

# Spatial dynamics of ground-level malaria prevention; tackling severe paediatric malaria in Sierra Leone through motorcycle mapping and community empowerment.

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## Introduction:

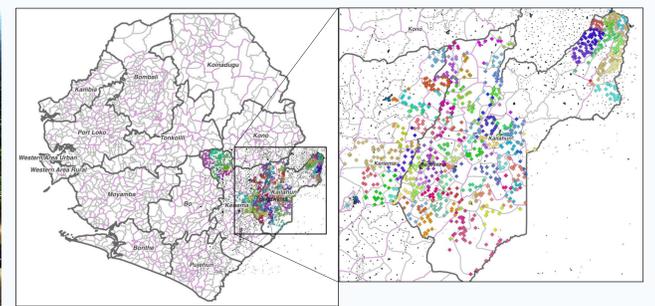
Malaria is a leading cause of paediatric death in Sierra Leone. Rurally, bed net distribution is advertised through vehicle-mounted announcements with ticket distribution at a village level. These tickets are subsequently exchanged in person at Primary Health Units (PHUs) during 'Wel Bodi' week for bed nets: the final destination of bed net distribution is unrecorded. Records at Nixon Memorial Methodist Hospital in Segbwema, Njaluahun chiefdom, Kailahun district, Sierra Leone, were hand-searched in May 2017 and rarely resulted in reliable inpatient origin or primary diagnosis documentation. We report the implementation of an innovative public health tool, designed to serve the staff of Nixon Memorial Methodist Hospital and the students of its affiliated nursing school, and example its utilisation through the design of a malaria primary prevention project throughout Njaluahun chiefdom that is currently in progress.

## Methods:

Local community members were recruited and trained to survey the 1,950 villages in the 11 chiefdoms served by Nixon Memorial Methodist Hospital, using OpenDataKit and OsmAnd. Surveyors were paired with local motorcycle drivers to reach all villages identified by satellite imaging and ascertain each community's definition of their village's name (or names), the various spellings, and its district, chiefdom and section. The main outcomes were a comprehensive map (OpenStreetMap) and the production of a 'Gazetteer' to ascertain patient origin on hospital arrival through a step-wise record of patient origin, linked to true GPS coordinates.



Fieldwork: motorcycle mapping in rural Kailahun

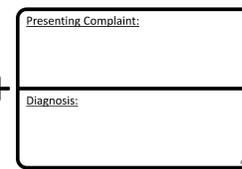


Mid-progress: seven weeks of village-level mapping with two crews (eight surveyors)

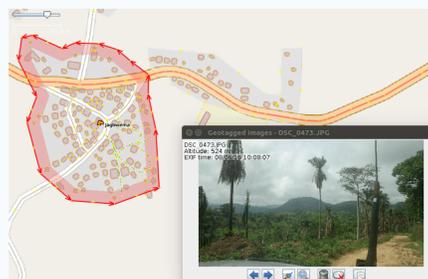
Improved coding was addressed by implementing a specially designed 'stamp', added to clinical notes on patient arrival by the hospital registrar in order to emphasise a clinician's primary diagnosis and allow a platform for the hospital registrar to question illegible or ambiguous entries.

### Hospital stamp:

A presenting complaint/diagnosis field was added to outpatient department slips and inpatient clerking. The process purposefully included active stamping during registration (rather than editing the electronic file) to emphasise the importance of the diagnoses collected.



**Ongoing:** Bed net distribution will be mapped comprehensively from all points of distribution in June 2019, using a Gazetteer (identical to that currently used in the hospital) at each of the 14 PHUs within Njaluahun chiefdom. This will allow village-level comparisons between severe malaria incidence in under-fives (currently being audited at Nixon Memorial Methodist Hospital) and the proportion of the under-five population receiving bed nets in the 134 villages of Njaluahun chiefdom, calculated from local surveying and satellite counts of dwellings/population-projections.



