Introduction

Despite the seemingly awareness of the importance of insecticide treated bednet (ITN) usage as a malaria preventive strategy in Ghana, there is still low use of ITNs among children under five years (GSS et al., 2009). This study seeks to assess the level of exposure to messages on malaria prevention among household heads of under-five year-olds in Ghana and to examine whether exposure influences use of ITNs among these children in their households. There is very 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 use of ITN. This study attempts to fill this gap and it is hoped that findings from this study would contribute to existing knowledge on the subject.

In the absence of a vaccine or effective and sustainable means of vector control, the most promising current intervention which both limits mosquito bites and kills the vector is the use of ITNs (Agyepong et. al, 1999). Research suggests that ITNs can reduce malaria incidence by 48–50 percent (Lengeler, 2004) and, if universally used, could 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 acknowledged reductions in cases of malaria of at least 50 percent in 2008 from 2000 levels. The decline in malaria cases and deaths in some of these countries have led to a decline in all causes of mortality among children under five years, suggesting that intensive efforts at malaria control could help many African countries to reach the MDG 4 target of a two-thirds reduction in child mortality by 2015 (WHO, 2011) and goal 6, which seeks to combat HIV/AIDS, malaria and other diseases. The use of ITNs is, therefore, a priority for malaria control and it is important to promote ITN usage in all countries in which malaria is endemic.

Malaria control strategies in Ghana include the dissemination of a number of 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 have also been involved in the campaign to reduce malaria incidence in Ghana. Research has, however, indicated inconsistent use of ITNs and according to the Ghana 2008 MDGs report, although ITN usage among children under five years increased from 3.5 percent in 2002 to 55.3 percent in 2007, it dropped to 40.5 percent in 2008 (Ministry of Health, 2009). This seems to suggest a low impact of the efforts being made to increase people's knowledge on ITN and to develop desirable attitudes and practices regarding its usage. In the light of the foregoing problems that relate to the use of ITNs in response to the disease burden and consequence of malaria, this study attempts to answer the following research questions: what is the level of exposure of household heads with under-fives to malaria prevention messages? To what extent does household heads' exposure to malaria prevention messages affect use of ITNs among children under five years in their households? Is there any association between the channel through which household heads are exposed to malaria prevention messages and use of ITN among children under five years in their households and which channels are more effective?

Background and Setting

Malaria is hyper-endemic in all parts of Ghana, with the entire population of about 24 million at risk. Transmission occurs all year-round with seasonal variations from the rainy to the dry season (USAID, 2010). It is the leading cause of death among children under five years (United Nations Development Programme, 2000, cited in Asante et al., 2003) as these children have not yet developed sufficient naturally acquired immunity against malarial

parasites (UNICEF, 2007). According to the Ghana Health Service (GHS) health facility data, malaria is the number one 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. 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 in children under five years. An estimated 14,000 deaths in children under five were attributable to malaria in 2008 (USAID, 2011). Reported malaria cases represent only a small proportion of the actual number of episodes as majority of people with symptomatic infections are treated at home and are, therefore, not reported (RBM, 2005).

In sub-Saharan Africa, malaria is directly responsible for one in five childhood deaths and indirectly contributes to a sizeable proportion of childhood morbidity and mortality resulting from other illnesses such as respiratory tract infections, diarrhoeal diseases, iron-deficiency anaemia and malnutrition (Breman et al 2001). This has serious demographic consequences for the continent such as high fertility. This is because high mortality among children usually results in high fertility (Kirk, 1996). In addition to the time and money spent on treating malaria, it causes considerable pain and weakness among its victims (Bradbury et al., 2005). Children who suffer from malaria may suffer recurrent fever, malnutrition, delays in cognitive development, and in cases of severe malaria, neurological damage (Bradbury et al., 2005). Frequent episodes of severe malaria among young children may have a negative effect on their learning abilities and educational attainment. This threatens human capital accumulation, a relevant issue in economic development.

