

EXPOSURE TO MALARIA PREVENTION MESSAGES AND INSECTICIDE TREATED BEDNET USAGE AMONG CHILDREN UNDER FIVE YEARS IN GHANA

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Abstract

This paper assesses exposure to messages on malaria prevention among household heads with children 0-4 years in Ghana, and examines whether exposure influences use of ITNs among these children in their households and if certain types of exposure (television, radio, health worker) are associated with ITN usage. We used data collected in the 2008 Ghana Demographic and Health Survey for which over 12,000 households were selected for interview. We used a final sample of 1770 households in our analyses. Bivariate and multivariate techniques were employed to examine the relationship between household head's level of exposure to malaria prevention messages and use of ITNs among children under five. Children under five years whose household heads had exposure to malaria prevention messages had over twice the odds of using ITNs as those whose household heads had no exposure. Household heads who were exposed through health workers and the radio had about 40 percent higher odds of using ITNs for their children under five years compared to those who did not have exposure through these channels while controlling for other channels. Campaigns must go beyond the production of messages regarding the hanging of bednets to include information on behaviour of mosquitoes to improve use of ITNs. Community-based educational campaigns involving health workers are recommended to target universal use of ITNs among under-five children in Ghana. There is also the need to improve literacy in order for other channels of information such as newspapers and posters to achieve similar results.

Keywords: Malaria, insecticide, bednet, under five

Introduction

Despite widespread awareness of the importance of insecticide treated bednet (ITN) usage as a malaria prevention strategy in Ghana, its use among children under five years is still low (Ghana Statistical Service et al., 2009). There is little empirical evidence on the relationship between exposure to malaria prevention messages and use of ITNs (Rhee et al., 2005), particularly in Ghana, as the available literature has largely focused on other determinants of ITN use (see Adongo et al., 2005 and De La Cruz et al., 2006). This study fills this gap and contributes to existing knowledge and preventive disease practice. Specifically, this paper assesses exposure to messages on malaria prevention among household heads with children 0-4 years in Ghana, and examines (1) whether exposure influences use of ITNs among these children in their households and (2) if certain types of exposure (television, radio, health worker) are associated with ITN usage.

In the absence of a vaccine or effective and sustainable means of vector control, use of ITNs is an effective way to limit mosquito bites and to kill the vector (Agyepong & Manderson, 1999). Thus, the use of ITNs is a valuable way to reduce malaria. Research suggests that ITNs can reduce malaria incidence (Njama et al., 2003) by 48–50 percent (Lengeler, 2004) and, if universally used, can prevent an estimated seven percent of global under-five mortality (Jones et al., 2003). More than one-third of the 108 malaria endemic countries, including Eritrea, Rwanda, and Zambia, have confirmed reductions in cases of malaria of at least 50 percent in 2008 from 2000 levels (WHO, 2009).

In Ghana, malaria control strategies include disseminating health education messages, which stress the importance of use of ITNs for preventing mosquito bites which cause malaria. Media outlets such as television, radio, newspapers, posters and leaflets are used for the health education campaigns. Health workers and community volunteers are also involved in the campaign to reduce malaria incidence in Ghana. Rates of ITN usage among children under five years have generally increased over time, going from 3.5 percent in 2002 to 55.3 percent in 2007 (Ministry of Health, 2009). There is considerable variability from year to year, however, and the rate for 2008 dropped to 40.5 percent. This could imply a lower impact of efforts to increase people's knowledge on ITN which would in turn increase their desire for ITN usage.

In the light of the need to increase ITN use to lower the burden of malaria, this study attempts to answer the following research questions:

1. What is the level of exposure of household heads with children under five years to malaria prevention messages?

2. To what extent does household heads' exposure to malaria prevention messages affect use of ITNs among children under five years in their households?

3. Is there any association between the channel through which household heads are exposed to malaria prevention messages and use of ITN among children 0-4 years in their households?

