



Experiences from the mobile phone-based surveillance (Mp-bS) for rabies in Tanzania

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Arusha, Tanzania

PARACON meeting at **Glenburn Lodge**, Gauteng, Republic of
South Africa,
9-11 June 2015

Infectious Diseases and the Cycle of Neglect

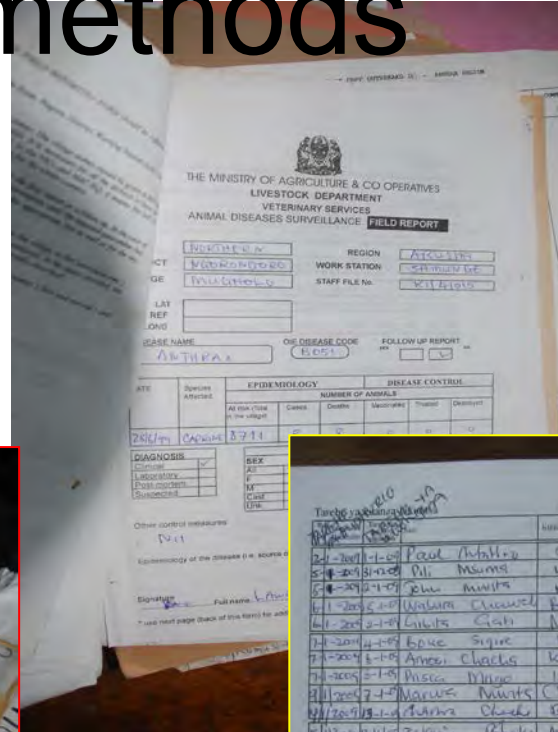
Regional and national priorities based on burden of disease

Accurate DATA & proper MANAGEMENT and ANALYSIS of such data

Low priority for research and control

Neglect

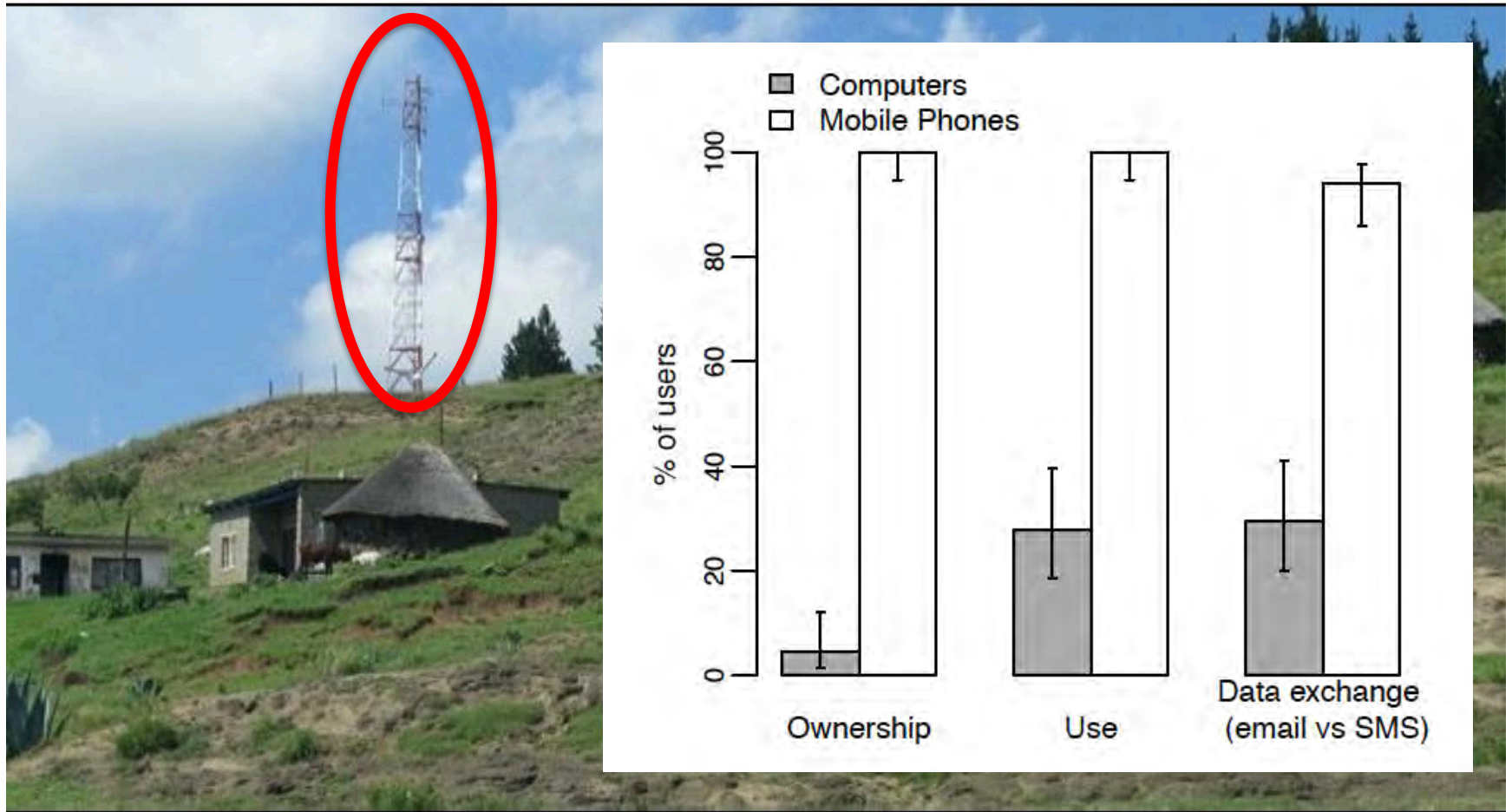
Opportunity: An environment for innovative surveillance methods



