RBM Partnership To End Malaria

30 January 2019

Spatial intelligence to optimize vector control planning, implementation and impact

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UNAIDS NothingButNets.net SEND A NET. SAVE A LIFE. World Health Organization END MALARIA COUNCIL APLMA ASIA PACIFIC LEADERS MALARIA ALLIANCE AKROS

‘Spatial intelligence’ optimizes service delivery:

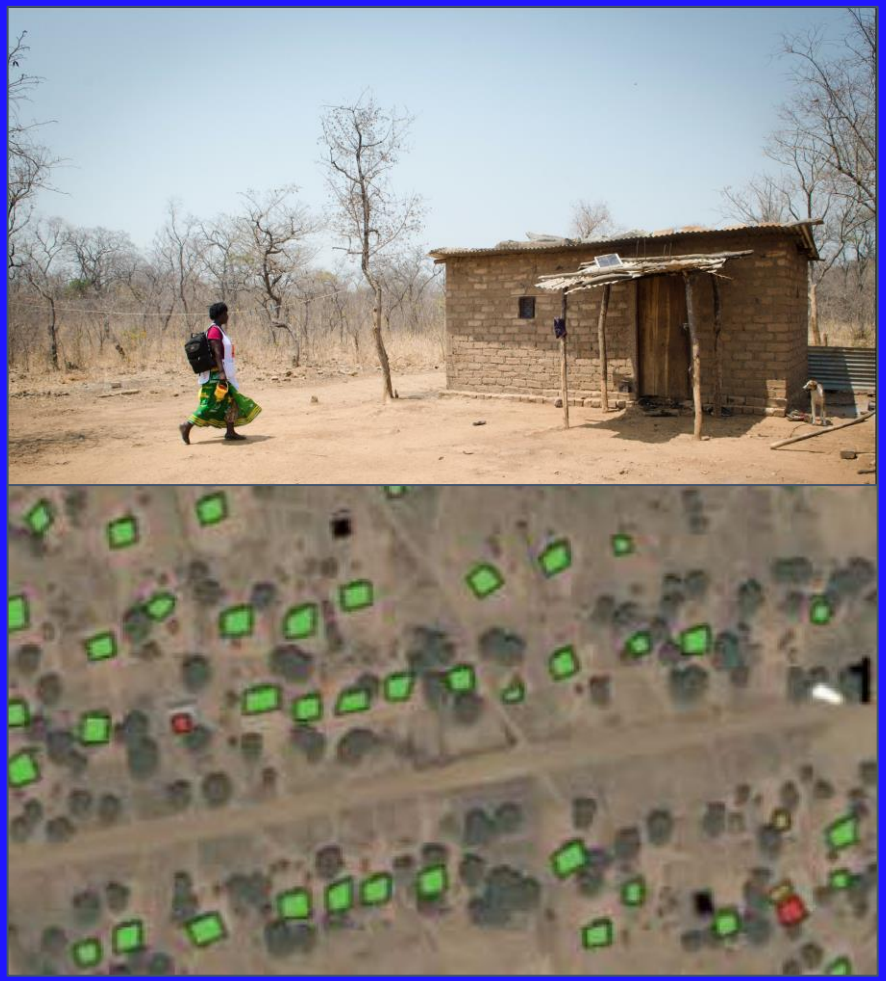
Where are services needed??

↓

Were services delivered??

↓

Improve Impact of those services



Simply – we want to ensure COMPLETE SERVICE DELIVERY.

We want to ensure that COMMUNITIES ARE NOT LEFT UNPROTECTED by important health services, including those meant to protect vulnerable populations from malaria transmission.

When it comes to IRS …
We know coverage is important

In communities with coverage > 80%, both sprayed and unsprayed houses had lower odds of malaria infection.*

WHO guidelines suggest at least 85% coverage is needed to maximize the benefits of IRS, however evidence shows IRS at village level is often under this threshold but reported above this.

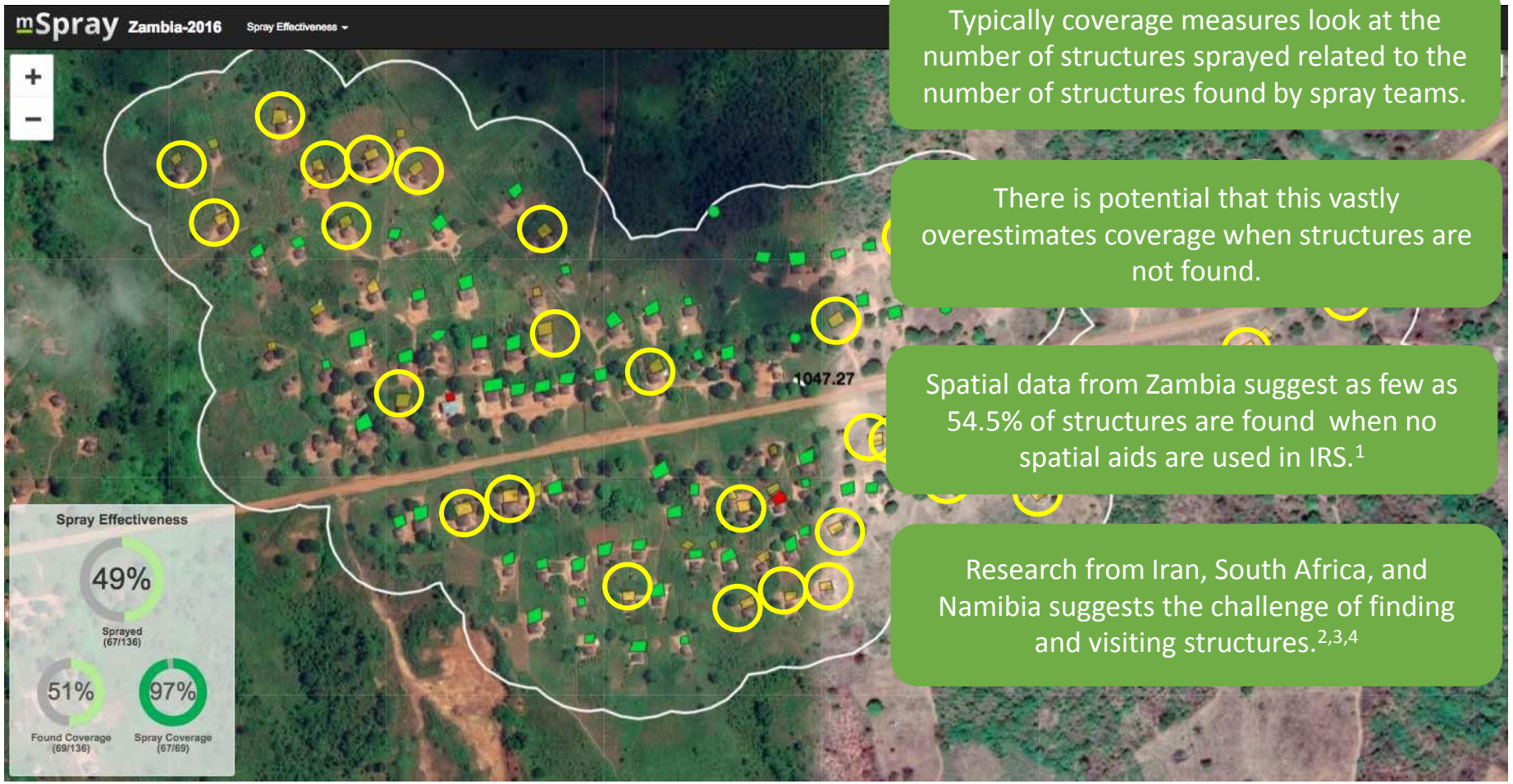
Rehman AM, Coleman M, Schwabe C, Baltazar G, Matias A, et al. (2011) How Much Does Malaria Vector Control Quality Matter: The Epidemiological Impact of Holed Nets and Inadequate Indoor Residual Spraying. PLOS ONE 6(4): e19205. https://doi.org/10.1371/journal.pone.0019205
http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0019205

Is this a REAL problem in vector control?

