

The use of a Campaign Information Management System for rapid and efficient mass distribution and monitoring of Long Lasting Insecticidal Nets in an urban setting of Bioko Island

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It is well established that long-lasting insecticidal nets (LLINs) can be used as a core vector control tool to reduce malaria transmission in endemic countries. LLINs provide both personal and community protection against malaria. For LLINs to provide community protection, universal coverage of every household having at least one LLIN for every two people in a given population is recommended. Ensuring universal coverage during mass distribution campaigns, and monitoring the use and durability of nets in urban settings characterized by high population density and mobility, particularly where houses are not enumerated, poses a major challenge. The Bioko Island Malaria Control Project (BIMCP) developed an Open Data Kit (ODK) and Geographical Information System (GIS) based Campaign Information Management System (CIMS) in 2014 for efficient and rapid household enumeration, LLIN distribution, and campaign monitoring on Bioko Island. The CIMS continues to be used in 2018 to carry out a mass LLIN distribution campaign on Bioko Island. Approximately 175,000 LLINs will be distributed door-to-door to a population of about 330,000 people in 85,000 households during a five-month period by a team of 50 enumerators and 100 volunteers. This system helps to identify enumerated households for field teams, facilitates revisiting closed or rejecting households to increase coverage, and can track nets distributed at the household level. Household information can be captured and analyzed in near-real-time to estimate coverages within defined geographic areas and used to allocate and mobilize additional resources if desired coverages have not been reached. The use of the CIMS tablet application has required substantial training for enumerators, but has ultimately increased operational efficiency and programmatic integrity, and has been adapted for use in multiple concurrent large-scale campaigns.

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ABSTRACT

Background

Long-Lasting Insecticidal bed nets (LLINs), a core vector control tool, have been used to reduce malaria transmission in malaria endemic countries. LLINs provide both personal and community protections against malaria. For LLINs to provide community protection, universal coverage of every household having at least one LLIN for every two people is recommended in a given population (WHO, 2015). Attaining universal coverage during mass distribution campaign and monitoring the use and durability of the nets in urban settings in Africa where housing units are not properly demarcated and most often characterized by high population density and mobility is a major challenge.

Objective

To use GIS-based Campaign Information Management system (CIMS) for efficient, rapid distribution and monitoring of LLINs during mass distribution campaign on Bioko Island.

RESULTS

- During the Mass Distribution Campaign, census of households and the population was carried out on Bioko with the CIMS.
- A total of about 70,000 houses were counted capturing a population of 238,711.
- Taking into consideration the population of the Island, 155,855 of LLINs were distributed during the 2018 mass distribution campaign.
- The percentage of houses that received at least 1 LLIN was 85% (Fig 7).
- Average number of LLINs distributed per house is 2.2 (Fig 7).
- Others important indicators that were captured using the CIMS were following:
 - Average number of persons per LLIN is 1.5
 - LLIN utilization among the general population was 47.3% (3 months after distribution) (Fig 8)
 - LLIN utilization among pregnant women was 51.9%
 - LLIN utilization among children under 5 years old was 54.6%

District	Inhabited houses	% of houses that received an LLIN	Number of LLIN distributed	Protected inhabitants	Average Bed Net/house	Average Bed Net/Person	% of Bed Nets hanging
Urban District 1	5,006	87%	10,339	15,145	2.1	1.5	78%
Urban District 2	8,233	85%	17,516	27,870	2.1	1.6	81%
Urban District 3	17,289	85%	39,803	62,414	2.3	1.6	70%
Urban District 4	11,164	84%	23,402	36,686	2.1	1.6	68%
Urban District 5	15,099	84%	30,822	49,269	2.0	1.6	70%
Malabo Rural	1,528	91%	3,093	5,263	2.5	1.4	78%
Banery District	8,776	86%	21,906	32,764	2.5	1.5	81%
Bilala District	863	92%	1,997	2,286	2.3	1.1	84%
Luba District	2,569	91%	6,177	7,014	2.4	1.1	74%
Total	70,527	85%	155,855	238,711	2.2	1.5	75%

Fig 7: 2018 LLINs coverage

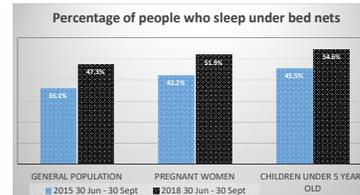


Fig 8: LLINs utilization (2015 and 2018)

DISCUSSION

- The system is efficient in identifying each household for the field team, avoids duplication of nets in households, and can track nets distributed to individuals at the household level.
- It provides in real time the population of the Island and the number of households necessary for estimating the number of LLIN to purchase for mass distribution.
- In addition, the system facilitates the collection, storage, processing and analysis of information within a very short period after the distribution.
- Universal coverage of LLINs on Bioko island achieved during the 2108 distribution campaign however LLIN utilization remain low.

Conclusion

The GIS-CIMS in use in Bioko is efficient and adaptable operational model for massive campaign activities in large urban cities for malaria control interventions and monitoring.

METHODS

Bioko island

Bioko is located 32 km off the coast of Cameroon with a population of approximately 335,000 people. Bioko is home to the Equatoguinean capital Malabo. Malaria transmission occurs throughout the year (Fig.1.).

BIMCP GIS-CIMS

The BIMCP GIS based Campaign Information Management System (CIMS) has created a geo-referenced mapping system that assigns each household a unique building identifier. The Island is divided into 1 km² sequentially numbered map areas (M), which in turn are subdivided into 100m² sequentially numbered sectors (S). Within each sector, the houses are numbered sequentially (E) using printed high resolution satellite images. Buildings with more than one households are ascribed a unique number for each household. Households residing in multi-story buildings receive a floor identifier (P) and the field team adhere stickers to each household entryway (e.g., M335 S49 E128 P1) (Fig 5). The information from the field maps and the database of each household are then digitized in ArcGIS software application and updated when new households are created.



Fig 1: Equatorial Guinea and Bioko Island

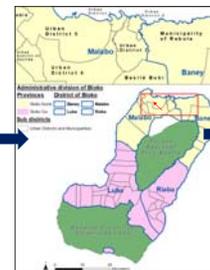


Fig 2: Visualization of the geo-political limits of Bioko Island

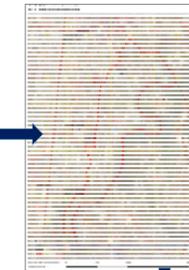


Fig 3: Community and Area Map



Fig 6: Volunteers hanging a bed net

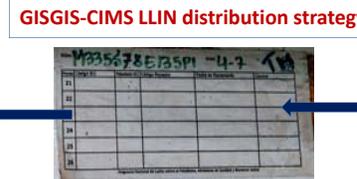


Fig 5: Sticker with the UNIQUEBID of a house



Fig 4: Sector Map

REFERENCES

Global Technical Strategy for malaria 2016–2030. Geneva: World Health Organization; 2015 (http://www.who.int/malaria/areas/global_technical_strategy/en/).

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