Mosquito Bed Net Ownership and Use in Lautem District, East Timor

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Abstract

Following the 1999 referendum in East Timor, mass forced migration, extensive infrastructure damage, widespread house burning, the suspension of vector control measures, and reduced access to health care sparked concern that malaria, endemic in the region, would emerge in epidemic proportion. In response, WHO launched mass distribution of insecticide treated bed nets, which have been shown to improve morbidity and mortality in children in many parts of the world, but had not before been used on a mass scale in East Timor. Now in a post-emergency phase, East Timor must develop ways to address the health problem of malaria within the context of an extremely limited health budget. Information about bed net ownership and use is important in developing long-term health plans. Lautem district, in the far eastern region of East Timor, has the highest rates of suspected malaria cases in the country. Two years after the referendum, it is unknown how widely bed nets were distributed there, or what determines their use. The aims of this study were (1) to assess the prevalence of bed net ownership and use in Lautem district and (2) to determine factors correlated with ownership and use. A cross-sectional household survey of 330 households selected randomly using a two-stage cluster sample found that 85% of households own bed nets, and 64% of households use them. In a multivariate logistic regression model, household ownership of bed nets was found to be associated with education and the presence of children under the age of 5. Among bed net owning households, actual use of bed nets was found to be directly correlated with the knowledge that mosquitoes cause malaria, high SES (as indicated by education and occupation), the presence of children under the age of 5, and the number of bed nets owned. This study showed that ownership and use of bed nets are not the same thing, and the factors accounting for that difference include income level, knowledge about malaria, and the number of bed nets owned. These findings may be useful in increasing levels of bed net use in East Timor and in similar settings.

Introduction and Literature Review

Insecticide-treated bed nets have been shown to be effective in reducing the burden of malaria, especially in children. A systematic review of insecticide treated bed nets and curtains compared with

also made of poured concrete. Very few houses have screened windows, and almost all of the houses were observed to allow for mosquito-human contact.

There are few data on bed net use in Lautem district. Based on anecdotal evidence gathered through discussions with district residents and health service providers, there was little use of bed nets in Lautem District during the Indonesian occupation. Government programs countrywide appeared to be limited to intermittent spraying and passive surveillance [47], [48]. A malaria "knowledge, attitudes, practice" survey of six districts in East Timor, including one community in Lautem District, was conducted in April of 2000, after the initial distribution of emergency bed nets. This survey found 83% of families reporting that someone was currently sleeping under a bed net. Asked about their use of bed nets before the 1999 referendum, 42% of families reported that they used nets pre-conflict [49]. In July of 2000, a malaria prevalence survey in Lautem District, including the sub-districts Lautem and Los Palos, found that 18 of 87 families (21%) had bed nets [44]. These two surveys, both of which took place before the distribution of PermaNets, lead to different conclusions about the ownership and use of bed nets in Lautem district. In the context of limited information about bed net uptake and usage levels, therefore, the survey reported below is the first designed specifically to determine bed net coverage and usage levels in Lautem District as a whole.

Methodology

This population-based cross-sectional survey was carried out in Lautem District, East Timor, in June and July, 2001. The study was conducted by the International Rescue Committee (IRC), a non-governmental organization working in East Timor. The survey instrument was adapted from a prior KAP survey conducted in East Timor on malaria by IRC [49]. That survey had been adapted from a previous survey conducted in Liberia, also on malaria. The survey was translated from English (Appendix 1) into Bahasa Indonesian (Appendix 2) and Fataluku, a language spoken widely in Lautem District. There were no resources available for back-translation of the survey, or for pre-testing of the survey instrument, although the prior survey instrument had been pre-tested. The revised survey included more detailed

information on bed nets, as well as information about the individuals in the household and some sociodemographic information.

All households in the district of Lautem were included in the study population. Sample size was calculated based on sampling methods designed for "Knowledge, Practice, Coverage" surveys in Child Survival programs [50]. A two-stage cluster sample of 330 households (30 clusters of 11 households each) was selected as being feasible given available resources and staffing.

The Lautem District Health Administrator for the United Nations Transitional Administration for East Timor (UNTAET) and the Lautem District Health Officer for the East Timorese Transitional Administration (ETTA) met with IRC to discuss implementation of the survey and its methodology. Both stated their support of the project.

Population data broken down by sub-village was provided by village leaders to IRC's Los Palos nurse-educator in August 2000 for the purposes of tracking bed net distributions. These data were similar to official UNTAET and ETTA Division of Health Services figures, and were used for cluster selection. Cumulative population of the entire district was listed by sub-village. The total population was divided by 30 (the number of clusters required), yielding the sampling interval. A random number was selected between one and the sampling interval, using banknote serial numbers. The sub-village in which this number fell was selected as the first cluster. The sampling interval was added to this first number, and the sub-village in which the cumulative population included the second number was chosen as the second cluster. This process was repeated until all 30 clusters had been selected (see Appendix 3).

Three East Timorese nurses were trained to administer the survey and record the results, and two Fataluku-speaking translators were trained to work as survey translators. The training included three days of discussion, role plays, and field practice. The field survey team consisted of the interviewers, the translators, a public health intern (myself), and an IRC driver.