Are operations missing houses and leaving communities unprotected?

Are we overestimating coverage?

Are we overestimating coverage?



Typically coverage measures look at the number of structures sprayed related to the number of structures found by spray teams.

There is potential that this vastly overestimates coverage when structures are not found.

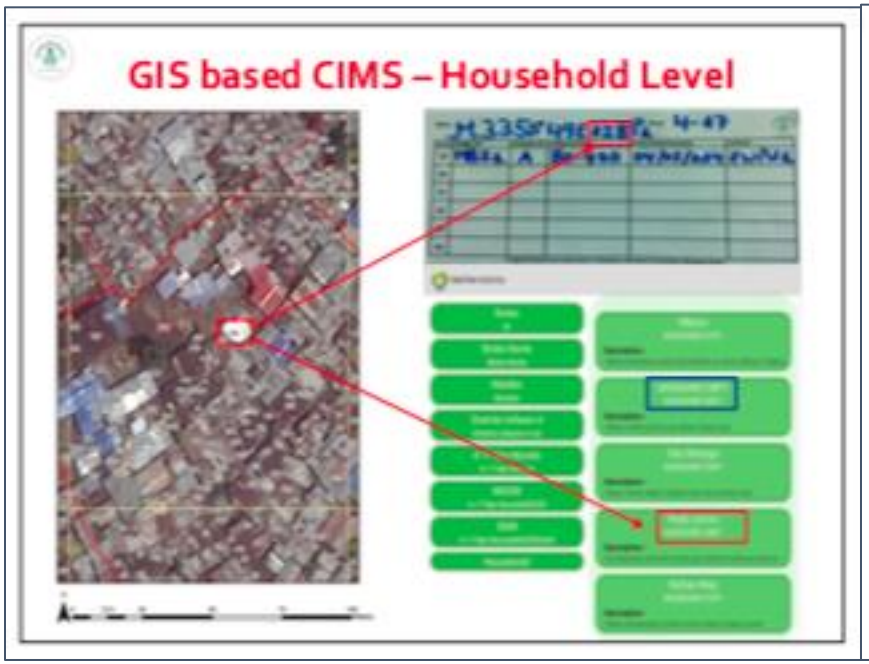
Spatial data from Zambia suggest as few as 54.5% of structures are found when no spatial aids are used in IRS.[1]

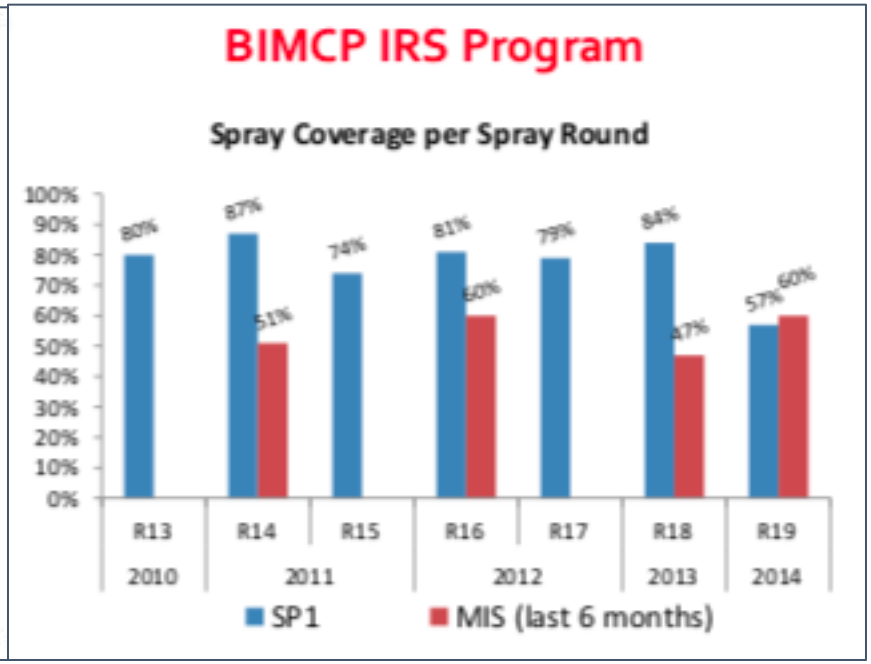
Research from Iran, South Africa, and Namibia suggests the challenge of finding and visiting structures.[2,3,4]

1. Mumbengegwi et al. Is there a correlation between malaria incidence and IRS coverage in western Zambezi region, Namibia. Public health Action, 2018
2. Sakeni et al. Indoor Residual Spraying Coverage and Acceptability Rates to Control Malaria and the Householders' Reasons of Acceptance or Rejection of Spraying, in South-East of Iran, Int J Infect. 2015 ;2(4):e60147. doi: 10.17795/iji-31548.
3. Bridges et al. Accuracy and impact of spatial aids based on satellite enumeration to improve IRS spatial coverage, Malaria Journal, 2018.
4. Hlongwana et al. Knowledge and practices towards malaria amongst residents of Bushbuckridge, Mpumalanga, South Africa. Afr Prim Health Care Fam Med, 2011

Bioko Island example…

- Previous to changing the indicator, using found structures as the denominator grossly overestimated spray coverage (2010-2013).
- ***Spray coverage is overestimated unless spatial intelligence is applied***
- The gap between found and actual structures differs by country but unless we can measure it, we don't know the extent of this problem is.