Malaria is hyper-endemic in all regions of Ghana, with the entire population of about 25 million or more at risk. Transmission occurs all year-round with seasonal variations from the rainy to the dry seasons (USAID, 2010). Malaria is the leading cause of death among children under five years (United Nations Development Programme, 2000; cited in Asante and Asenso-Okyere, 2003) as these children have not yet developed sufficient naturally acquired immunity against malarial parasites (UNICEF, 2007). According to health facility data from the Ghana Health Service (GHS), malaria is also the leading cause of morbidity, accounting for about 38 percent of all out-patient illnesses, 36 percent of all admissions, and 33 percent of all deaths in children under five years in the country. Between 3.1 and 3.5 million cases of clinical malaria are reported in public health facilities each year, of which 900,000 cases are among children under five years (USAID, 2011). Reported malaria cases represent only a small proportion of the actual number of episodes because the majority of people with symptomatic infections are treated at home and are, therefore, not reported (Roll Back Malaria, 2005).

Although, in Ghana, the rate of ownership of ITNs increased from three percent in 2003 to 33 percent in 2008 with the proportion of children under five years who were put under an ITN increasing from four percent to 28 percent within the same period (Ghana Statistical Service et al., 2004 and 2009), the percentage of children using a net is still below the World Health Assembly's target of 80 percent (WHO, 2009). It is hoped that an understanding of the relationship between heads of household's exposure to malaria prevention messages and ITN usage among children under five years would be helpful in better repackaging these messages to achieve expected results in the fight against malaria among children in Ghana and elsewhere in sub-Saharan Africa.

This study draws on Lasswell's (1948) framework on communication. Lasswell identifies some key components of communication study as the sender (who encodes and transmits), the content or message (communication substance), the channel (the medium through which message is transmitted), the receiver or audience (who decodes communication to derive meaning) and effect (some measurable outcome of the process). This study addresses four components:-the content; - (a specific message urging families to sleep under ITNs), the channel; - (television,

radio, etc.), the audience; - (household head) and the effect; - (whether children under five years sleep under ITNs).

Methodology

Data

This study uses data collected in the 2008 Ghana Demographic and Health Survey (GDHS); a household-based survey, implemented in a representative probability sample of more than 12,000 households selected nationwide. The survey utilized a two-stage sampling design. The first stage involved selecting sample points or clusters from an updated master sampling frame constructed from the 2000 Ghana Population and Housing Census. A total of 412 clusters were selected from the master sampling frame. The clusters were selected using systematic sampling with probability proportional to size. A complete household listing operation was conducted from June to July 2008 in all the selected clusters to provide a sampling frame for the second stage of households. The second stage of selection involved the systematic sampling of 30 households from each cluster. Data were not collected in one of the selected clusters due to security reasons, resulting in a final sample of 12,323 selected households. The 2008 GDHS is the latest of the demographic and health surveys to be undertaken in Ghana with preparations for the next one currently under way.

The household level analyses examine household head's exposure to malaria prevention messages, channel of exposure and use of ITNs among children under five years in the household. For the purpose of this paper, households which had children under-five living in them were selected, which resulted in a sample of 4,606. The sample was then restricted to the subset of those households that owned ITNs, reducing the sample size to 2,105. Due to missing data and discrepancies, a final sample of 1770 households was used in the analysis done in this paper.

Analyses Techniques

The methods of analyses comprise univariate, bivariate and multivariate techniques. At the univariate level of analysis, frequencies are used to describe level and channels of exposure to malaria prevention messages and the demographic and socio-economic characteristics of household heads. The relationship between each independent variable and use of ITNs is examined using cross tabulations. Two binary logistic regression models are used to determine the relationship of each independent variable with use of ITN (non-use and use). All the data were analyzed using the Statistical Package for Social Science (SPSS) software.

Measures

The dependent variable is use of ITN among children under five years who are members of the household. Household heads were asked about the use of ITNs by children under age five residing in the household. Use of ITN was originally coded in the dataset as 0= No; 1= All children slept under ITNs the night before the survey; 2= some children slept under ITNs; 3= no net in household. Because the category of “some children slept under ITNs” represented only eight percent, they were added to the category; “all children slept under ITNs”. Those who did not own ITNs were not included in the sample since the study is interested in ITN usage among those who owned them. New categories were, therefore, created as 0= Non-Use; 1= Use and this is with reference to only those who own ITNs.

Level of exposure to malaria prevention messages and the channels through which the household heads had exposure are the main independent variables. Exposure level has been categorized into those who heard or saw any messages in the last 12 months preceding the survey urging families to sleep under ITNs to prevent bites from mosquitoes which cause malaria and those who did not. The channels through which the prevention messages were received include television, radio, newspapers or magazines, posters, leaflets or brochures, health workers and community volunteers. Respondents could choose multiple channels.

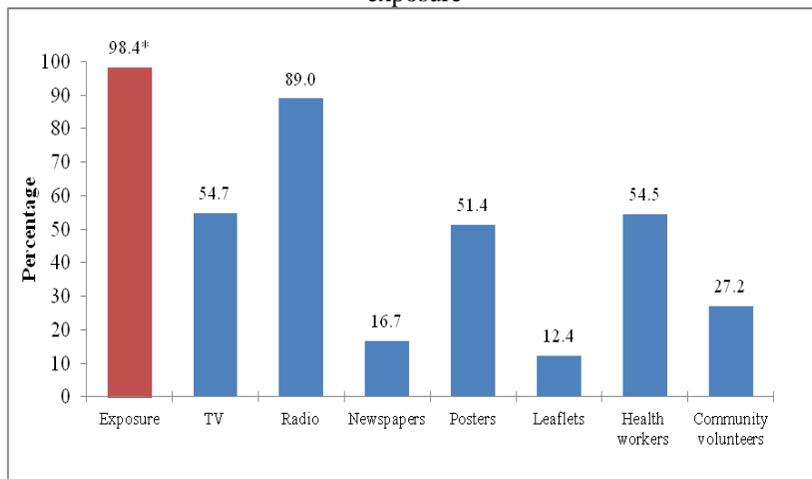
This study controls for demographic and socio-economic characteristics that influence use of ITNs, which include the age, sex, education and marital status of the household head, type of place of residence, region of residence and wealth status of the household. Data on age of heads of household were collected in single years but for the purpose of this study, these have been grouped into five-year ages. Household heads with ages below 25 years were grouped together, as were those 60 years and above, because the cases were few. Sex of household head is either male or female, and the type of place of residence is either rural or urban. Region of residence is grouped into the 10 administrative regions of Ghana. With regard to respondents' educational status, the categories included those who had no education and others whose highest level of education attained was recorded as primary education, middle/junior high education, secondary/senior high education and higher education. Respondents' marital status was classified as never married, married or living together and divorced or widowed. Finally, the wealth status of the household has been grouped into five quintiles namely the poorest, poorer, middle, richer and richest categories.

Results

As is expected to pertain to sub-Saharan Africa, more than two-thirds of household heads were males. Seventy-eight percent of household heads were between the ages of 25 and 49 years. More than half were in rural areas, with Ashanti Region recording the highest proportion of households. Sixty-two percent of respondents were educated beyond primary school. Seven percent had higher than secondary education and about 90 percent of household heads were either married or in consensual unions.

Ninety-eight percent of respondents reported to have heard or seen messages on malaria prevention specifically urging families to sleep under treated bednets to prevent mosquito bites which cause malaria (Figure 1).

Figure 1: Percent of household heads reporting exposure, in total, and by channel of exposure



Source: Computed from the 2008 GDHS household data set

*With the exception of exposure (red bar), the various channels of exposure (blue bars) are multiple responses

The bivariate results indicate that for household heads who had been exposed to malaria prevention messages, close to two-thirds of their under-fives used ITNs (Table 1) whereas fifty percent of those with no exposure put their under-five year-olds under ITNs.

