Nationwide survey of bednet use in rural Gambia

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A nationwide survey was carried out to investigate the use of bednets in rural areas of the Gambia, particularly among children under 5 years old and among pregnant women. A stratified multistage design was used; 360 compounds in 60 villages were visited. Overall, 58% of beds had a net, with very little difference between villages with primary health care (PHC) facilities and those without (non-PHC). Bednet use was higher in the Central Region (76%) than in the Western and Eastern Regions (both 51%). It was highest among the Jola ethnic group (77%) and lowest among Sarahulis and other minority groups.

Use of bednets was higher among target groups (such as infants, children under 5 years old, and pregnant women) than among the general population, and reached a level of over 90% in these groups in the Central Region. Use was associated with possession of a metal bed and a radio.

Previous trials of impregnated bednets in the Gambia have been carried out in the Central Region, where bednet use is highest. The efforts of the National Impregnated Bednet Programme should therefore concentrate on the other regions and among the minority ethnic groups in order to increase bednet ownership.

Introduction

The Gambia is a narrow country in West Africa, stretching inland for approximately 400 km and extending along both sides of the Gambia river. The climate is typically sub-Sahelian with a long dry season from mid-October to June/July, and a shorter rainy season covering the remaining months. Despite the short transmission period, malaria remains one of the major health problems in the country.

The efficacy of insecticide-impregnated bednets in reducing malaria morbidity has been well shown in the Gambia (*1, 2*). In a more recent trial (*3*), an important reduction in mortality was observed in children aged 1–4 years who used impregnated bednets and who lived in villages with primary health care (PHC) facilities. Following these results, the Gambian Ministry of Health decided to implement a nationwide programme of bednet impregnation via the PHC system. This would cover all the PHC villages over a 2-year period, possibly with a subsequent extension to non-PHC villages. As part of the preparation for this programme, it was necessary to estimate the proportion of the population who habitually slept under bednets.

Despite the widespread use of bednets worldwide, we have been unable to find any published data on national levels of such use. In Ghana (F. Binka, personal communication, 1992) and Kenya (R. Snow, personal communication, 1992) the use of bednets has been reported to be as low as 10% or less, and only 3.7% in Yaoundé (Cameroon) (*4*). In Burkina Faso people do not use bednets (F. Esposito, personal communication, 1992). In the Gambia, data collected by the Medical Research Council (MRC) and nongovernmental organizations indicate that the level of net ownership varies between areas; to obtain more information a nationwide survey of net ownership was undertaken in September 1991 using a stratified multistage sampling scheme.

The main objectives of the survey were to evaluate the extent of using bednets in rural areas and their use between different ethnic groups. Further information was collected on the proportions of infants, 1–4-year-old children, and women aged 15–45 years who slept under bednets as these would be the target groups for the National Impregnated Bednet Programme (NIBP).

The study also looked at some simple socioeconomic indicators that could be linked with the ownership of a bednet; this information could help in directing the efforts of the educational campaign in areas where their use is particularly low.

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Reprint No. **5489**

Methods

The incidence of malaria, although an important cause of mortality in towns, is lower in urban than in rural areas (5). Therefore, the NIBP has been targeted first at rural areas. For this reason, all urban and peri-urban areas (Kombo North District with the capital Banjul and all communities with more than 3000 people, according to the 1983 national census) were excluded from the survey. The Gambian PHC programme reaches all communities with a population of more than 400. The survey was stratified by region (Western, Central and Eastern) and by PHC/non-PHC villages, forming six strata in all. Within each region five districts were selected, in each district two PHC and two non-PHC villages were chosen, and then in each study village six compounds were chosen. Districts and villages were selected with probability proportional to size (pps), the size being estimated from the 1983 national census. Compounds were selected within a village using a modification of the EPI (Expanded Programme on Immunization) sampling scheme. From the centre of each village a direction was chosen by randomly spinning a pen and the first three compounds in that direction were chosen. Standing at the centre of the village, another direction was chosen randomly and the last three compounds towards the edge of the village were chosen. Whenever a selected village contained less than six compounds, the nearest village of similar size was visited to complete the sample. In each village, an MRC field assistant visited the six compounds chosen, counted the numbers of beds and hanging nets, and administered a questionnaire.

Estimates and standard errors for proportions of beds with nets were calculated taking into account the design of the survey, using the CLUSTERS package (International Statistical Institute Research Centre, Voorburg, Netherlands). Weighting was introduced into the analysis to allow for stratification, and for inequalities in the proportion of the population who lived in PHC villages between districts.