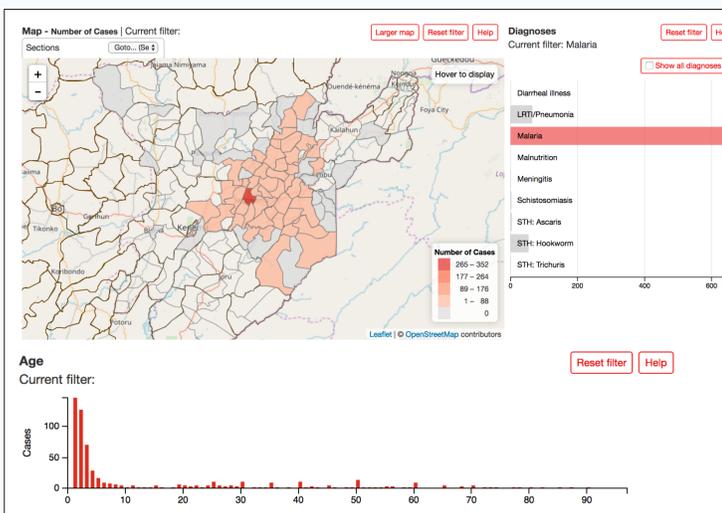
Dwelling counts: recorded from up-to-date satellite imagery

### Gazetteer:

A structured and systematic determination of patient origin (or bed net distribution in upcoming project), sequentially established district, chiefdom, section and village name using a coded booklet or 'Gazetteer'. Data entries from each village resulted in unique coding, tagged to GPS coordinates. The name of the village chief was used for cross-reference and quality assurance.

District: Kailahun Chiefdom: Kpeje Bongre			S19
Section: Seimaya			
Village name	Other names	Village chief	Meaning of village name
Faalahun		Lahai Swaray	
Fabiana		Joseph B Brima	Fabiana means why did u go there
Foindu 2		Saidu Lahai	
Gbahama		Koroma Bockarie	
Mbawomah		Jusu Musa	
Saffa Town		Bockarie Allieu	
Salina		Sheku Charles	
Waterloo		Momoh Ansu	

## Results:



### Dashboard:

An interface that reads data recorded from hospital ledgers and presents them as geographically labelled counts, with the ability to filter by date/age/diagnosis/section.

Software updates are being engineered to present data as incidence rather than absolute case numbers, using dwelling counts and local population surveys, and calibrate for hospital proximity and accessibility. Recent preliminary questioning found schools in the local area to contain four-fold as many students as registered, according to government statistics.

New features are being designed for the upcoming project, including the ability to toggle layers of resolution and view individual villages.

Twelve months after initial implementation, patient origin is continuing to be recorded in a reliable and sustainable manner with ongoing stamp record of primary diagnosis and minimal external influence. A 'dashboard' has been designed and implemented, based on software originally engineered by Medecins sans Frontieres (MSF) and provided with permission, to visualise diagnoses both spatially and temporally in a manner accessible to end-users (both hospital staff and students of the hospital's affiliated nursing school). The initial mapping effort has also provided a proof of concept, allowing the development of a methodology 'playbook' of workflows and product-modelling. This has been utilised in further humanitarian efforts in both Tanzania and Uganda.



Playbook: Organisations utilising experience from West African Motorcycle Mapping (WAMM) project

## Discussion:

The hospital's nursing school (with a student-body of 300) continues to provide community outreach services, including drives combating malaria, across Njaluahun chiefdom. Recording village-level bed net distribution and paediatric severe malaria caseload will offer this organisation, participating in community outreach, a tailored dataset to ask "why is *this* village having paediatric cases of severe malaria". We intend for this dataset to not only direct community outreach project planning but also stimulate public health and primary prevention discussion within the nursing school student body, strengthening understanding that can be taken with community nurse graduates as they move within the country for their future careers. In addition to this, multiple sub-Saharan communities are benefiting from our proof of concept, utilising Android technology now widely available across the continent.

Grant kindly provided by:



Project website:

