

Improved Monitoring of IRS coverage on Bioko Island through the use of GIS-Based Campaign Information Management System (CIMS)

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Medical Care Development
International



CONTENTS

- Bioko Island Malaria Control Project (BIMCP)
- BIMCP Indoor Residual Spraying (IRS)
- GIS-based Campaign Information Management System (CIMS)



en Guinea Ecuatorial

Bioko Island, Equatorial Guinea

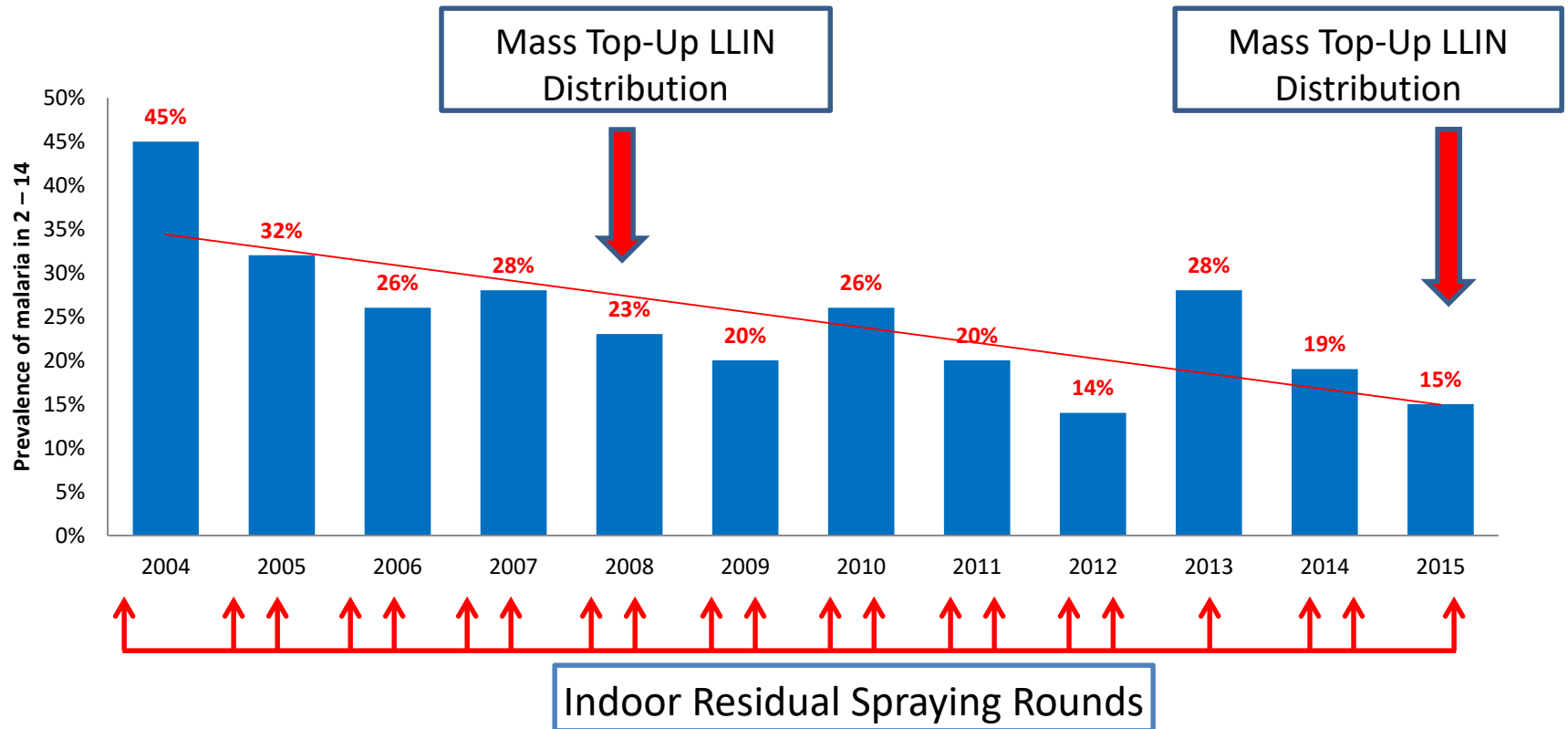
- Small volcanic Island about 2,000km²
- Main Island of Equatorial Guinea with a population of ~250,000
- Highly endemic, year round malaria transmission setting; primary health burden prior to control



BIMCP Integrated Malaria Control

- Island-wide IRS from 2004 -2014
 - 2015 focalized IRS
- LLIN distribution
 - Island-wide mass distributions in 2008, 2015, planned in 2018
 - Routine keep-up through antenatal clinics since 2009 + starting in 2016 through all primary schools
- Intermittent Preventive Therapy in Pregnancy through Government ANC
- Case management for uncomplicated malaria
 - Training of government health providers in diagnosis and treatment
 - Supply of RDTs, reagents for microscopy, and ACTs
- Monitoring and Evaluation
 - Robust vector monitoring system
 - Annual Malaria Indicator Surveys ($n_{2015} = 23408$ individuals, 5236 hh)
 - National Health Information System in Government health facilities
 - **GIS based Campaign Information Management System (CIMS) since 2014**