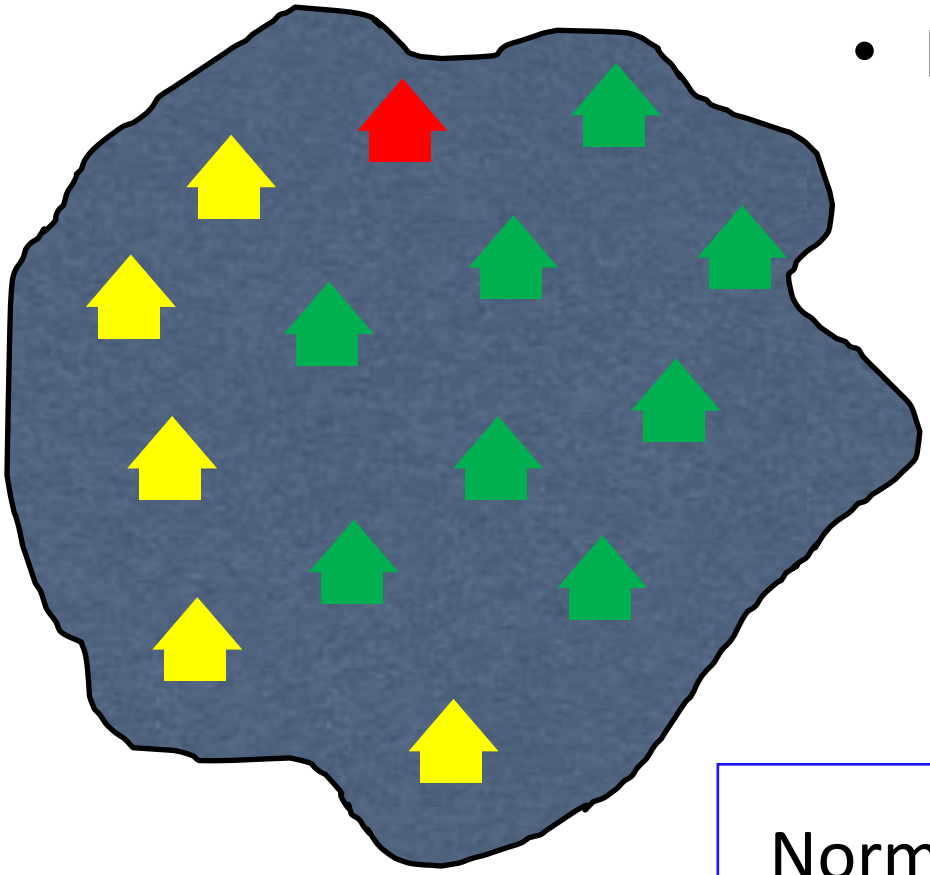
Phiri W (2015). Improved monitoring of IRS coverage on Bioko Island through the use of GIS based campaign information system (CIMS). Internal report for Malaria Care Development International.

Challenges to effective IRS

- Insecticide resistance
- Behavioral resistance
- Benefit beyond ITNs?
- Overestimation of coverage

How do we address the problem of overestimation of coverage?