Upon arrival in a village, the survey team spoke with the village leader or, if he was not in the village, his deputy, to explain the project and obtain permission to conduct household interviews. We then asked the village leader to take us to the center of the community. From there, we selected a random

direction by spinning a pen on a clipboard. Following that random direction of the penpoint, we counted the number of houses (n) between the center and the edge of the community, consulting the village leader about where the village boundaries were located. (In many villages, the boundaries were not clear, as villages were often located contiguously.) We then chose a random number between 1 and n using banknote serial numbers. The house corresponding to that number was the first house surveyed in a cluster. From that house, we visited the next closest house, skipping houses where no one was home or where no adult was present, until we had interviewed 11 households.

The interview took place with the head of the household when present. If he or she were not present, an adult 18 years or older present in the home was interviewed. If no adults were present in the home, interviewers skipped that household. The number of households skipped was not recorded. During the interview, IRC staff physically verified the presence of bed nets in the home, asking to see each net that was reported present. A bed net was defined as being currently in use if it was strung up above the bed, mat, or sleeping area when the interviewer was in the home.

Upon completion of a cluster, the questionnaires were gathered and collated. After all the surveys were completed, questionnaire data were entered into a database for analysis using EpiInfo 2000. Data were cleaned and a preliminary descriptive report was completed in East Timor [51]. In the United States, data were analysed using univariate analysis and multiple logistic regression.

Dependent variables. This study examined two dependent variables. The first was bed net ownership. The definition of bed net ownership was that a household possessed at least one bed net, used or unused. A bed net was counted even if it was not one of the nets that IRC had distributed in Lautem. The second dependent variable was bed net use. The criterion for bed net use was that a household used at least one net, as evidenced by their reporting use in the previous night *and* a physical verification by the interviewer, accomplished by asking to see the sleeping place. A bed net that was strung up over a sleeping place and reported to have been used the previous night was included even if the net was torn or was not one of the nets that IRC had distributed. The household was defined as the group of people sleeping in the house the previous night together with those family members who usually sleep in the

house but who were temporarily absent due to hospital stay or time spent sleeping in the rice fields. Both dependent variables were binary, making logistic regression attractive for multivariate analysis.

Independent variables. The independent variables were: the presence of children under 5 years old in the household; the presence of a pregnant woman in the household; high relative income, for which sources of income included private business, church employment, NGO employment, or UN employment, all of which provided a cash income, as opposed to households relying solely on farming, fishing, or humanitarian assistance; highest educational status achieved by anyone in the household in one of four school levels (no education, primary education, secondary education, and college education); knowledge of what causes malaria, indicated by the inclusion of mosquitoes or mosquito bites in response to the question "what causes malaria?"; malaria morbidity reported for any household member within the past month; number of people in the household; adequacy of bed net coverage, for which less than or equal to three people per net owned was considered adequate coverage and any more than that was considered inadequate (this was based on the programmatic goals of the Lautem district bed net distributions, which aimed to provide one bed net for every three people); and number of nets owned by the household, a figure which included both used and unused nets.

Data analysis. The unit of analysis was the household. Differences between proportions found in different groups were tested for statistical significance using the chi-square test. Crude odds ratios and 95% confidence intervals were calculated. Differences between averages found in different groups were tested for statistical signficance using the t-test. Differences in central tendency for ordinal data were tested for statistical significance using the Wilcoxon rank-sum test.

Continuous and ordinal variables found to be significant predictors of the outcome in the crude analysis were examined to determine the proper form for logistic regression modeling. Log odds ratios were plotted by categories of the variable to see whether there was a linear relationship between the variable and the outcome. A model was also fitted of the variable and the variable multiplied by itself (the power term) to determine whether there was evidence against an assumption of linearity (see Appendix 4).

Stepwise multivariate logistic regression procedures were used to determine the best model for describing the relationship between the independent variables and the outcome. Variables that did not improve the fit of the logistic regression model as measured by the likelihood ratio test were left out of the model. Not all variables that were significant via univariate analysis were used in the multivariate analysis, as some were found to be well described by a combination of others, and it was decided that they were largely measuring the same thing but had different intepretability. Only those factors that remained significantly associated with the outcome in the presence of other significant factors remained in the final models.

Adjusted odds ratios and 95% confidence intervals were calculated after multivariate analysis. In all cases, a p-value of less than 0.05 was considered statistically significant. The statistical software package SAS was used for the analysis.

Results

Demographic characteristics. Three hundred and thirty (330) households in Lautem District, East Timor, were interviewed in June and July, 2001, over a period of four weeks. During this time, heavy rains and flooding displaced hundreds of people, destroying crops and homes and causing extensive damage to several major roadways in the district. This flooding delayed completion of the survey by about two weeks. Village and sub-village leaders all agreed to take part in the project. At the household level, there was one refusal. There were 1,701 people reported in the 330 households, for an average household size of 5.2 people. Fifty-one percent (50.8%) of the sample population was female, and 49.2% was male. Forty-six (46) households reported that a pregnant woman was living there, for a total of 13.9% of the households. Children under 5 years old were present in 186 households, or 56.4% of the homes. At the individual level, there were 301 children under the age of five in the sample (17.7%). The age and sex distribution of the sample population is presented in Figure 1.

Socioeconomic factors. For those individuals 16 years and older (868 people), 404 (47%) had never attended school, 189 (22%) had attended primary school, 259 (30%) had attended secondary