Table 1: Rates of ITN use among children under five by household heads' exposure to malaria prevention messages

Exposure to malaria prevention messages	Percent Of Households Using Bednets	Total number
No	50	29
Yes	65	1,741
Total Sample	64.7	1,770

Source: Computed from the 2008 GDHS household data set

Level of exposure significantly increased among household heads with higher levels of education and those living in the poorest households. There were no statistically significant variations by age, sex, place of residence and marital status of household head (Table not shown).

The results show statistically significant variations in ITN usage among children under five depending on the channel of exposure (Table 2). For example, household heads who had exposure through community volunteers, had a higher proportion of their under-five year old children using ITNs compared to those not reporting this channel of exposure (72 percent vs. 62 percent). This is followed by those who mentioned health workers (69 percent vs. 60 percent among those not exposed) and radio (66 percent vs. 55 percent among those not exposed). Interestingly, a smaller proportion of those who had exposure to malaria prevention messages through television used ITNs for their children under five years (61 percent) compared to those who had no exposure through this channel (69 percent).

Table 2: Rates of ITN use among children under five years by channel of exposure to malaria prevention messages

Channel of exposure to malaria prevention messages	Use of ITNs	
	Percent of Households Using Bednets	Total number
<u>TV***:</u>		
No	69.3	802
Yes	60.8	968
<u>Radio***:</u>		
No	55.4	195
Yes	65.9	1575
<u>Newspapers/magazines:</u>		
No	64.6	1,475
Yes	65.4	295
<u>Poster:</u>		
No	63.3	861
Yes	66.1	909
<u>Leaflets/brochures:</u>		
No	64.4	1,551
Yes	67.1	219
<u>Health worker***:</u>		
No	59.6	806
Yes	69.0	964
<u>Community volunteer***:</u>		
No	62.1	1,289
Yes	71.9	481
Total Sample	64.7	1,770

Source: Computed from the 2008 GDHS household data set,

*** p-value <0.01

The results of the multivariate analyses indicated by Model 1 in Table 3 show that, net of a host of controls, under-five year-olds whose household heads had exposure to malaria prevention messages had over twice the odds of using ITNs as those whose household heads had no exposure at the 0.10 significance level. As shown in Model 2, (Table 4) household heads who were exposed through health workers and the radio had about 40 percent higher odds of using ITNs for their children under five years compared to those who did not have exposure through these channels while controlling for other channels. Children under five years living with household heads who had exposure through community volunteers had odds that were 32 percent higher than those whose household heads did not have exposure through this channel, controlling for other channels they may have had exposure from. Finally, male household heads, those younger than 35 years, those with higher educational levels and those living in the poorest households were more likely to have their under-five children use ITNs compared to those in female headed households, those aged 60+, the uneducated, and the richest households respectively. These results for the control variables were similar in both regression models.

Table 3: Logistic regression parameter estimates of the models on use of ITNs by children under five years

Model 1				
Variables	Odds ratios	P-value	95% CI for EXP (B)	
			Lower	Upper
Exposure (RC=No)				
Yes	2.228	0.056	0.980	5.066
Age of Household Head (RC=60+)				
Under 25	1.511	0.179	0.827	2.760
25-29	1.667	0.040	1.024	2.715
30-34	2.432	0.000	1.507	3.926
35-39	1.234	0.370	0.779	1.956
40-44	1.139	0.595	0.704	1.843
45-49	1.192	0.495	0.720	1.971
50-54	0.807	0.464	0.456	1.431
55-59	1.016	0.962	0.526	1.962
Sex of Household Head (RC=Female)				
Male	1.458	0.007	1.110	1.915
Type of Place of Residence (RC=Rural)				
Urban	0.790	0.104	0.594	1.050
Region of Residence (RC=Ashanti Region)				
Greater Accra	0.595	0.018	0.387	0.914
Western	0.673	0.040	0.461	0.982
Central	0.391	0.000	0.262	0.582
Volta	1.546	0.057	0.987	2.421
Eastern	0.903	0.613	0.607	1.342
Brong Ahafo	1.371	0.108	0.933	2.014
Northern	0.319	0.000	0.187	0.546
Upper East	0.890	0.681	0.510	1.552
Upper West	1.340	0.508	0.564	3.182