Rejista ya OPD, Schemu ya Magonjwa yamayotolewa Ripoti

Tarifa ya Magonjwa	Kazi	Ukazi	Ukazi	Majidha	Mababu	
2-2011-1-01	Paul Mwangi	Matara	4	MR/KR	Adrian Juma	For T.T.
5-2011-1-02	Mi Mwangi	Kogonyo	9	MR/KR	Robt. Mwangi	T.T.
6-2011-1-03	Elu Mwangi	Mogonyo	20	MR/KR	Robert Mwangi	T.T.
1-2011-1-04	Wahum Chacha	Mogonyo	11	MR/KR	Robert Mwangi	T.T.
1-2011-1-05	Elu Mwangi	Mogonyo	4	MR/KR	Robert Mwangi	T.T.
1-2011-1-06	Elu Mwangi	Mogonyo	6	MR/KR	Robert Mwangi	T.T.
1-2011-1-07	Amos Chacha	Kogonyo	13	MR/KR	Robert Mwangi	T.T.
1-2011-1-08	Amos Chacha	Kogonyo	25	MR/KR	Robert Mwangi	T.T.
1-2011-1-09	Marius Mwangi	Chamote	14	MR/KR	Marius Mwangi	T.T.
1-2011-1-10	Marius Mwangi	Bomani	7	MR/KR	Julius Kabati	T.T.
1-2011-1-11	Zelma Chacha	Mogonyo	74	MR/KR	Thomas Mwangi	T.T.
1-2011-1-12	Pine Emmanuel	Chamote	18	MR/KR	Thomas Mwangi	T.T.
1-2011-1-13	Jemima James	Mogonyo	8	MR/KR	Wanyoko James	T.T.
1-2011-1-14	Elu Mwangi	Kogonyo	10	MR/KR	Elu Mwangi	T.T.
1-2011-1-15	Maria Francis	Mogonyo	52	MR/KR	Maria Francis	T.T.
1-2011-1-16	Wahum Chacha	Mogonyo	11	MR/KR	Wahum Chacha	T.T.
1-2011-1-17	John Mwangi	Mogonyo	66	MR/KR	John Mwangi	T.T.
1-2011-1-18	Elu Mwangi	Mogonyo	44	MR/KR	Elu Mwangi	T.T.
1-2011-1-19	Elu Mwangi	Mogonyo	70	MR/KR	Elu Mwangi	T.T.

Opportunity: An environment for innovative surveillance methods



Paper- vs. mobile phone-based surveillance

Phone-based

Paper-based

Date of Exposure □
The day when victim
Encounter animal bite

Date of Clinic Presentation □
The day when patient went to clinic
Seeking for treatment

Date Reported □
The day when data on animal bite victims
were available to national authorities



Attend to clinic



Patient information Recorded into
Paper-based Surveillance System



Health Workers

Paper-forms collation



District Level

Transport/
postage



Regional

Transport/ postage



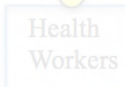
Data Unit

Data Entry & Cleaning



MoHSW

PARACON - Jun 9 - 11, 2015, RSA



Health Workers

Data submission



Central server

Research Centre
Shared to MoHSW
MoLFD & WHO and
Universities

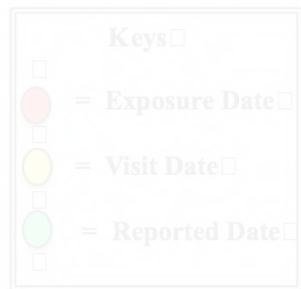
Patient information Recorded into Mobile
Phone-based Surveillance System

Validation

Rabies focal
person at
MoHSW

MoHSW
National
Database

Validation



Rabies Elimination Demonstration

Project:

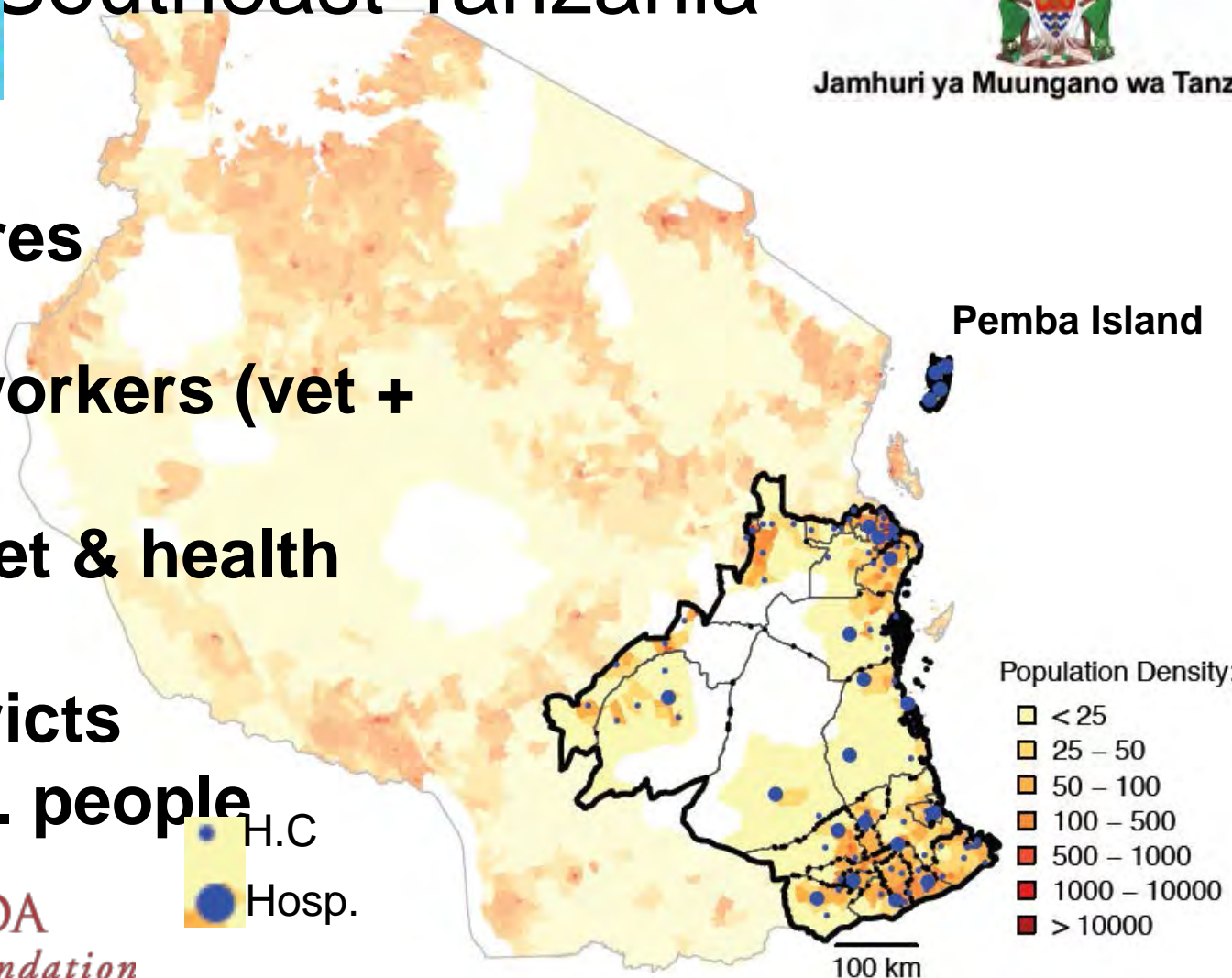
Southeast Tanzania



Jamhuri ya Muungano wa Tanzania

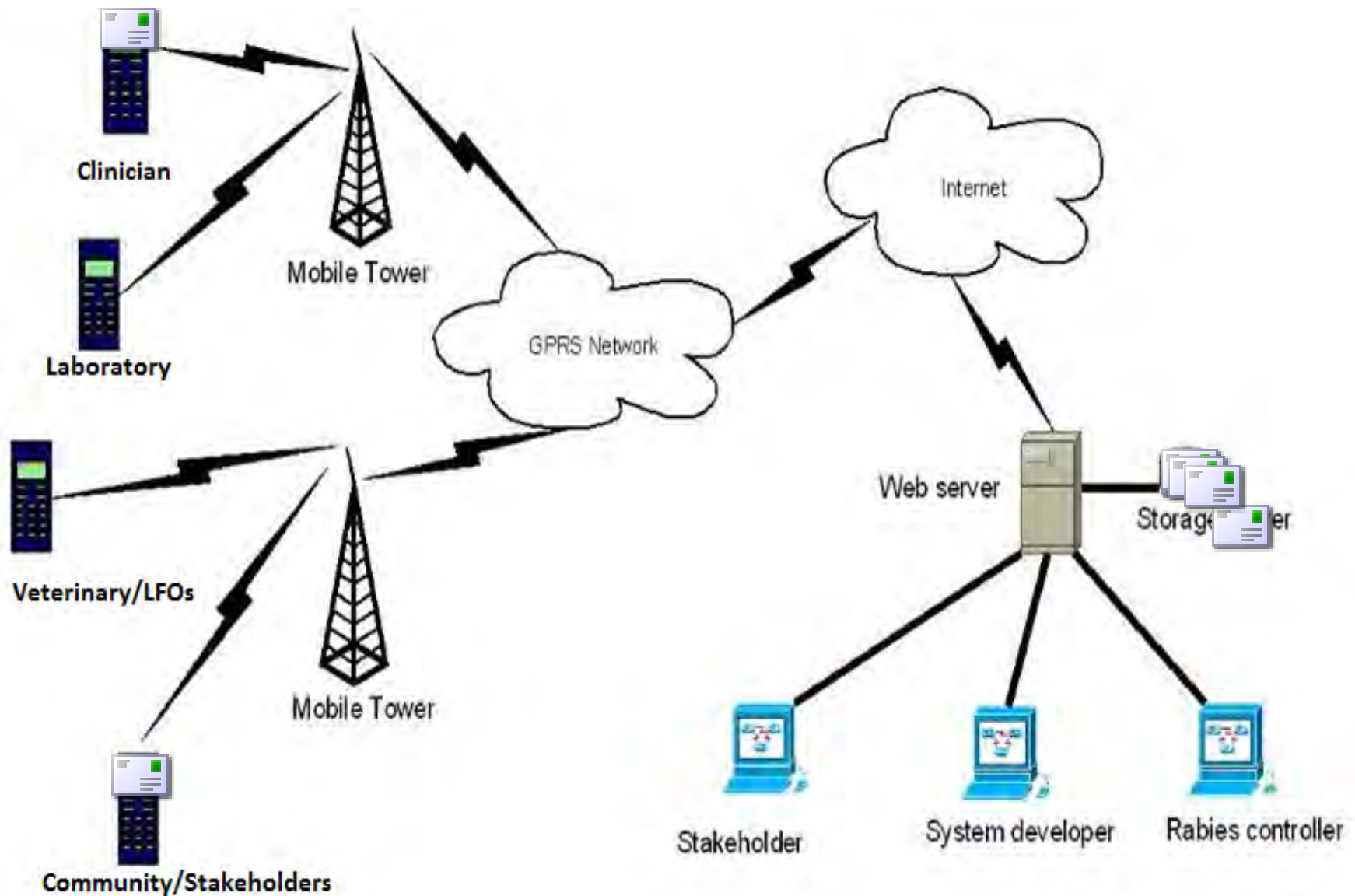
Key features

- > 150 workers (vet + health)
- > 100 vet & health units
- 28 districts
- ~ 8 mill. people