1. Rethink the indicator

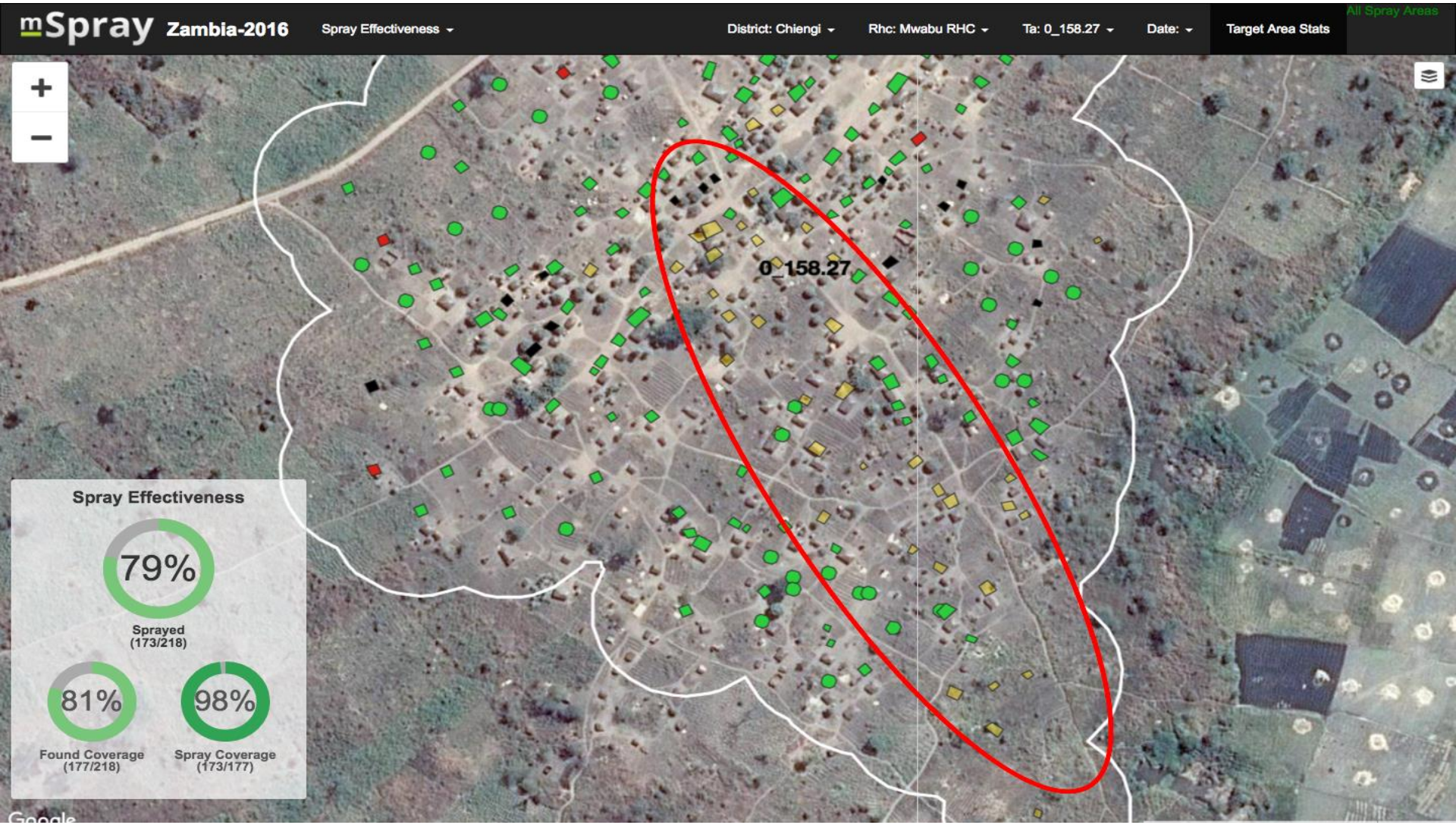


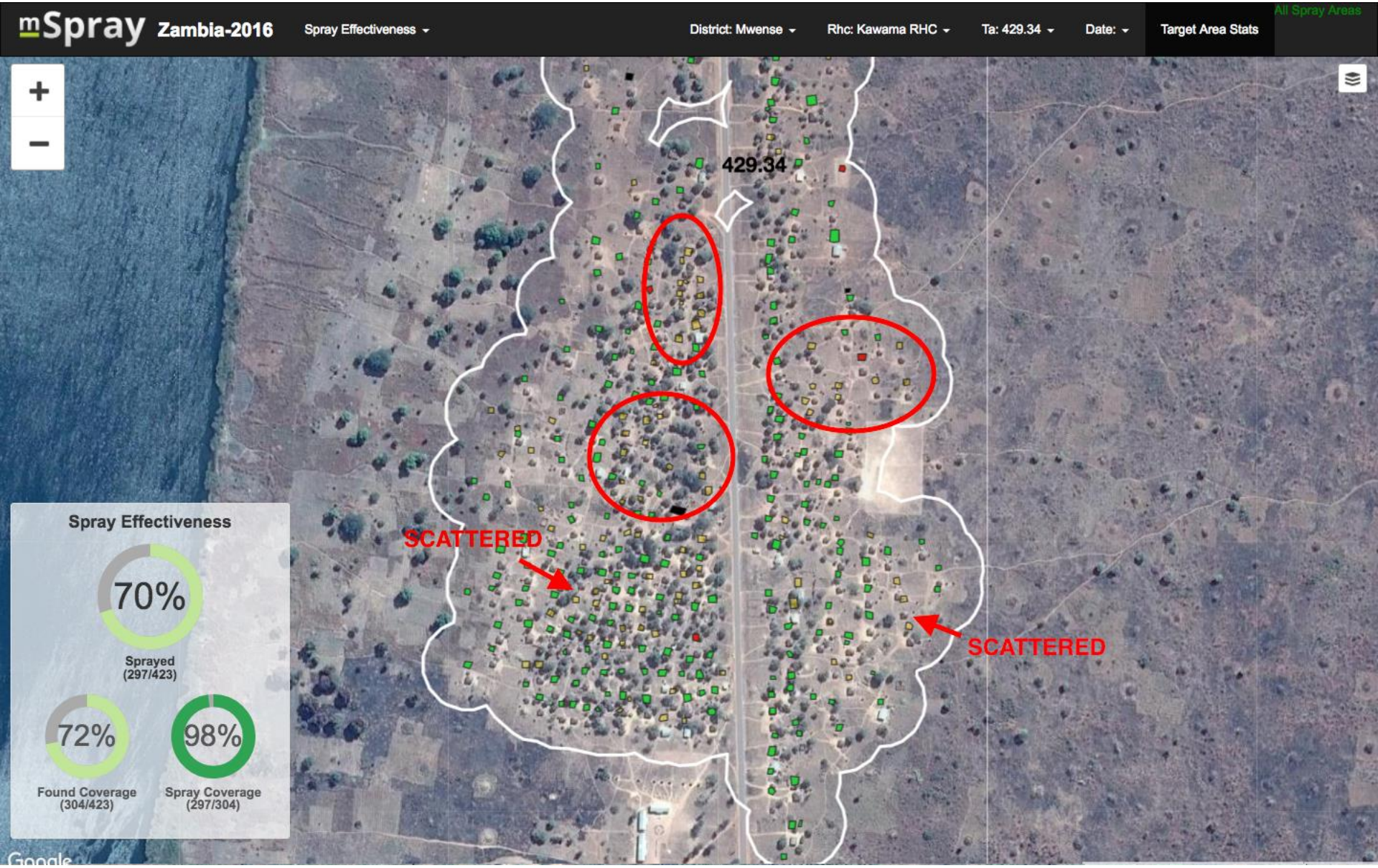
- IRS Operators visit Spray Area
  - 9 structures found
  - 8 structures sprayed
  - 1 structure refused
  - 5 structures NOT FOUND

Normal IRS Reporting: 8/9 = 89%

Actual coverage: 8/14 = 57%

Real life examples…

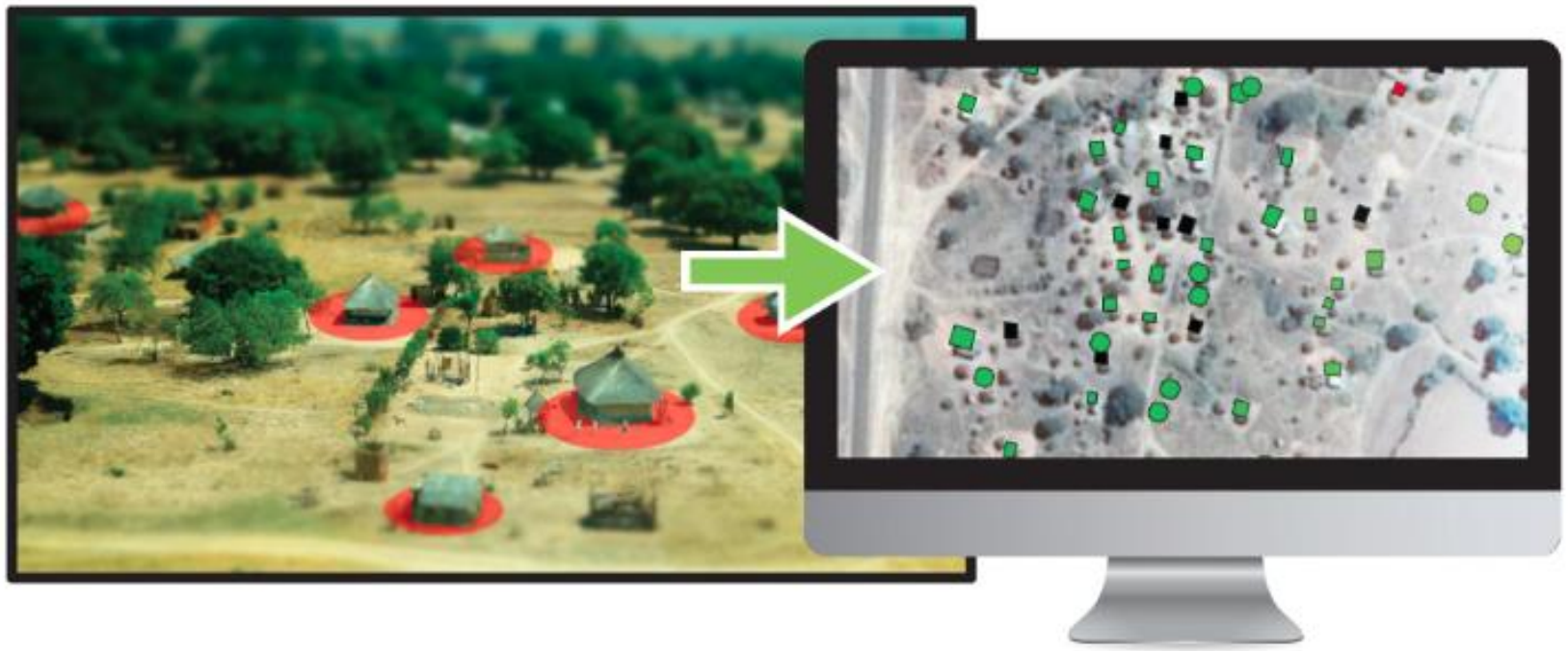



mSpray Zambia-2016
Spray Effectiveness
District: Mwense
Rhc: Kawama RHC
Ta: 429.34
Date:
Target Area Stats
All Spray Areas
429.34
SCATTERED
SCATTERED
Spray Effectiveness
70%
Sprayed
(297/423)
72%
Found Coverage
(304/423)
98%
Spray Coverage
(297/304)

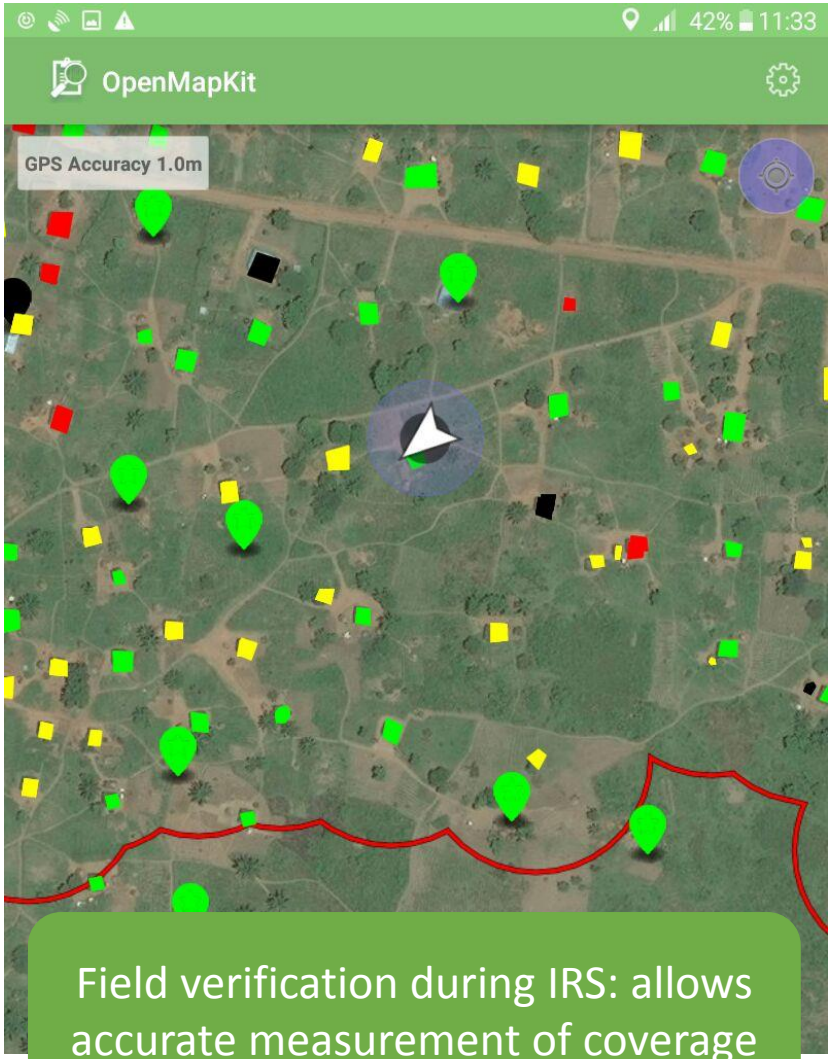
2. Map sprayable structures

Use satellite imagery to
map structures
= accurate denominator

Enumeration: 94%[1] accuracy, aids planning and identifying clusters



3. Guide spray teams with in-field maps & validate coverage



Field verification during IRS: allows accurate measurement of coverage

4. Support decision making in-field

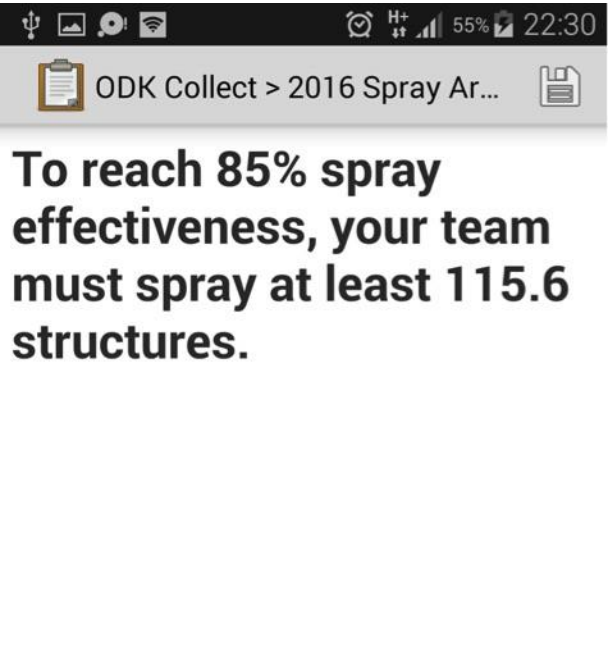
mSpray Zambia-2017 Spray Effectiveness District: Katete

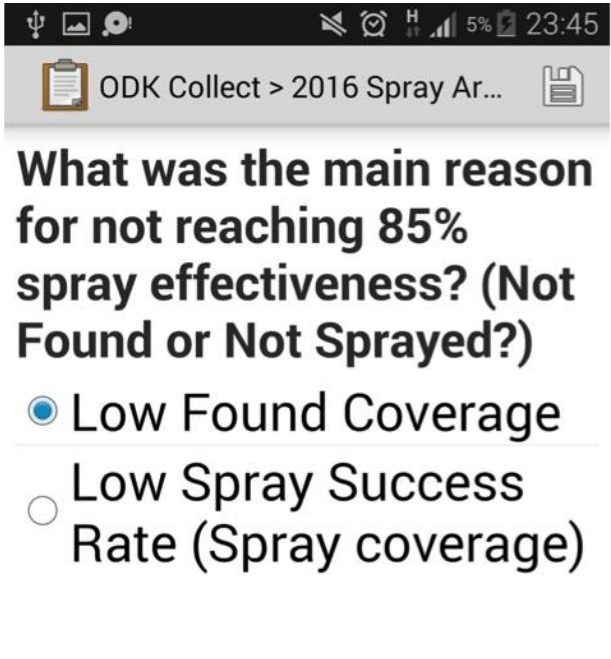
District: Katete

Search:

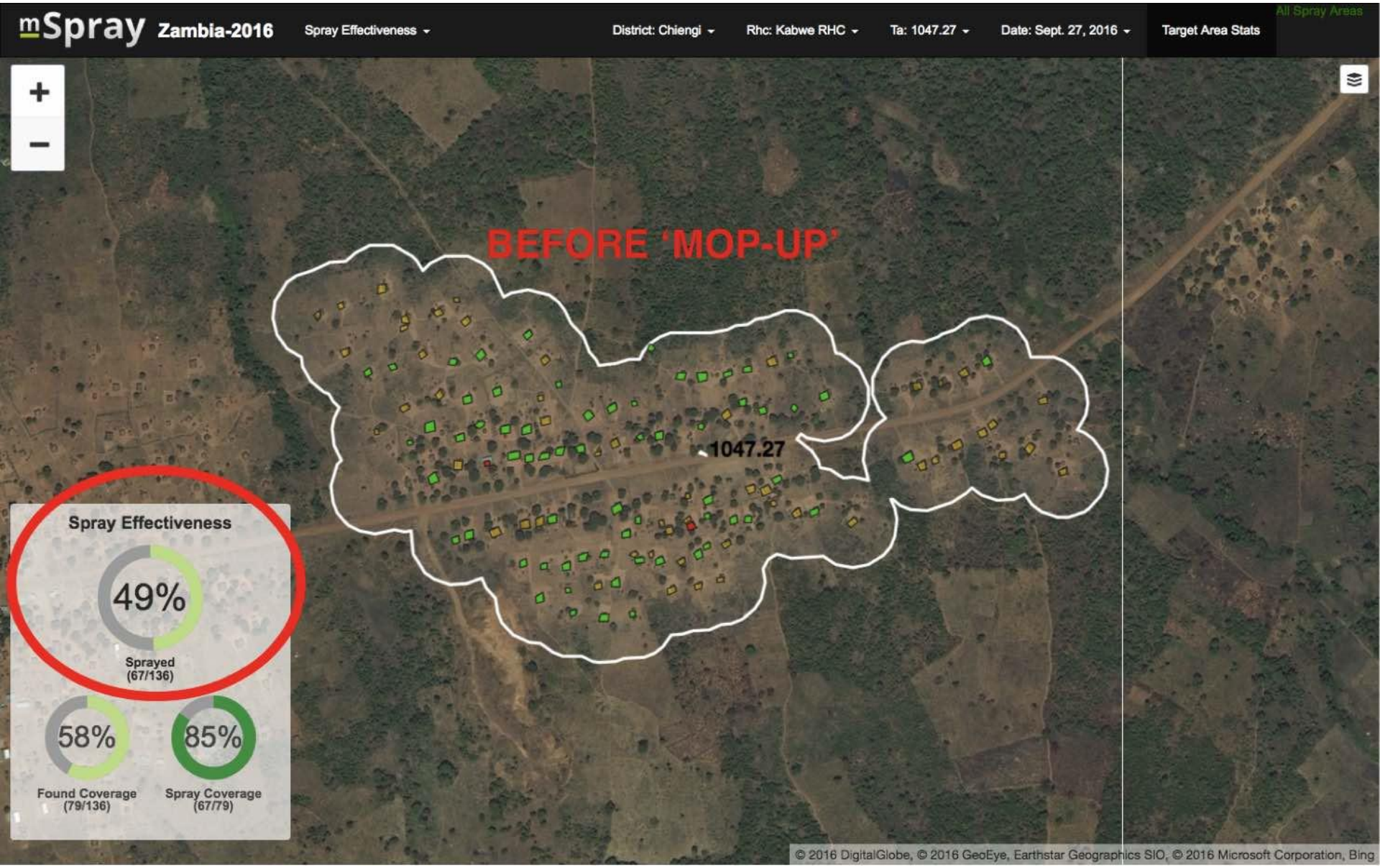
Health Facility	Eligible Spray Areas	Spray Areas Visited [a]		Spray Areas Sprayed Effectively[b]	
		Number	%	Number	%
Chibolya	10	7	70%	6	86%
Chimtende	7	7	100%	1	14%
Chinkombe	8	8	100%	7	88%
Kafumbwe	5	5	100%	5	100%
Kafunkha	3	2	67%	1	50%
Kagoro	13	13	100%	6	46%
Kalimeta	1	0	0%	0	
Kamiza	4	4	100%	1	25%
Kamphambe	10	3	30%	0	0%
Katete Boma	6	6	100%	3	50%

…protocols to guide decision making





Managers go through decision form guidance while viewing dashboard to decide whether mop-up is necessary to protect this community and to plan accordingly.


mSpray Zambia-2016
Spray Effectiveness
District: Chiengi
Rhc: Kabwe RHC
Ta: 1047.27
Date: Sept. 27, 2016
Target Area Stats
All Spray Areas
BEFORE 'MOP-UP'
1047.27
Spray Effectiveness
49%
Sprayed
(67/136)
58%
Found Coverage
(79/136)
85%
Spray Coverage
(67/79)
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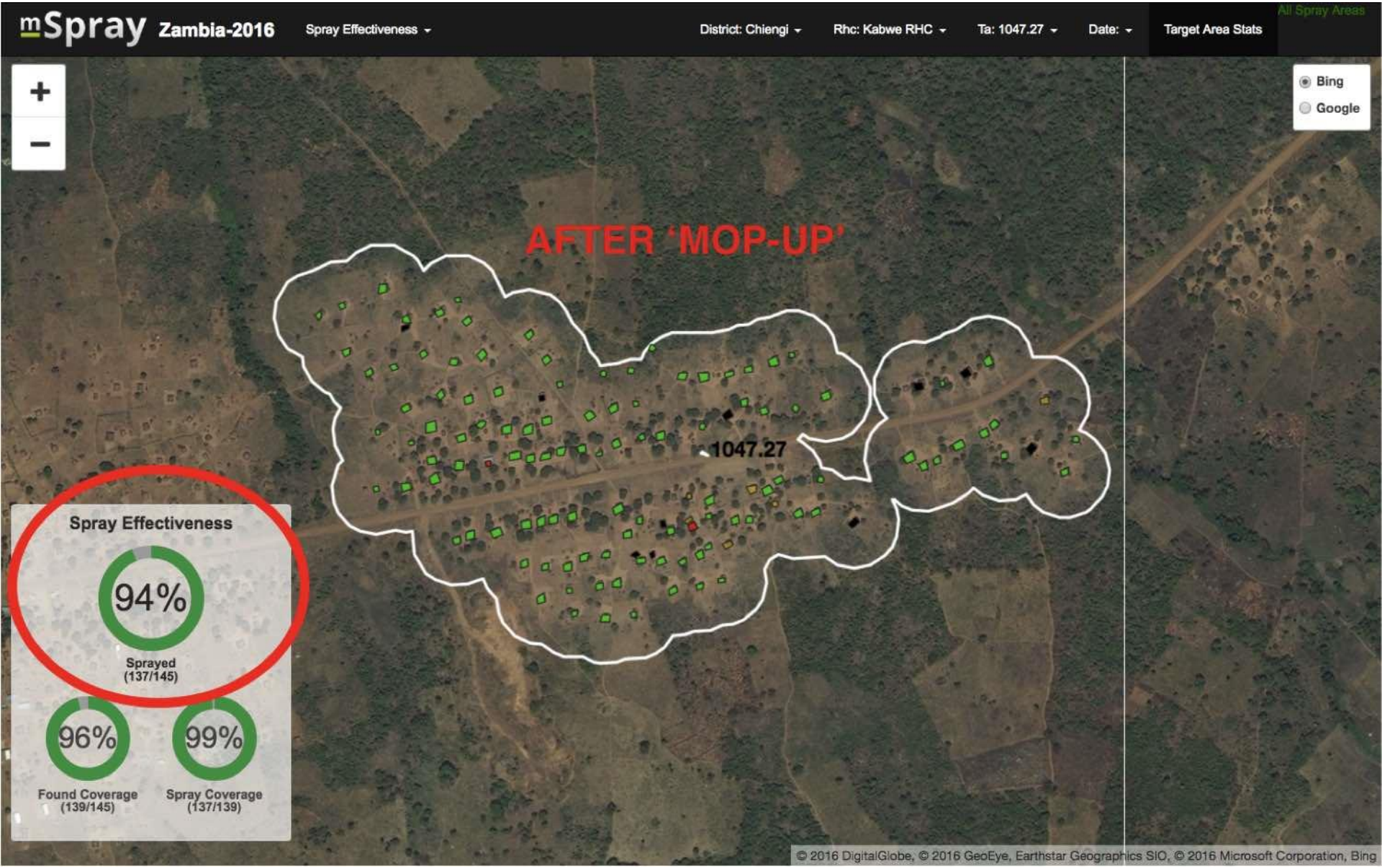


How often is this happening and what is the impact…

Mop Up or Revisit Results from 2017

Of 2,057 villages that received IRS, 50% were ‘re-visited’

Re-visit Success	Before Re-visit	After Re-visit	Difference
IRS Coverage	53.7%	86.1%	32.4%
Success Rate	80.2%	95.2%	15.0%
Found Coverage	65.5%	92.4%	26.9%

In-Field Offline Decision Making

Does spatial intelligence like this improve impact?

Impact (preliminary)

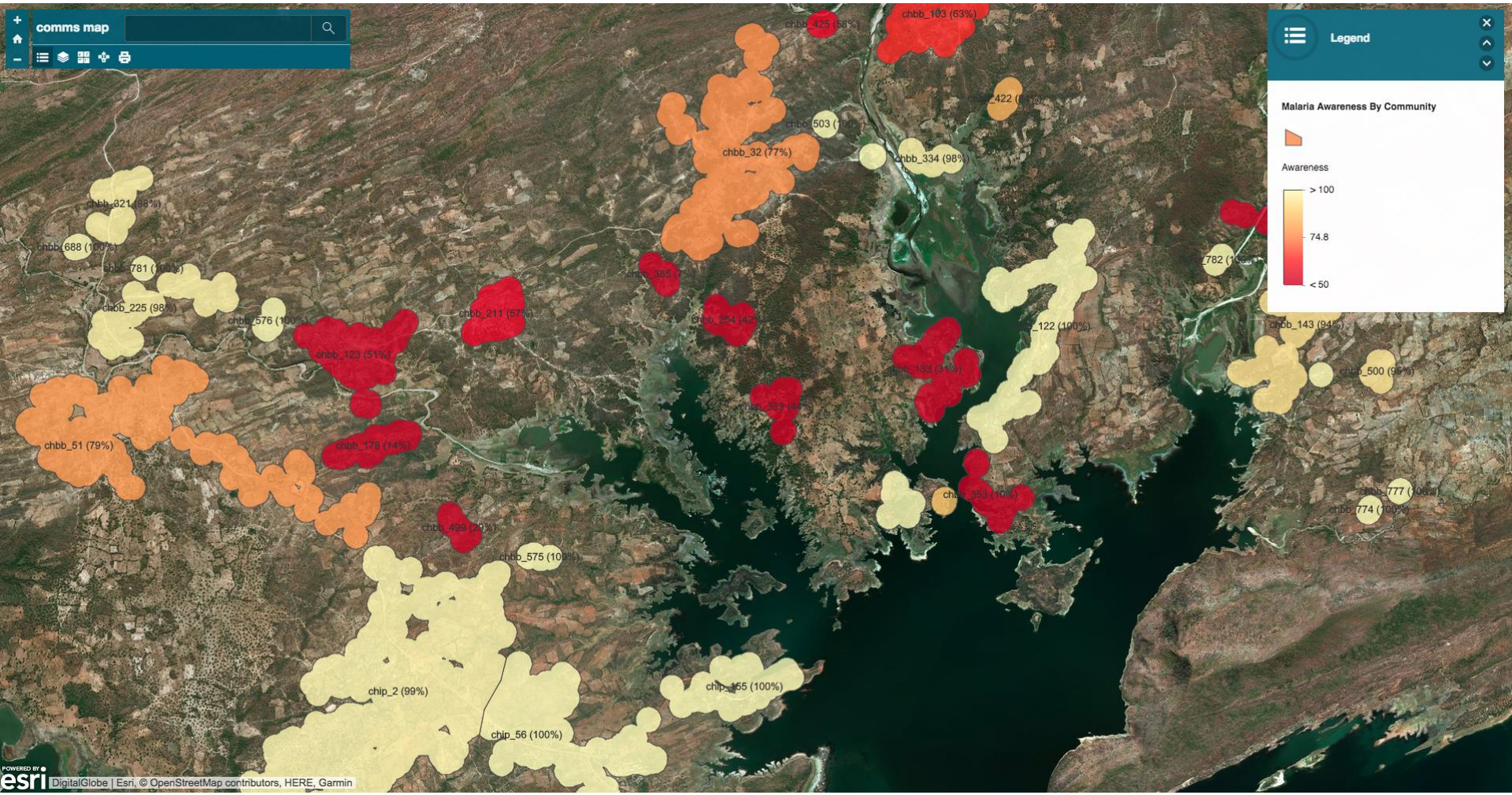
"…mSpray was associated with a significant 15% further reduction in confirmed case incidence…due to better targeting and achieving overall higher household coverage."[5]

5. Report: Retrospective Evaluation of the Effectiveness of Indoor Residual Spray with Pirimiphos-Methyl (Actellic) on Malaria Transmission in Zambia. Eisele, T; Miler, J; Yukich, J; Bennett, A. Center for Applied Malaria Research and Evaluation. UCSF Global Health Sciences. 2017.

Learning Opportunities

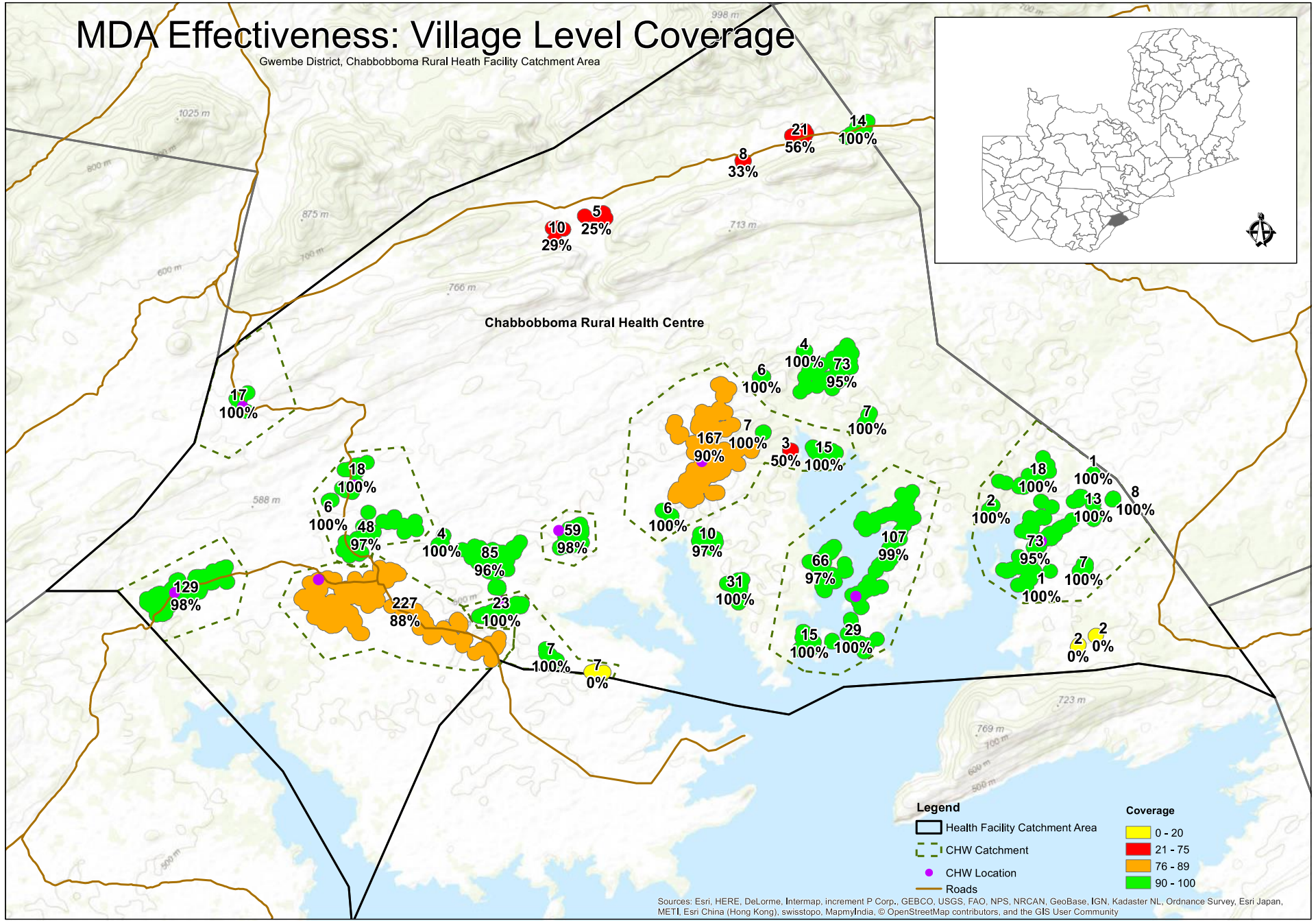
- Cost-effectiveness of using spatial intelligence (analysis Feb 2019, Tulane University)
- Impact of “Layering” interventions and linking to household; i.e. IRS, IRS + mobilization, IRS +MDA

Spatial intelligence & community mobilization



Thanks to PATH-MACEPA

Malaria Awareness by Community
Low awareness (Red); High awareness (Yellow)

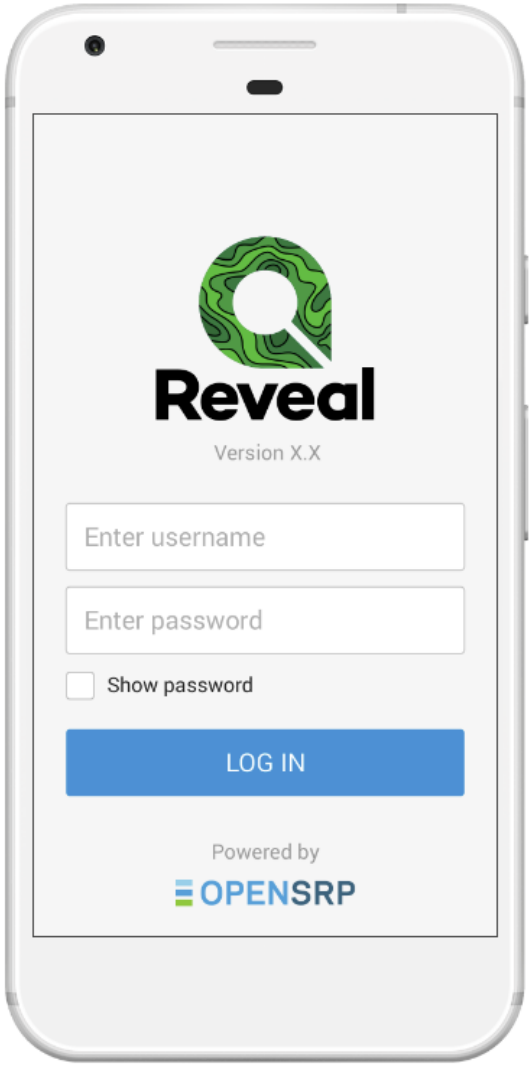

MDA Effectiveness: Village Level Coverage
Gwembe District, Chabbobboma Rural Heath Facility Catchment Area
Chabbobboma Rural Health Centre
14 100%
21 56%
8 33%
5 25%
10 29%
17 100%
18 100%
6 100%
48 97%
4 100%
85 96%
59 98%
129 98%
227 88%
23 100%
7 100%
7 0%
4 100%
73 95%
6 100%
7 100%
167 90%
7 100%
3 50%
15 100%
6 100%
10 97%
31 100%
107 99%
66 97%
29 100%
15 100%
1 100%
18 100%
2 100%
13 100%
8 100%
73 95%
1 100%
7 100%
2 0%
2 0%
Legend
Health Facility Catchment Area
CHW Catchment
CHW Location
Roads
Coverage
0 - 20
21 - 75
76 - 89
90 - 100
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Application of spatial intelligence principles to other malaria interventions

Reveal

REDEFINING PRECISION

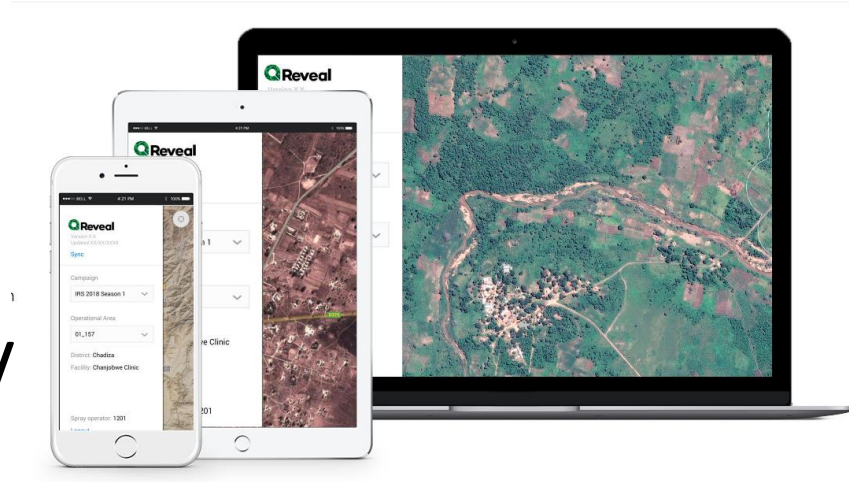
- Gates funding under Digital Solutions for Malaria Elimination grant.
- Reveal is a geospatial tool which supports decision makers and intervention managers to guide and track delivery of in-field activities with precision and to hold field teams accountable for action.
- Spatial planning support, precise data collection, dashboarding, protocol guidance
  - Open source
  - IRS, ITN distribution and tracking, larval source management, MDA, RACD, foci Investigations, community engagement, focal IRS response
- Timeline: Complete by mid 2019
- Implementation support in CHAI countries



Digital Solutions for Malaria Elimination Community of Practice

- 2019 implementation expansion to Thailand, (*Namibia, Botswana, Nepal, Mozambique, Zambia*).
- Planned deployment to 10+ countries in 2020

https://dsme.community/



Current Community of Practice Members

Vital Wave serves as the current steward of DSME community. Interested in joining? Read our member commitments and Get Involved!

https://dsme.community/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Thank you.
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DiSARM
Vital Wave℠
President's Malaria Initiative
Africa Indoor Residual Spraying Project
AIRS
CLINTON
HEALTH ACCESS
INITIATIVE
PATH
ONE ZAMBIA ONE NATION

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