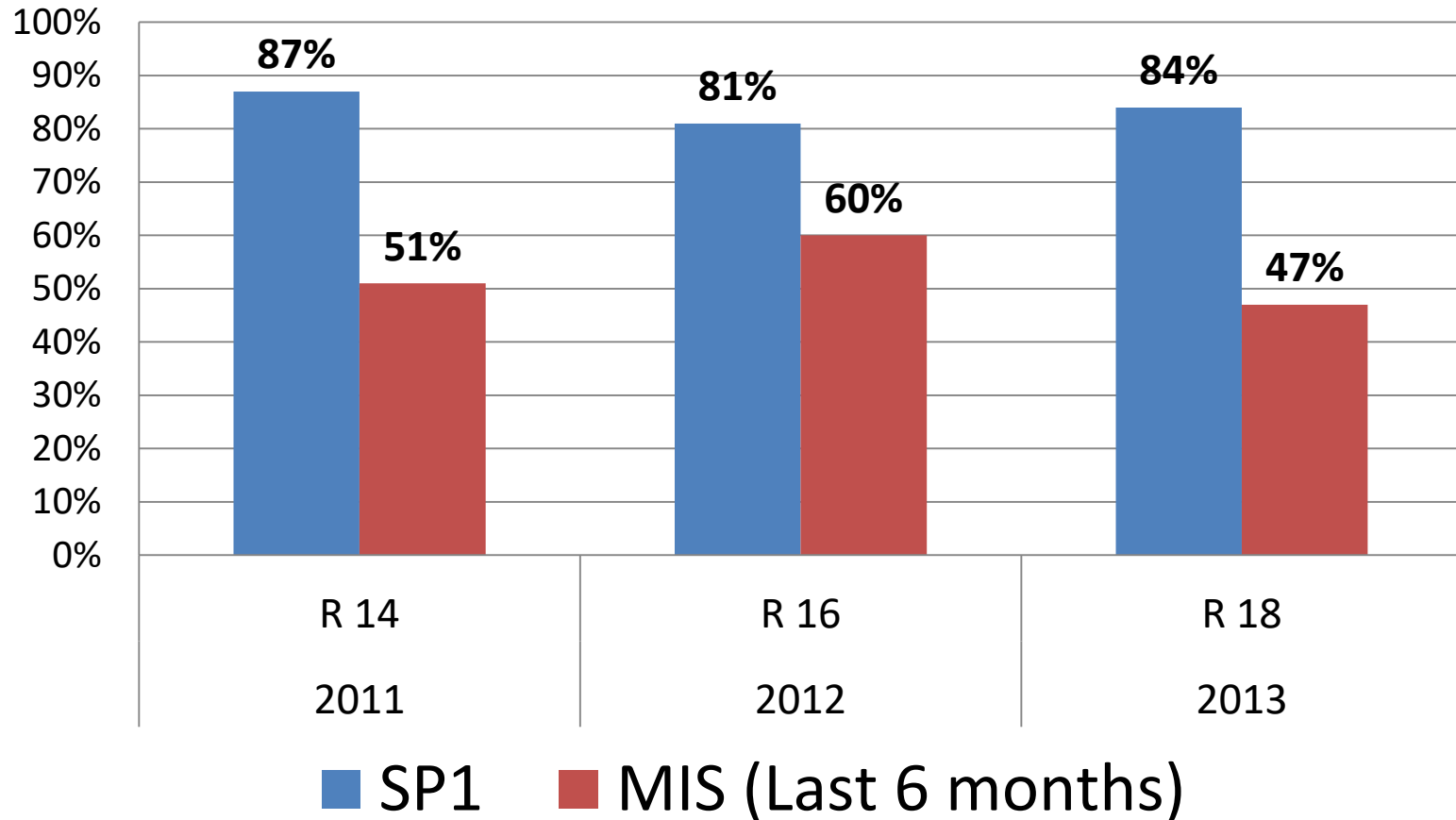
Impact of BIMCP control



- Malaria prevalence in 2-14 year old children declined from 45% pre intervention to 15% in 2015 **(Source BIMCP)**
- Moderate to severe anemia fell from 15% pre intervention to 2% in 2011 **(Bradley et al., 2012)**
- All cause under Five mortality declined from 152/1000 births to 55/1000 in the first four years post intervention. **(Kleinschmidt et al., 2009)**

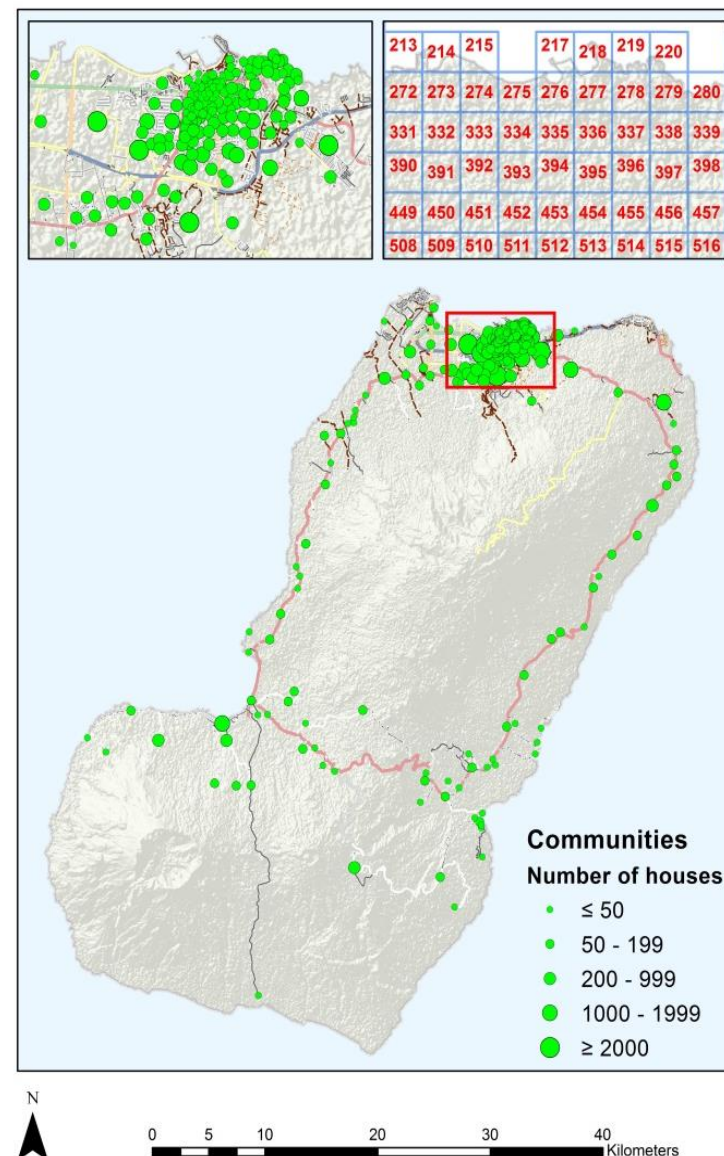
Challenges in calculating IRS coverage

IRS coverage per Round



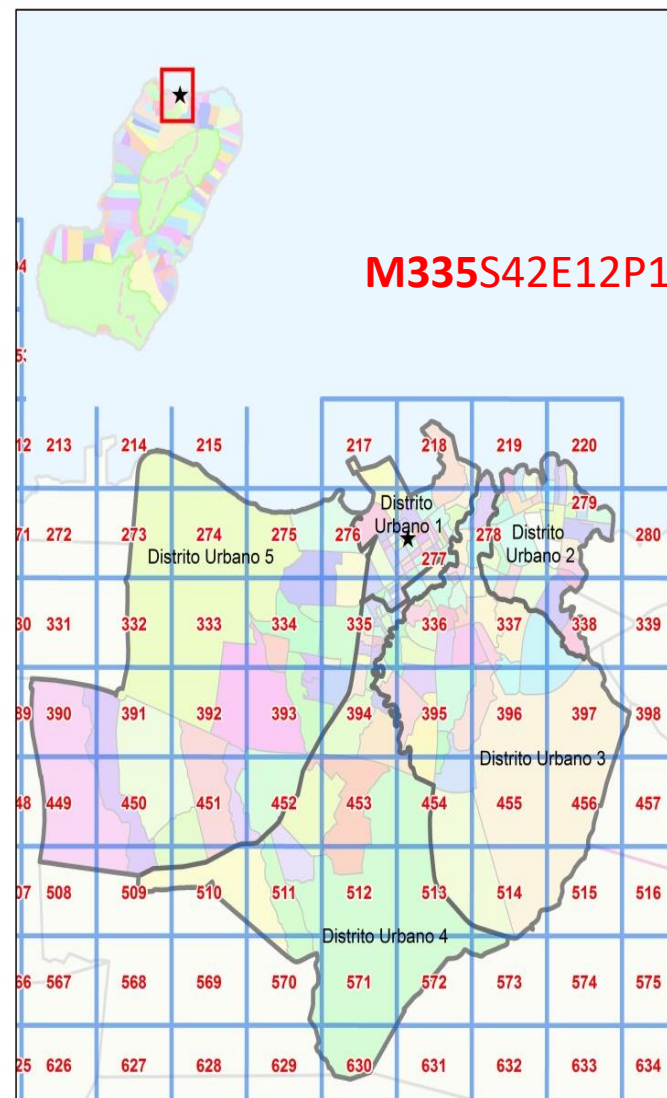
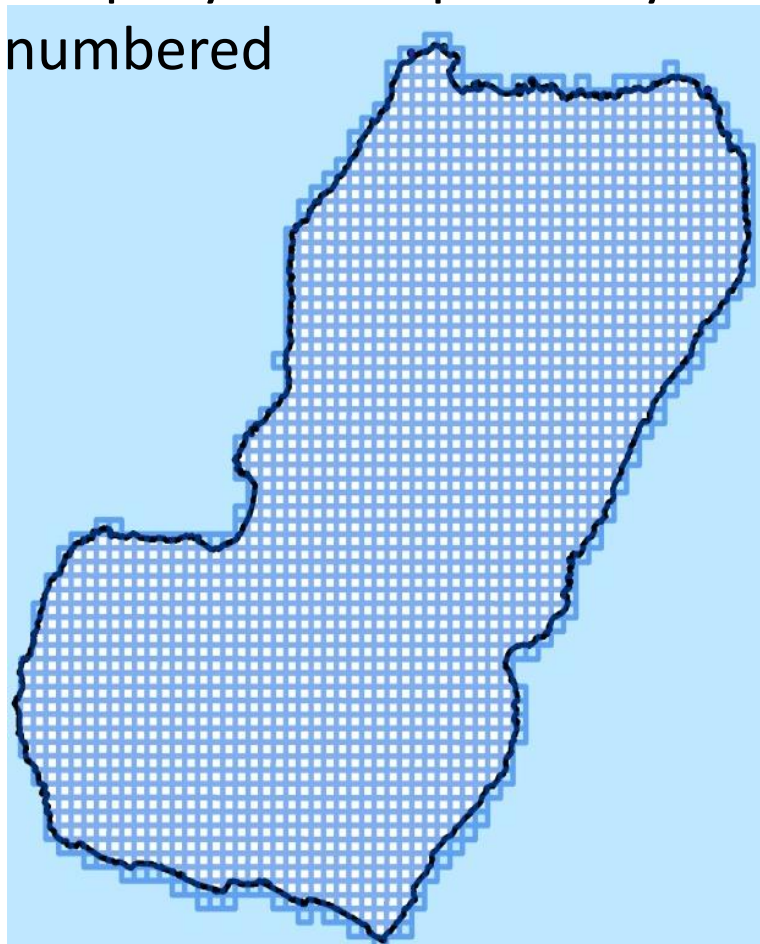
GIS based CIMS

- System is linked to listing of geo-referenced households on Bioko Island
 - Every household on the Island ascribed a unique building identifier or **UNIQUEBID** for building(s) they reside in
Ex: **M335S42E128P1**
 - Use Government's political boundaries (Region, Province, District, Communities) as basis for geographical location hierarchy



Creating the UNIQUEBID- Map Areas

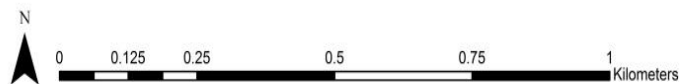
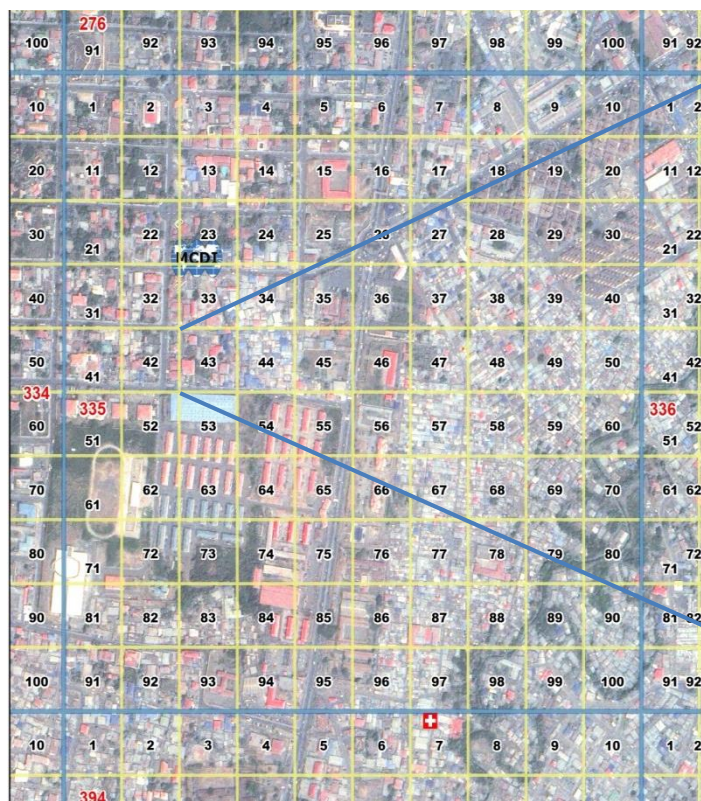
1 km² MAP AREAS are uniquely and sequentially numbered



Defining UNIQUEBID - Sectors

MAP AREAS subdivided into 10,000m²
SECTORS which are also sequentially
numbered within each MAP AREA

M335 S42 E12 P1



Defining UNIQUEBID

M335 S49 E128 P1

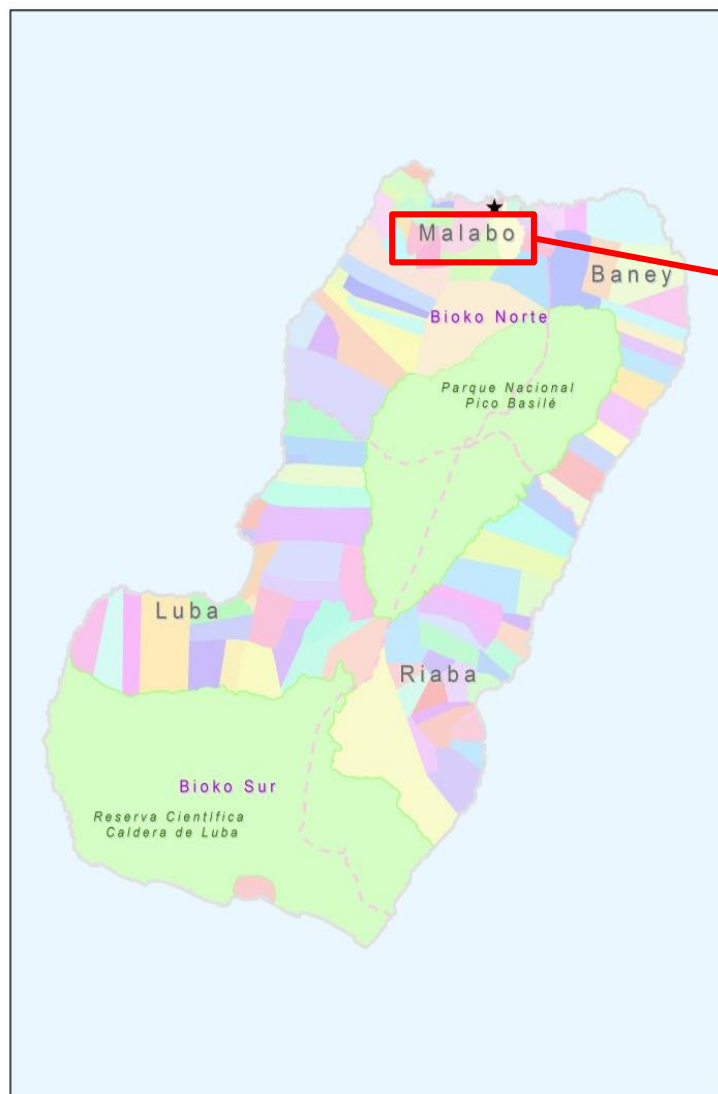
**MAP
AREA**

SECTOR

**BUILDING
(Edificio)**

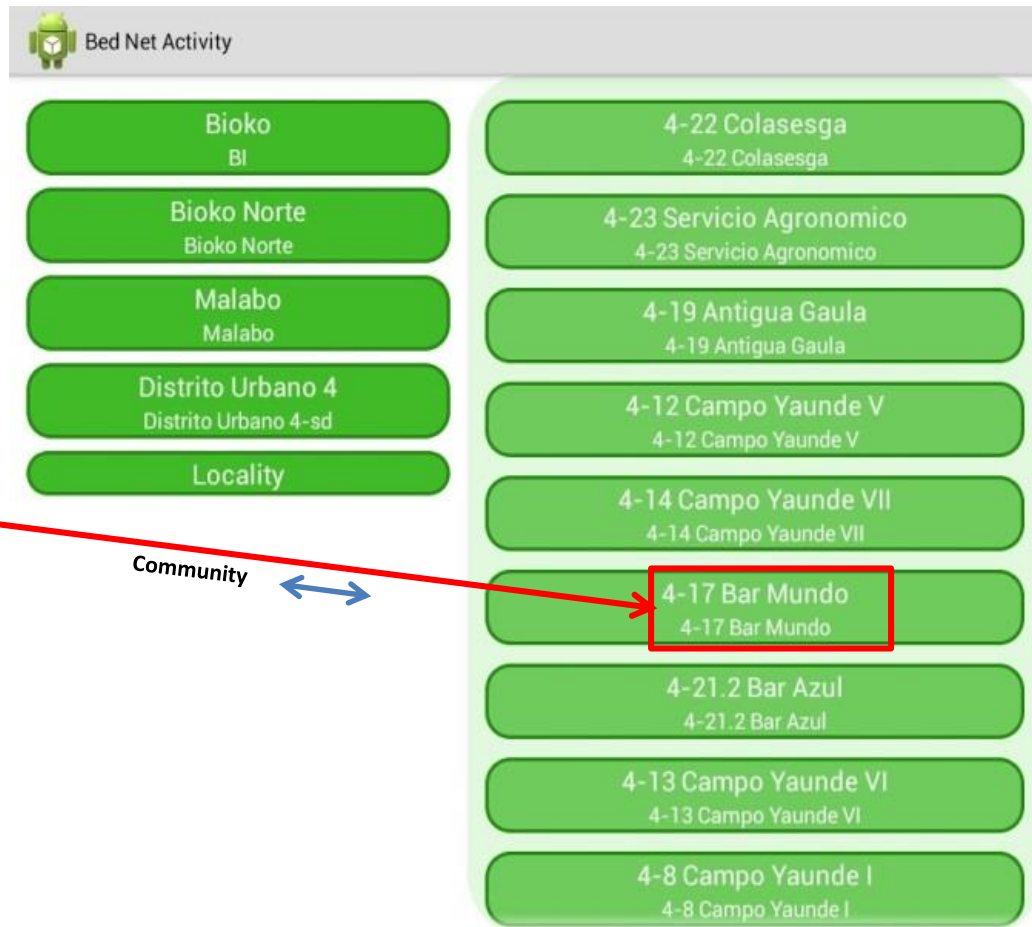
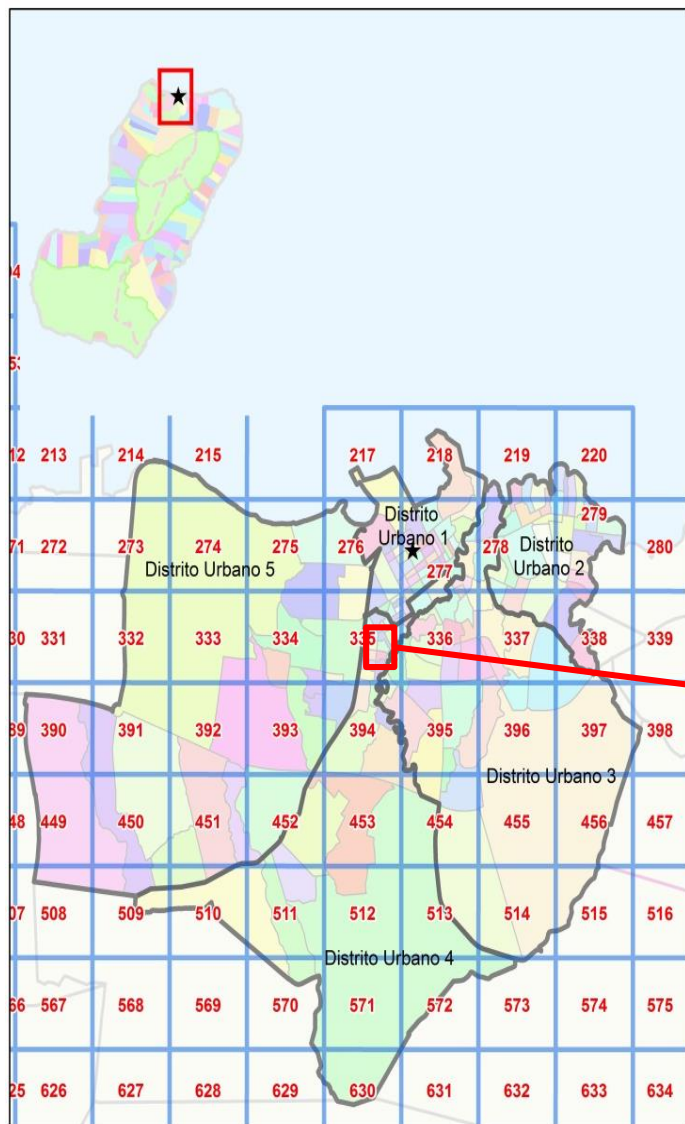
**FLOOR/LEVEL
(Piso)**