Highest Educational Level of Household Head (RC=No education)

Primary	0.810	0.251	0.564	1.161
Middle/JSS/JHS	1.085	0.611	0.792	1.486
Secondary/SSS/SHS	1.174	0.472	0.758	1.817
Higher	1.727	0.035	1.035	2.872

Marital Status of Household Head (RC=Never married)

Married/living together	1.103	0.798	0.521	2.334
Divorced/Widowed/Separated	0.941	0.883	0.420	2.111

Wealth Status of Household (RC=Richest)

Poorest	2.793	0.000	1.622	4.811
Poorer	1.427	0.129	0.902	2.259
Middle	1.483	0.065	0.975	2.253
Richer	1.296	0.167	0.897	1.872
Constant	0.372	0.125		
N	1770			

Source: Computed from the 2008 GDHS household data set, RC=reference category

Table 4: Logistic regression parameter estimates of the models on use of ITNs by children under five years

Variables	Model 2			
	Odds ratio	P-value	95% C.I. for EXP(B)	
			Lower	Upper
Channels of Exposure (RC=No)				
TV	0.792	0.077	0.612	1.025
Radio	1.402	0.050	1.000	1.965
Newspapers/magazines	1.063	0.714	0.765	1.477
Poster	1.021	0.863	0.809	1.288
Leaflets/brochures	1.056	0.770	0.731	1.526
Health worker	1.359	0.011	1.073	1.722
Community volunteer	1.317	0.053	0.996	1.742
Age of Household Head (RC=60+)				
Under 25	1.627	0.118	0.884	2.993
25-29	1.748	0.025	1.071	2.851
30-34	2.511	0.000	1.552	4.063
35-39	1.266	0.317	0.798	2.01
40-44	1.196	0.468	0.738	1.941
45-49	1.191	0.498	0.718	1.975
50-54	0.822	0.505	0.463	1.461
55-59	1.041	0.905	0.536	2.025
Sex of Household Head (RC=Female)				
Male	1.475	0.006	1.12	1.942
Type of Place of Residence (RC=Rural)				
Urban	0.789	0.108	0.591	1.054
Region of Residence (RC=Ashanti Region)				
Greater Accra	0.614	0.028	0.398	0.948
Western	0.675	0.044	0.461	0.989
Central	0.379	0.000	0.253	0.566
Volta	1.322	0.234	0.834	2.096
Eastern	0.881	0.536	0.590	1.316
Brong Ahafo	1.255	0.254	0.849	1.855
Northern	0.278	0.000	0.161	0.481

Upper East	0.772	0.366	0.440	1.354
Upper West	1.263	0.600	0.527	3.025
Highest Educational Level of Household Head (RC=No education)				
Primary	0.832	0.322	0.579	1.197
Middle/JSS/JHS	1.045	0.787	0.760	1.437
Secondary/SSS/SHS	1.091	0.704	0.697	1.705
Higher	1.623	0.076	0.951	2.771
Marital Status of Household Head (RC=Never married)				
Married/living together	1.090	0.821	0.516	2.301
Divorced/Widowed/Separated	0.926	0.851	0.413	2.075
Wealth Status of Household (RC=Richest)				
Poorest	2.456	0.002	1.389	4.343
Poorer	1.317	0.259	0.816	2.124
Middle	1.401	0.126	0.909	2.158
Richer	1.260	0.225	0.867	1.830
Constant	0.590	0.330		
N	1770			