Results

A total of 360 compounds were visited, 120 in each region; half of them were in PHC villages and the other half in non-PHC villages. A total of 3867 beds were recorded. Compounds visited in the Eastern region had on average more beds (11.6 per compound) than the Central (10.8) or Western (9.9) regions, and PHC villages had bigger compounds with more beds (12.5) than non-PHC villages (8.9). Mandinkas, the ethnic group represented most frequently in PHC villages, had 100 compounds out of 180 (56%), while the Fulas were the biggest ethnic group in non-PHC villages with 76 compounds out of 180 (42%).

Nationwide, 58% (95% confidence interval, 48% to 68%) of all beds had a net (Table 1). Although there was no difference overall in their use between PHC and non-PHC villages, there was a large difference between regions (76% in the Central Region compared with 51% in the Eastern and Western regions). The Jolas were more likely to use nets than members of the Mandinka, Wollof or Fula ethnic groups; and other ethnic groups, mainly Sarahulis, were less likely to use them.

Use of nets among groups particularly vulnerable to malaria (Table 2) was higher among children aged under 1 year, children aged 1–4 years and pregnant women than among the general population, and was almost universal in the Central Region. There were no differences between PHC and non-PHC villages in this respect (data not shown).

Bednet use was higher among those who slept on metal beds than on any other type of bed (Table 3), and this difference persisted after stratification by ethnic group (data not shown). The presence of a radio in the compound was an indicator of a higher use of bednets (Table 3, $z = 2.54$, $P = 0.01$), but ownership of a bicycle, motorcycle or cart was not related.

Table 1: **Percentage of beds with nets according to region, village type (PHC or non-PHC), and ethnic group**

	PHC villages (*n*=2261)	non-PHC villages (*n*=1606)	All villages (*n*=3867)
Overall	57.8 (6.1)[a]	57.3 (8.4)	57.7 (5.1)
Region:			
Eastern (*n*=1185)	49.2 (12.3)	55.7 (12.8)	50.8 (10.0)
Central (*n*=1293)	78.7 (3.3)	67.6 (13.3)	75.8 (4.0)
Western (*n*=1389)	52.5 (7.1)	45.1 (18.4)	51.4 (6.5)
Ethnic group:			
Jola (*n*=227)	80.5 (0.0)	69.0 (0.7)	76.5 (2.9)
Mandinka (*n*=1752)	63.4 (9.5)	72.9 (15.0)	64.4 (8.8)
Fula (*n*=902)	69.1 (4.3)	42.7 (11.3)	56.4 (6.5)
Wollof (*n*=566)	46.1 (13.1)	64.6 (12.7)	54.6 (10.5)
Other (*n*=420)	30.2 (11.7)	33.9 (18.8)	30.4 (11.1)

[a] Figures in parentheses are the standard errors.

Table 2: **Percentage of members of target groups for malaria control using bednets, by region**

Target group	Eastern	Central	Western	All regions
Children (<1 year) (*n*=295)	55.7 (13.6)[a]	95.5 (2.7)	57.9 (9.9)	67.7 (7.3)
Children (1–4 years) (*n*=1219)	63.6 (11.1)	92.5 (2.7)	65.5 (8.0)	71.8 (5.8)
Pregnant women (*n*=156)	62.3 (12.8)	91.2 (4.0)	58.2 (12.7)	67.2 (7.7)

[a] Figures in parentheses are the standard errors.

The design effect for overall bednet use, representing the loss of precision due to taking a stratified multistage sample rather than a simple random sample of compounds, was 5.89, leading to a rate of homogeneity of 0.444 (*6*), a high value indicating that the level of use is very variable between districts.

Discussion

Despite the low level of bednet use reported in other parts of Africa, this study showed that almost 60% of the rural Gambian population sleep regularly under nets. Bednets have been used for a long time in this country (*7*). High mosquito density seems to be an important factor influencing bednet ownership: their use in the Eastern and Western Regions is considerably lower than in the Central Region where, because of the presence of rice fields, the mosquito density is much higher (M. Thomson, personal communication, 1992). Another contributing factor is the absence in the Central Region of Sarahulis and other minority ethnic groups whose use of bednets is low. The results of this survey show very little difference in bednet use among the major ethnic groups. Even the Fulas and Wollofs, who were reported to be poor users in previous studies (*7, 8*), were found to have an overall rate of 56% and 55% respectively. As there was no difference in bednet use between PHC and non-PHC villages, the national programme could be extended to the whole rural population if an impact on malaria mortality and morbidity is shown in the first 2 years of the programme.