GIS based CIMS – District Level

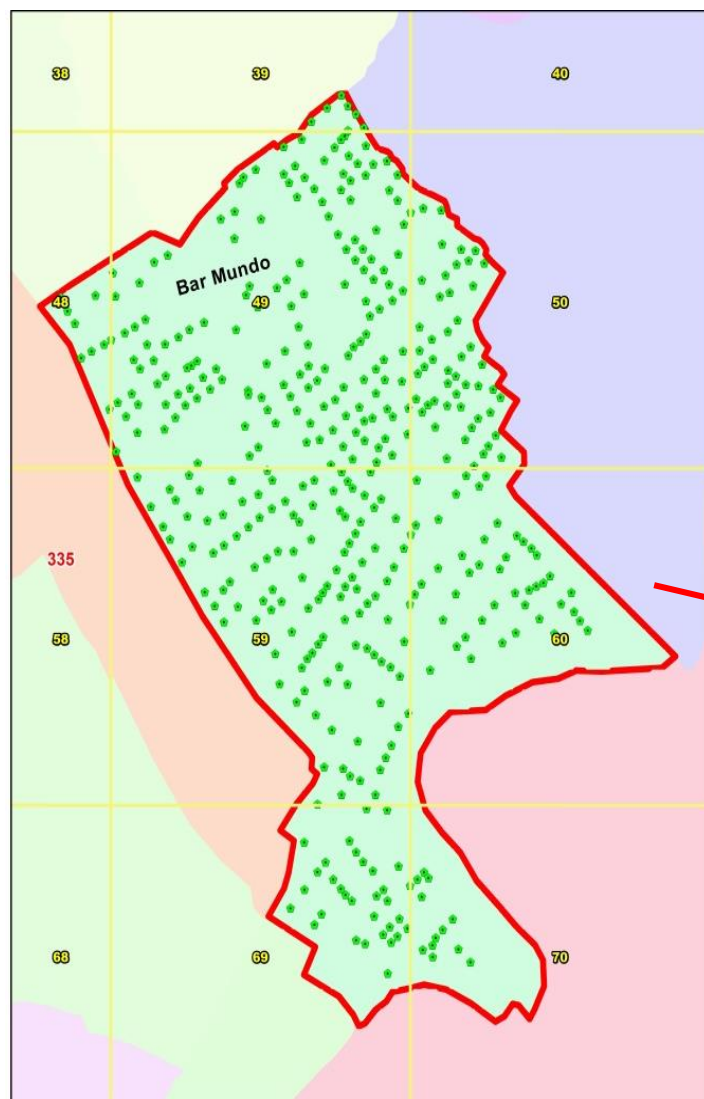


0 5 10 20 30 40 Kilometers

GIS based CIMS – Sub District Level



GIS based CIMS – Community Level




Bed Net Activity

Bioko BI	4-22 Colasesga 4-22 Colasesga
Bioko Norte Bioko Norte	4-23 Servicio Agronomico 4-23 Servicio Agronomico
Malabo Malabo	4-19 Antigua Gaula 4-19 Antigua Gaula
Distrito Urbano 4 Distrito Urbano 4-sd	4-12 Campo Yaunde V 4-12 Campo Yaunde V
Locality	4-14 Campo Yaunde VII 4-14 Campo Yaunde VII
	4-17 Bar Mundo 4-17 Bar Mundo
	4-21.2 Bar Azul 4-21.2 Bar Azul
	4-13 Campo Yaunde VI 4-13 Campo Yaunde VI
	4-8 Campo Yaunde I 4-8 Campo Yaunde I



0 20 40 80 120 160 Meters

GIS based CIMS – Household Level



Núm: **M335S49E128P1** Área: **4-17**

Ronda	Código IEC	Resultado IEC	Código Rociado	Fecha de Rociamiento	Control
19	MB2L	A	B2-400	04/02/014	FWPJA
20					
21					
22					
23					
24					

Programa Nacional de Lucha contra el Paludismo, Ministerio de Sanidad y Bienestar Social

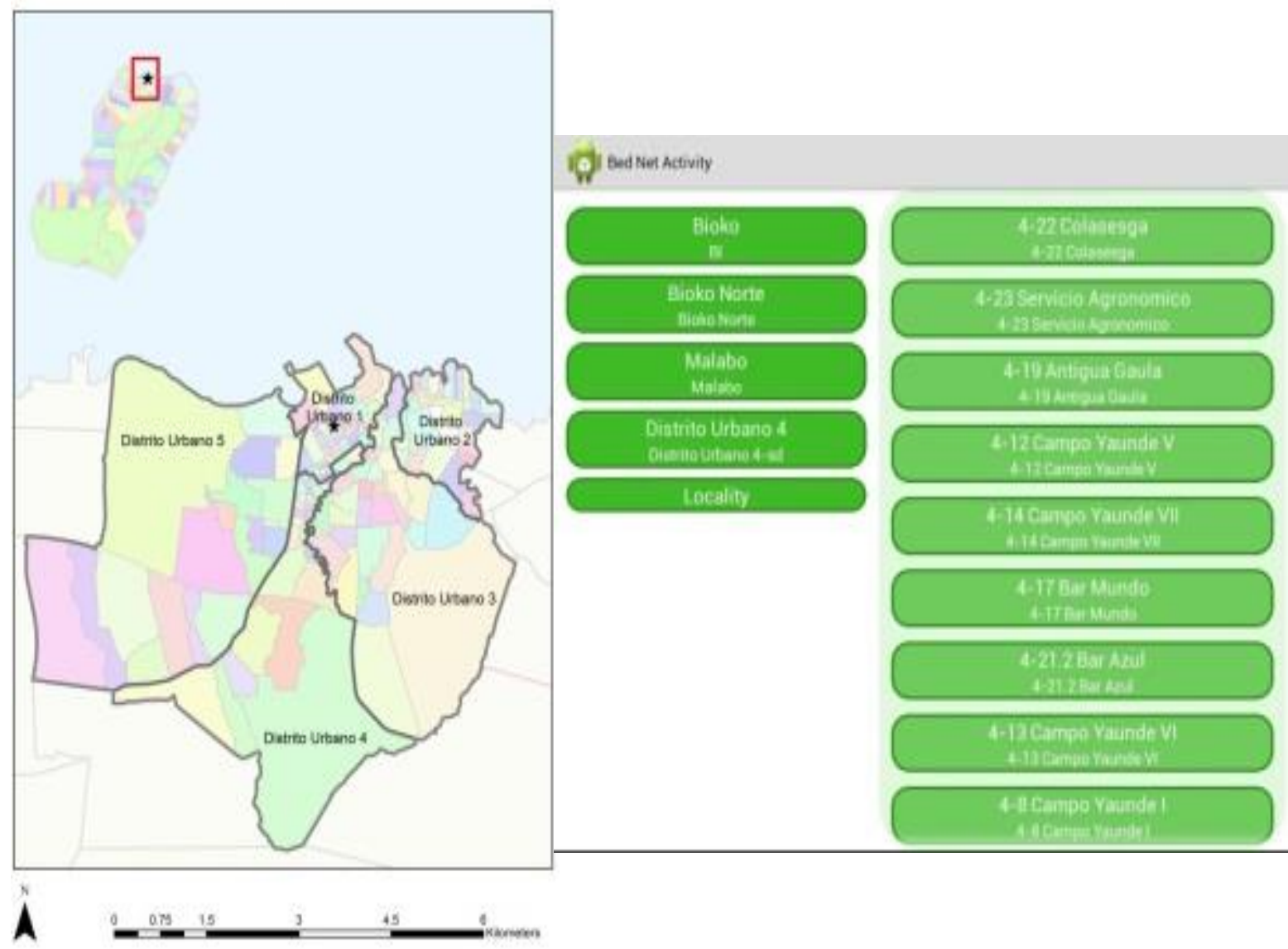
Bed Net Activity

- Bioko
BI
- Bioko Norte
Bioko Norte
- Malabo
Malabo
- Distrito Urbano 4
Distrito Urbano 4-sd
- 4-17 Bar Mundo
4-17 Bar Mundo
- M0335
4-17 Bar MundoM0335
- S049
4-17 Bar MundoM0335S049
- Household

- Mboro
M335S49E131P1
Description :
Tablas amarillas puerta azul delante un cerco tablas y chapas
- M335S49E130P1**
M335S49E130P1
Description :
Tablas verdes puerta roja abajo chapas rojo
- Edu Motogo
M335S49E129P1
Description :
Tablas verdes abajo chapas rojas dos puertas rojas
- Redji sorizo**
M335S49E128P1
Description :
Contraplaque amarillo puerta gris delante baldosas blancas
- Boñao May
M335S49E127P1
Description :
Tablas anaranjadas puerta marron abajo chapas azules

1

Spray teams receive household listings for each locality based on the CIMS database



1

2 Sprayers identify households on the list using maps on the tablet and the UNIQUEBID



1

2

3

FORMULARIO DIARIO DEL ROCIADOR SP1

COMUNO DE ROCIADOR: 80-377 SUPERVISOR: Emilio enguema

LOCALIDAD: 8-12

FECHA: 25/02/10

COMUNO DE ROCIADOR: 80-377 SUPERVISOR: Emilio enguema

LOCALIDAD: 8-12

RESISTENTE: X

ESTRUCTURAS

Todos los espacios tratados como: patio, cocina, baño, etc.

ROCIADOR		NO ROCIADOR		Población Protegida	
INDICADOR	VALOR	INDICADOR	VALOR	INDICADOR	VALOR
1431 576 E 12 R	H W M P T	0 0	0 0	1	5
1451 576 E 20 D	CH M N	H T		1	3
1461 576 E 26 D	CH M N P	T		1	4
1471 576 E 28 D	CH M P T	H		1	1
Total: 11		Total: 9		Total: 8	

Cargas: 1/1

1-12/10

In the field, sprayers record data about each house sprayed on an SP1 card. Info includes:

- UNIQUEBID
- # and type of houses sprayed/unsprayed
- Individuals protected
- Initial response of household from IEC Advance team

Supervisors also receive lists of households that their teams are working. They can quickly track their team and conduct supervision. Results of supervisory visits are recorded based on the UNIQUEBID