Source: Computed from the 2008 GDHS household data set, RC=reference category

Discussion

The results show that there is almost a universal exposure to malaria prevention messages on ITN usage among household heads studied. This finding is not surprising as earlier reports have suggested that Ghanaians have high exposure to the print and broadcast media (GSS et al., 2009), which are major channels of malaria prevention messages in the country. This high exposure level is also similar to reports on contraceptive knowledge: 97.8 percent for women and 98.9 percent for men, and knowledge of AIDS: 98.2 percent for women and 99.2 percent for men (GSS et al., 2009). Furthermore, the results show that level of exposure to malaria prevention messages has increased from the 2003 GDHS level (89.4 percent) to 98 percent in 2008. In contrast to findings of other studies where there was a significant variation between males and females concerning malaria knowledge (Mazigo et al., 2010), this study found no statistically significant difference between male and female household heads regarding their level of exposure to malaria prevention messages.

This study demonstrates that exposure to the prevention messages influences ITN usage. The result is consistent with an earlier study in Ghana (Owusu-Agyei et al., 2007) and another in Tanzania (Minja et al., 2001). However, the fact that about a third of under-fives whose household heads had exposure did not use ITNs and almost half of those whose household heads did not have exposure used them is suggestive that ITN usage may depend on other factors and not on exposure to prevention messages alone. For those who had exposure and did not use bednets, it may be a result of lack of trust in the messages, which has been often expressed in African communities (Alaii et al., 2003). This was confirmed in a study using a focus

group discussion where a female participant stated “I have bought a mosquito net for my son and he sleeps under it every night but he was diagnosed with malaria”, indicating her skepticism based on the fact that she uses a bednet but malaria was not prevented as promised (Opiyo et al., 2007, p.14).

The results further demonstrate that the channel through which respondents are exposed to ITN messages matter. Learning about ITNs through health workers and community volunteers increases the use of ITNs more than other channels of exposure. This finding suggests that malaria prevention messages are more effective when transferred through health workers. This is supported by a study in Vanuatu (Atkinson et al., 2010) which found that participants appeared to be influenced by those that they saw as an authority when it comes to health issues. Besides, one-on-one dialogue provides instant opportunities for nagging questions to be addressed and skepticisms addressed to increase the possibility of usage. Therefore, doctors, village-based health workers (including both nurses and aid post volunteers) were most often reported to have the greatest influence on malaria prevention practices such as ITN use.

Exposure through radio is also statistically significantly associated with ITN usage. In addition to its widely accessible nature, other malaria control programmes such as the “*He Ha Ho*” (Healthier Happier Homes) which is broadcast on radio could explain this finding. Launched in 2002, “*He Ha Ho*” is a communication campaign, centred on a radio drama that aims to improve home-based care (HBC) for childhood illnesses and malaria. It was developed by the collaborative efforts of the Roll Back Malaria (RBM)/Integrated Management of Childhood Illness (IMCI) programmes division of the Ghana Broadcasting Corporation (GBC) with technical assistance from Johns Hopkins Bloomberg School of Public Health Center for Communication Programs (JHU/CCP). Interestingly, unlike radio, household heads who had exposure through television are less likely to have their children under five use ITNs but at the 10 percent alpha level. This was observed after controlling for all other channels of exposure to ITN messages. Further research is needed to explain this finding.

In addition to exposure to different campaigns, demographic and socio-economic characteristics of the household and the household head are also associated with use of ITNs. Younger household heads are more likely to report the use of ITNs among their children under five. Previous studies show that local beliefs and misconceptions were more frequently expressed by older people for non-use (Opiyo et al., 2007). A possible reason could be that younger people are more likely to heed health education messages they have been exposed to. Also, according to a theory of adoption of innovations commonly used in applied social psychology, young people are

likely to be innovators or early adopters of preventive technologies (Rogers, 1983, cited in Nuwaha, 2001). In addition to this reason, younger families are more likely to have more than one under-five child and are, therefore, more likely to use ITNs.