Despite the huge malaria burden in Africa, the use of control measures is currently limited and coverage of ITN, which has been proven to be an effective intervention for reducing morbidity and mortality, is low in many African countries; less than 10 percent in some areas (Wiseman et al, 2007). Although the percentage of African households estimated to own at least one ITN increased from 17 percent in 2006 to 31 percent in 2008 and more children under five years of age used an ITN in 2008 (24 percent) compared to previous years, the percentage of children using a net is still below the World Health Assembly's target of 80 percent (WHO, 2009).

Theory

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 deals with four components-the second; in this case a specific message urging families to sleep under ITNs, third; channels of exposure, fourth; household head as receiver of the message and fifth; whether under-fives in the household sleep under ITNs.

Research has shown that greater knowledge about malaria causation, symptoms and prevention as well as groups most vulnerable to malaria does not necessarily translate into improved health behaviour (De La Cruz et. al, 2006). According to Adongo et al., (2005, p.376) "knowledge and behaviour change have no simple and direct relationship, and other intervening and contradicting variables may lead to behaviour consistent and inconsistent with knowledge". The gap between knowledge, attitudes and practices, however, is not a new phenomenon neither is it peculiar to malaria. This is because similar results have been noted

for the use of condoms (Ogbuji, 2005) and other family planning methods (Obisesan et al., 1998).

In a longitudinal study carried out in one of five geopolitical divisions of Kampala, Uganda, using logistic regression for analysis, it was found that although 53 percent of respondents were aware of the effectiveness of bednets in preventing malaria, only 25 percent reported using bednets (Njama et. al, 2003). On the other hand, a study conducted on "Communication Impact: Rural communication activities increase net use in Tanzania" found that after controlling for age, education, socio-economic status, malaria knowledge, receipt of voucher, and exposure to general media, households that were exposed to the road-shows, were more than twice as likely to have all of their children under-five sleeping under an ITN. Some studies have supported research from applied social psychology and health education, where attitudinal and self-efficacy beliefs are very important in influencing health-related behaviour (Ajzen, 1991, cited in Nuwaha, 2001). Nuwaha's study reported that during and after a malaria epidemic in western Uganda, the intensification of media campaigns on bednet usage may have accounted for higher bednet usage in his study compared to previous reports in the country.

Another study in Tanzania showed that there was an increase in ownership and use of ITNs by the population after a social marketing strategy, which reinforced public health messages to promote ITNs was developed (Minja et. al, 2001). Although the study did not directly evaluate the impact of promotional activities, the sharp rise in ownership and use of ITNs by the population (from 10 to more than 50 percent) suggests that they contributed significantly to the success of the social marketing programme. Hetzel et al., (2008) attributed the extremely high bednet usage (98 percent) in Tanzania partly to the success of health education and social marketing in promoting the use of ITNs.

Data source, sample size and variables

This study uses data collected in the 2008 Ghana Demographic and Health Survey; a household-based survey, implemented in a representative probability sample of more than 12,000 households selected nationwide. The survey utilized a two-stage sample 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 a 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 of the households listed in 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.

This study considered only households which had children under five years residing in them. It is a household level analysis which looks at household head's exposure to malaria prevention messages, channel of exposure and use of ITNs among children under five years in the household. The data were, therefore, screened to extract households which had under-five year-olds living in them and a sample of 4,606 was realized. In assessing usage of ITNs by children under five years in households in which household heads had been exposed to malaria prevention messages and owned ITNs, the sample size reduced to 2105.

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 mosquito bites 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. This study controls for demographic and socio-economic characteristics that the literature has established as associated with use of ITNs, which include age, sex, education, marital status of household head, type of place of residence, region of residence and wealth status of household. The dependent variable is use of ITN among children under five years who are members of the household. Household heads were asked how many mosquito nets they owned and the responses ranged from one to seven. A new variable was, therefore, created which categorized ITN ownership into those who owned at least one. Use of ITN was originally coded 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; 4= missing. Because the proportion of some children who slept under ITNs formed only six percent, there 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. At the bivariate level of analysis the missing cases were coded as those who did not state whether they used ITNs or not. At the multivariate level, however, the missing cases were automatically taken out of the model. New categories have, therefore, been created and for the bivariate analysis these are: 0= Non-Use; 1= Use; 2= Not stated. For the multivariate analysis, the categories are 0= Non use; 1= Use of ITN and this is with reference to only those who own ITNs.