Table 3: **Percentage of beds with nets according to type of bed and presence of selected objects in the compound**

Type of bed:		
Metal (*n*=1472)	73.3 (4.3)[a]	
Carved wood (*n*=993)	46.2 (6.0)	
Bamboo (*n*=948)	47.5 (7.8)	
Millet stalk (*n*=397)	54.0 (6.7)	
Modern objects in compound:	Yes	No
Bicycle (in 34.9% of compounds)	53.6 (7.4)	61.4 (5.2)
Motorcycle (in 7.0% of compounds)	54.9 (9.5)	58.3 (4.8)
Radio (in 75.7% of compounds)	59.7 (5.0)	44.7 (7.7)
Cart (in 41.0% of compounds)	58.4 (6.1)	56.8 (5.4)

[a] Figures in parentheses are standard errors.

Metal beds are the commonest type of beds used in the Gambia, and 73% of such beds have a net. Considering the cost of a metal bed (more than 300 dalasi, US$ 30), this suggests that economic factors as well as cultural factors may determine bednet purchase. However, these factors are not easy to identify. As already reported (*7*), only the presence of a radio could be linked with bednet ownership. This may be due to the promotion of bednets as a malaria control method by the government through the media.

All previous trials of impregnated bednets in the Gambia have been carried out in the Central Region (*3*) where their use is the highest in the country, with >90% coverage of target groups such as children under 5 years of age. The nationwide programme, in which all bednets in PHC villages are to be dipped in insecticide, could have a smaller impact than expected, particularly in the Eastern and Western Regions where bednet use is lower. The efforts of the national programme should therefore be concentrated in these areas, and among minority ethnic groups, in order to increase bednet ownership.

Acknowledgements

We thank Dr Kabir Cham, Mr John Stratton and the Farafenni field staff who contributed to various aspects of this

study. The study was financially supported by the UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases.

Résumé

Enquête nationale sur l'utilisation des moustiquaires dans les zones rurales de Gambie

En Gambie, une étude récente a révélé une réduction importante de la mortalité chez les enfants âgés de 1 à 4 ans qui dorment sous des moustiquaires et habitent des villages possédant un centre de soins de santé primaires (CSSP). Au vu de ces résultats, le Ministère de la Santé a décidé de mettre en œuvre un programme national d'imprégnation des moustiquaires de lits pour tous les villages dotés d'un CSSP. Une enquête nationale a été effectuée en 1991, selon un système d'échantillonnage stratifié à plusieurs étapes, pour mieux cerner les conditions d'utilisation des moustiquaires. La stratification a été faite par région (Ouest, Centre et Est) en distinguant les villages dotés ou non d'un CSSP, ce qui a conduit à la création de six strates. Cinq districts ont été choisis dans chaque région, puis deux villages avec CSSP et deux villages sans CSSP ont été retenus dans chaque district. Enfin, une version modifiée du système d'échantillonnage du PEV (Programme élargi de vaccination) a été appliquée pour choisir six ensembles de logements dans chaque village.

Au total, 360 ensembles de logements ont été visités, soit 120 dans chaque région; la moitié d'entre eux se trouvaient dans des villages avec CSSP et l'autre moitié dans des villages sans CSSP. Dans l'ensemble du pays, 58% des lits (intervalle de confiance à 95%: 48% à 68%) possédaient une moustiquaire. Globalement, on n'a pas noté de différence dans l'utilisation des moustiquaires entre les villages avec ou sans CSSP, mais la différence d'une région à l'autre était considérable (76% d'utilisation dans la région Centre contre 51% dans les régions Est et Ouest). En ce qui concerne les groupes ethniques, la plus forte utilisation a été constatée chez les Jola (77%) et la plus faible chez les Sarahulis et d'autres groupes minoritaires. Chez les nourrissons de moins d'un an, les enfants de 1 à 4 ans et les femmes enceintes, l'utilisation était plus élevée que dans la population générale, et elle était presque universelle dans la région Centre. A cet égard, les villages avec CSSP ne différaient pas des villages sans CSSP. L'utilisation des moustiquaires était plus développée chez les personnes qui dormaient sur des lits de métal que chez les autres. Compte tenu du coût d'un lit de métal (plus de 300 dalasi ou US$ 30), on peut penser que les facteurs économiques ont autant d'influence sur l'achat des moustiquaires que les facteurs culturels. D'autre part, la présence d'un poste de radio dans un ensemble de logements était un indicateur d'utilisation plus fréquente des moustiquaires. Cela peut être dû aux campagnes du gouvernement dans les médias présentant les moustiquaires comme un moyen de lutte contre le paludisme.

A la différence des essais précédents de moustiquaires imprégnées, qui avaient été menés dans la région Centre, il faudrait concentrer les efforts de la campagne nationale sur les autres régions et sur les groupes ethniques minoritaires afin d'inciter la population à se procurer des moustiquaires et à les utiliser.

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