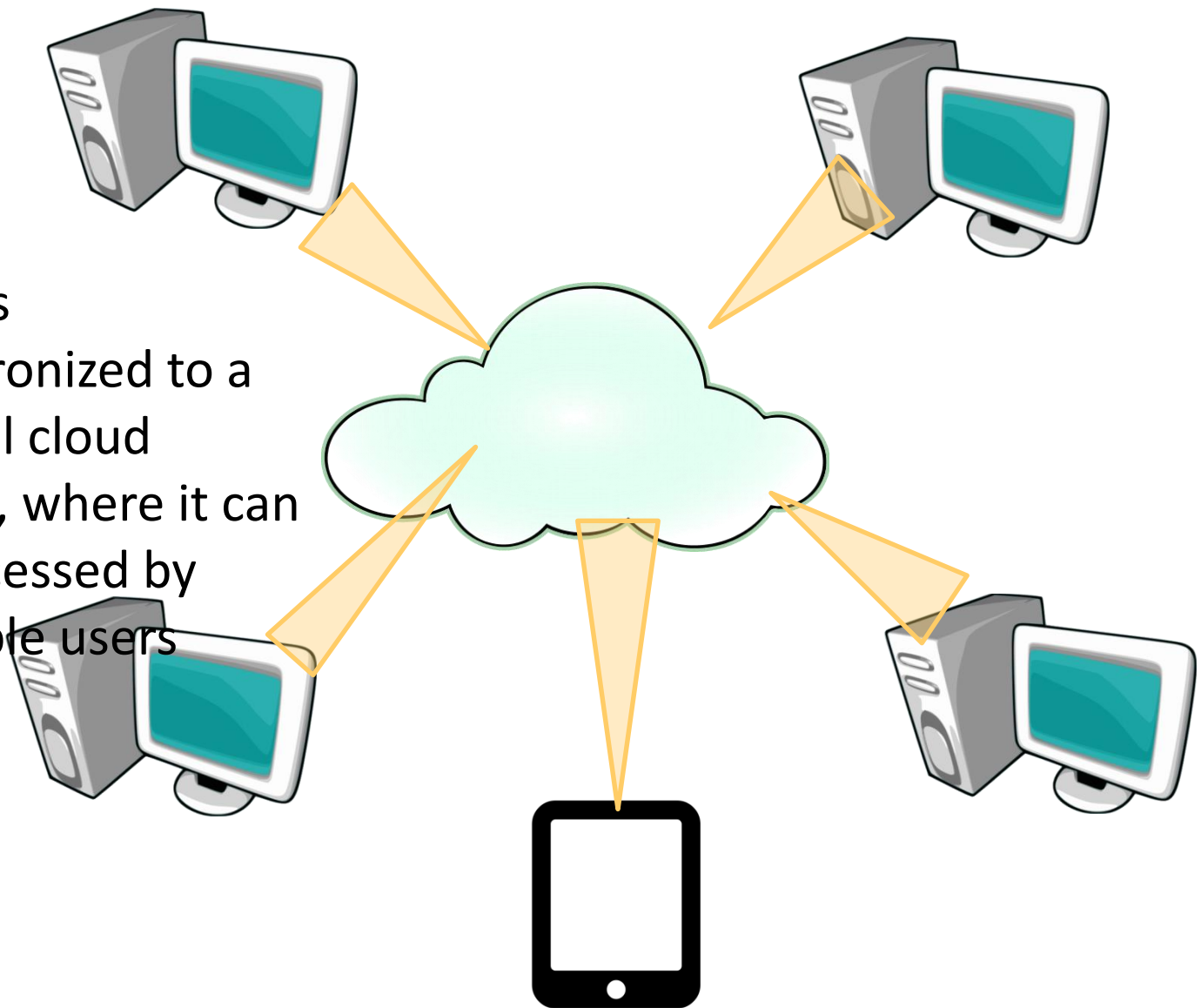
- 1
- 2
- 3
- 4 Field supervisors input SP1 data into tablets daily using CIMS household lookup

During this process, they can add new households, or note that a house has been destroyed or is currently un



1
2
3
4
5

Data is
synchronized to a
central cloud
server, where it can
be accessed by
multiple users



1

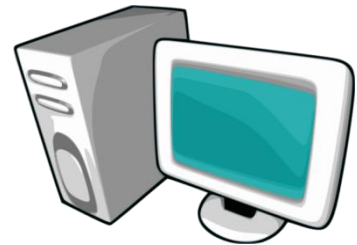
2

3

4

5

6



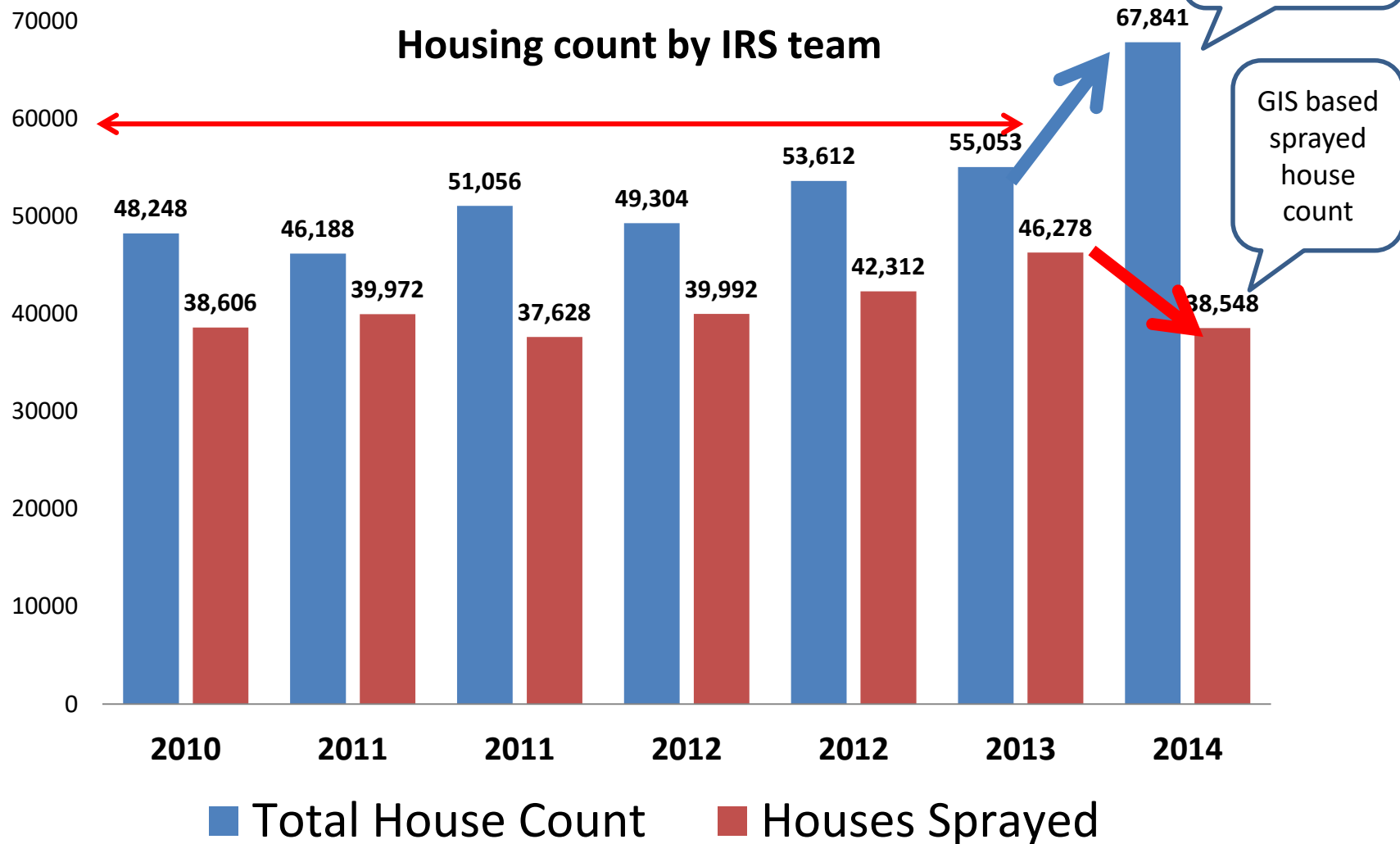
Data are available at the end of the work day, allowing for:

Lists or reported sprayed houses to conduct IQK verification. Monitoring team can accurately identify sprayed households

Updated lists of households not sprayed for follow-up by spray teams

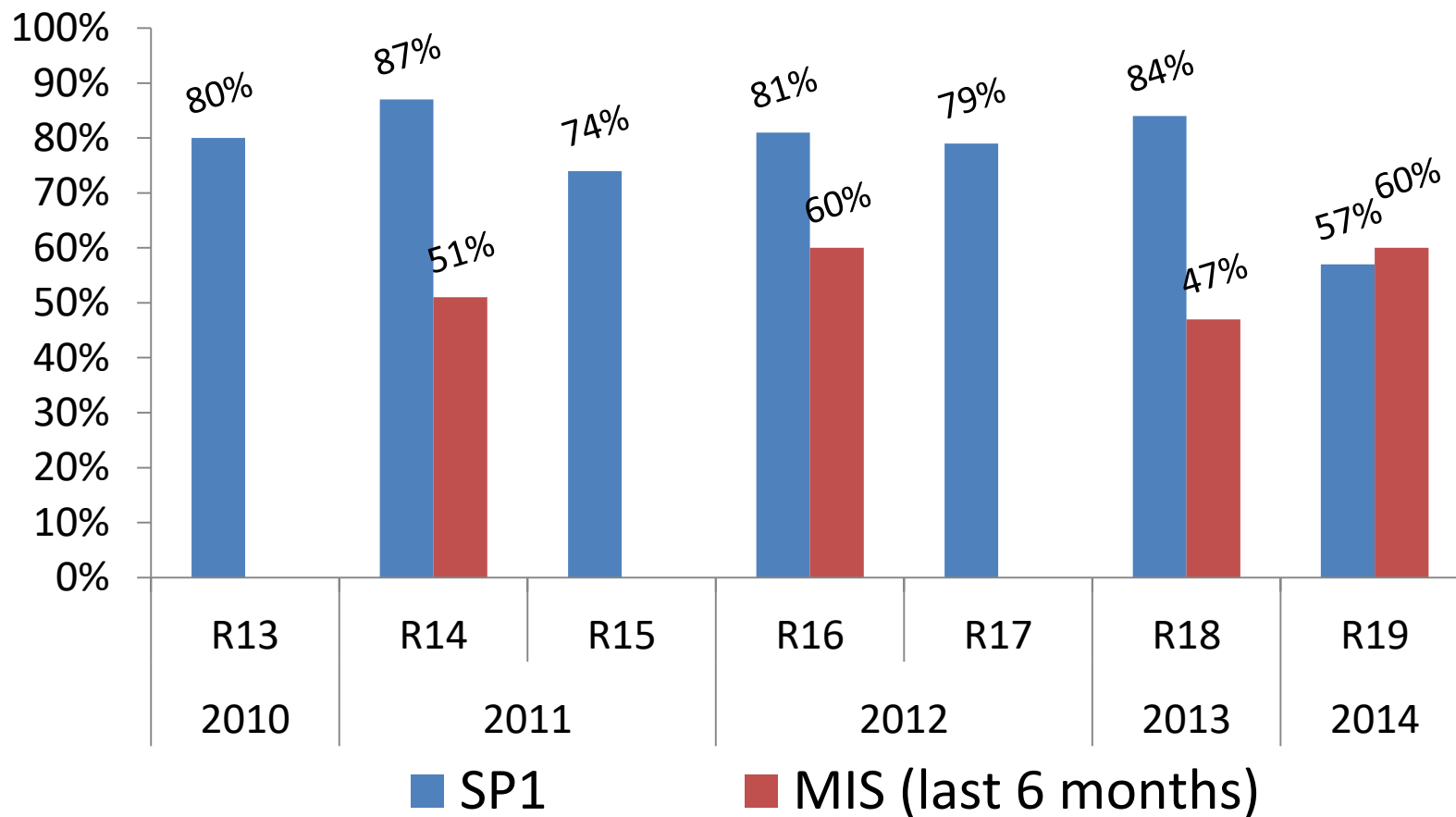
Report creation (spray coverage over-all and by area; sprayer productivity; % population protected, etc.)

Coverage determination after the use of GIS based CIMS



BIMCP IRS Program

Spray Coverage per Spray Round



IRS v. MIS comparison

		MIS 6-month recall self-reported spray data	
		Sprayed	Not Sprayed
SP1 reported coverage Rd. 19	Sprayed	2720	479
	Not Sprayed	206	1112



Sensitivity	85.0%
Specificity	84.4%
Accuracy	84.8%

Benefits of GIS-based CIMS for IRS

- Improved planning and management
 - Accurate house count and ability to add or delete houses in real time (subject to mapping team verification) improved basis for planning and budgeting
 - Detailed maps (most based on satellite imagery) improved efficiency of resource deployment in space and time.
 - Ability to easily and readily locate and verify houses reportedly sprayed eliminated substantial falsification of data by spray teams.
 - Targeted mop-up rendered substantially more efficient (IEC Agents, community representatives and sprayers able to readily locate specific non-compliant houses).
- Improved data management and monitoring and evaluation
 - Same day data processing. Next day data cleaning.
 - Secure central storage allowing both IRS managers and M&E team to access data
 - Remote same or next day progress monitoring by managers.
 - Rapid continuous updating of IRS performance indicators.
 - Real time quality assurance
- IRS service data integrated with other control intervention data down to individual household level.

Acknowledgements

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- Government of Equatorial Guinea
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- Atlantic Methanol Company (AMPCO)
- SONOGAS 



Implementing Organizations

- Ministry Of Health and Social welfare, Government of Equatorial Guinea
- Medical Care Development International (MCDI) 
- University of Southern Maine 
- London School of Hygiene and Tropical Medicine 
- Texas A & M University 
- Liverpool School of Tropical Medicine 