Preliminary analyses

The methods of analyses comprise univariate, bivariate and multivariate techniques. All the data were analysed using the Statistical Package for Social Science (SPSS), version 17.0. From multivariate models net of a host of controls (age, sex, education and marital status of household head as well as place of residence, region of residence and wealth status of household), the results show that under-five year-olds whose household heads had exposure to malaria prevention messages were 61 percent more likely to use ITNs than those whose household heads had no exposure. This finding suggests that exposure to malaria prevention messages has a positive impact on ITN usage. The result is consistent with a study done in Ghana, which found that after intensification of malaria control activities and awareness creation over a three-year period, the proportion of under-five children who used treated bednets increased from 47 percent to 83 percent between 2000 and 2003 (Owusu-Agyei et al., 2007).

Planned Analyses

This study has shown that a very high proportion of the study population had exposure to malaria prevention messages. In spite of this fact, use 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. This study therefore intends to explore whether the seven channels of exposure outlined in the data (television, radio, newspapers or magazines, posters, leaflets or brochures, health workers and community volunteers) have any association with ITN usage. These channels would be distilled into three categories (exposure through humans, electronic and print media) to see which groups are most associated with ITN usage. And this may vary by different sub groups for instance highly educated or younger household heads may have different channels from their older counterparts or those with no education.

Table1: Percentage distribution of household heads by channel of exposure

Channel of Exposure	Percent
Exposure	94.1*
TV	49.6
Radio	80.5
Newspapers/magazines	14.7
Posters	44.2
Leaflets/brochures	10.6
Health workers	47.7
Community volunteers	24.5

* With the exception of exposure, the rest are multiple responses

Table 2: Percentage use of ITN among children under five by household heads exposure to malaria prevention messages

Exposure to malaria prevention messages	Use of ITNs			
	Non-use	Use	Not stated	Total number
No	46.1	48.7	5.2	76
Yes	32.9	60.6	6.5	2,029
Total %	**33.4**	**60.1**	**6.5**	
Number	**703**	**1,266**	**136**	**2,105**

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

Independent variables	Logit Coefficient (B)	Standard Error	Odds Ratios (Exp(B))
Exposure			
Yes	0.476*	0.261	1.610
No (RC)			1.000
Age of HH head			
Under 25	0.367	0.292	1.443
25-29	0.539**	0.234	1.714
30-34	0.913***	0.230	2.492
35-39	0.295	0.220	1.343
40-44	0.192	0.230	1.212
45-49	0.280	0.241	1.323
50-54	-0.194	0.274	0.823
55-59	0.076	0.323	1.079
60+(RC)			1.000
Sex of HH head			
Male	0.333**	0.133	1.395
Female (RC)			1.000
Place of residence			
Urban	-0.241*	0.139	0.786
Rural (RC)			1.000
Region of residence			
Greater Accra	-0.491**	0.208	0.612
Western	-0.428**	0.187	0.652
Central	-0.889***	0.195	0.411
Volta	0.408*	0.219	1.504
Eastern	-0.084	0.196	0.919
Brong Ahafo	0.330*	0.191	1.390
Northern	-1.209***	0.255	0.299
Upper East	-0.238	0.262	0.788
Upper West	0.326	0.424	1.385
Ashanti (RC)			1.000
Education			
Primary	-0.160	0.175	0.852
Middle/JHS	0.114	0.152	1.121
Secondary/SHS	0.175	0.214	1.191
Higher	0.605**	0.253	1.832
None (RC)			1.000
Marital status			
Married/living together	0.322	0.360	1.380
Divorced/widowed	0.072	0.389	1.075
Never married (RC)			1.000
Wealth quintile			
Poorest	1.087***	0.266	2.967
Poorer	0.514**	0.226	1.672
Middle	0.457**	0.204	1.579
Richer	0.315*	0.182	1.370
Richest (RC)			1.000
Constant	-0.991	0.541	0.371

Source: Computed from the 2008 GDHS Data set

*** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10

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