukwor	2,567	590	30	Yes	21
Paicho	Aswa	Paicho	Kal-Umu	6,525	1501	75	Yes	52
Monroc	Aswa	Bungatira		2,304	530	26	Yes	18
Cwero	Aswa	Paicho	Pagik	3,966	912	46	Yes	32
Acet	Omoro	Odek	Binya	13,383	3078	154	Yes	108
Patiko-Ajulu	Aswa	Patiko	Kal	5,873	1351	68	Yes	48
Lugore	Aswa	Palaro	Owalo	2,155	496	25	No	
Lukodi	Aswa	Bungatira		1,215	279	14	No	
Adak	Omoro	Lalogi	Lukwir	1,915	440	22	No	
Te-tugu	Omoro	Koro	Lapainat West	5,636	1296	65	Yes	45
Palenga	Omoro	Bobi	Palenga	4,756	1094	55	Yes	38
Atoo Hill	Aswa	Paicho	Kal-Umu	1,064	245	12	Yes	8
Alokolum	Omoro	Ongako	Alokolum	4,061	934	47	Yes	33
Awach	Aswa	Awach	Paduny	4,747	1092	55	Yes	38
Odek	Omoro	Odek	Binya	1,488	342	17	No	
Coope	Aswa	Bungatira	Agonga	4,451	1024	51	Yes	36
Awere (Gulu)	Omoro	Odek	Lamola	1,766	406	20	No	
Dino	Omoro	Odek	Palaro	1,474	339	17	Yes	12
Unyama	Aswa	Paicho	Pakwelo	5,058	1163	58	Yes	41
Lalogi	Omoro	Lalogi	Gem	3,264	751	38	No	
Okwir	Omoro	Bobi		150	35	2	No	
Opit	Omoro	Lalogi	Parwec	4,951	1139	57	Yes	40
Ongako	Omoro	Ongako	Kal	2,710	623	31	Yes	22
Bobi	Omoro	Bobi	Paidwe	1,813	417	21	No	
Omel Apem	Aswa	Paicho	Omel	353	81	4	No	
Awoo	Omoro	Lakwana	Parak	3,780	869	43	Yes	30
Minakulu	Omoro	Bobi	Palwo	3,450	794	40	No	
TOTAL	31			114,187	26263	1098		769

454 Source: IDP camps and population were based on UNHCR data as of 28th July, 2008.

455 Population of women of reproductive age and expected pregnancies were based on

456 Ministry of health statistical abstract of 2008/9