ITN usage is higher among under-five-year-olds who live in households headed by males. A plausible reason could be that men are ultimately responsible for decision making regarding bednet use in the household particularly in African societies. A study in Vanuatu reported that participants in a focus group discussion were quoted as saying “the father is the head of the house so he is the one that tells the children and the mother to use nets to protect them from malaria, ...we heard from the doctor that we should use the net to sleep under and so we, the fathers, as household heads, we make sure all the members of our family sleep under nets” (Atkinson et al., 2010, pp 8). In support of this viewpoint, Alaii et al., (2003) pointed out that while knowledge of prevention measures might be confounded by demographic variables like the age and education level of the household head, the actual usage of various methods including ITN might be decided by the household head, and in the case of a number of African countries, including Ghana, households are headed by males. Similarly, in Ayalew et al.’s study (2009), female heads of household were found to decrease the odds of net utilization.

Higher levels of education increased the odds of ITN usage, supporting other studies done in Ethiopia, the Democratic Republic of Congo and Tanzania (Ayalew et al., 2009, Ndjinga et al., 2010, Mazigo et al., 2010). However, in terms of wealth, under-five children in poorest households were found to be about three times as likely as the richest to sleep under ITNs as children from richest households. Recent reports, which are consistent with this finding, show that ITN usage is not determined by higher wealth. For instance, in Gabon, the percentage of net users was significantly higher among families in the lowest group of the economic score (Goesch et al, 2008). This is likely to be due to the fact poorer households are more likely to be found in locations that are more conducive for mosquitoes and may also lack additional malaria prevention tools such as window netting, and may thus, be left with no option than use of the ITN as a malaria-prevention measure. It may also be because poor households may be more commonly targeted for ITN campaigns compared to their counterparts who are relatively richer.

Limitations to the Study

This study is not without limitations. The data asked questions on exposure to malaria prevention messages from only household heads. As a result, household heads’ exposure and their demographic and socio-

economic characteristics were used to measure use of ITNs among children under-five. However, as stated earlier, other studies have noted that the actual usage of various methods, including ITN might be decided by the household head and may depend on the socio-economic status of the household (Alaii et al., 2003).

Furthermore, the study does not address knowledge about malaria. Research has shown that although exposure to malaria prevention messages is almost universal in some African countries, (Ghana Statistical Service et al., 2004, Hamel et al., 2001 cited in Legesse et al., 2007), knowledge about malaria transmission is still low. Less than half of study participants in Ethiopia for example, mentioned mosquito bites as a mode of malaria transmission (Legesse et al., 2007). Data availability, however, does not permit the examination of knowledge on malaria causation for which data were not collected in the Demographic and Health Survey used in this study.

Additionally, the binary logistic regression technique was used to analyze the relationship between channels of exposure (a multiple response question) and ITN usage. This model assumes the response is an additive function of being exposed through each channel, which may be unlikely.

Conclusion

Even though health education appears to positively impact ITN usage, usage of ITNs among even one of the most vulnerable groups - children under five years – is still below the Roll Back Malaria coverage target of 80 percent. Campaigns must go beyond the production of messages regarding the hanging of bednets to include information on the behaviour of mosquitoes to improve use of ITNs. For example, if people understand that there are many species of mosquitoes but only a few transmit the malaria parasite, they may not stop using the ITN because they have been bitten by mosquitoes before their bedtime. Although exposure to malaria prevention messages matters, it appears to be most effective when the messages are received through health workers, community volunteers and the radio. Community-based educational campaigns involving health workers are recommended to target universal use of ITNs among under-five children in Ghana. More efforts to use these channels will have the most impact on increasing use of ITNs. There is also the need to improve literacy in order for other channels of information such as newspapers and posters to achieve similar results.

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