BILL & MELINDA
GATES foundation

Mp-bS System architecture

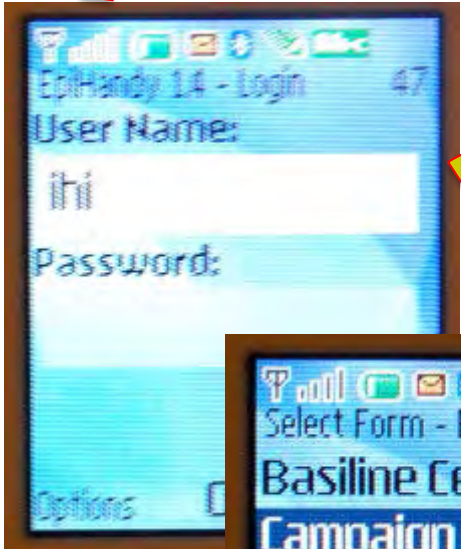


Field user interface

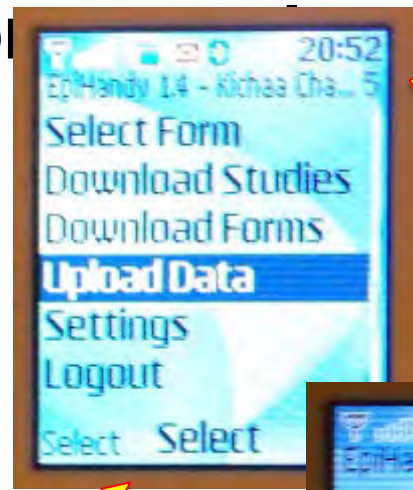
1. Users select software



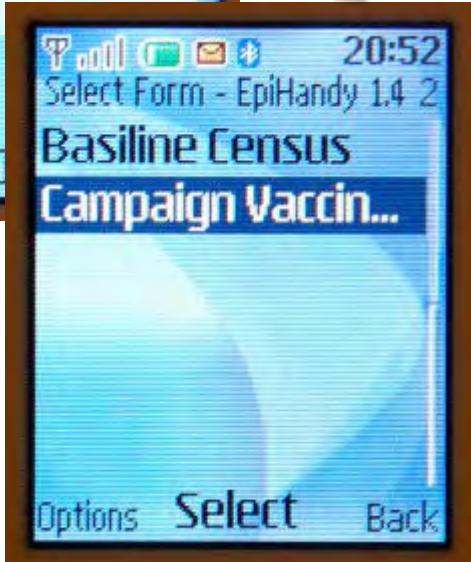
2. Users Login



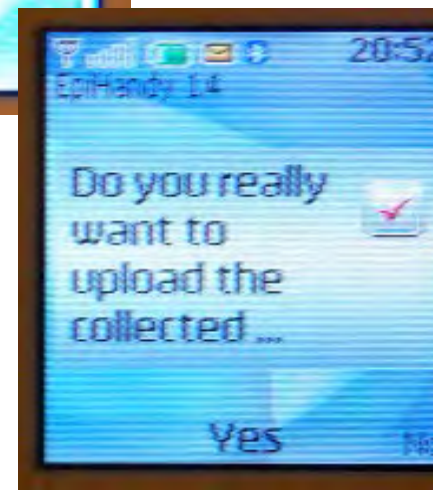
4. Enter data according to questions



3. and choose data entry form



5. Finally submit data



Data access

Go to: www.esurveillance.or.tz

- Surveillance System

Home

Surveillance Data

SMS Intervention

Products

Support

Control Panel

About Us

Animal Bite Injuries

Animal Vaccination Campaign

Rabies Suspect Case

Laboratory Diagnostics

Animal Household Survey

Rabies PEP Stock Control



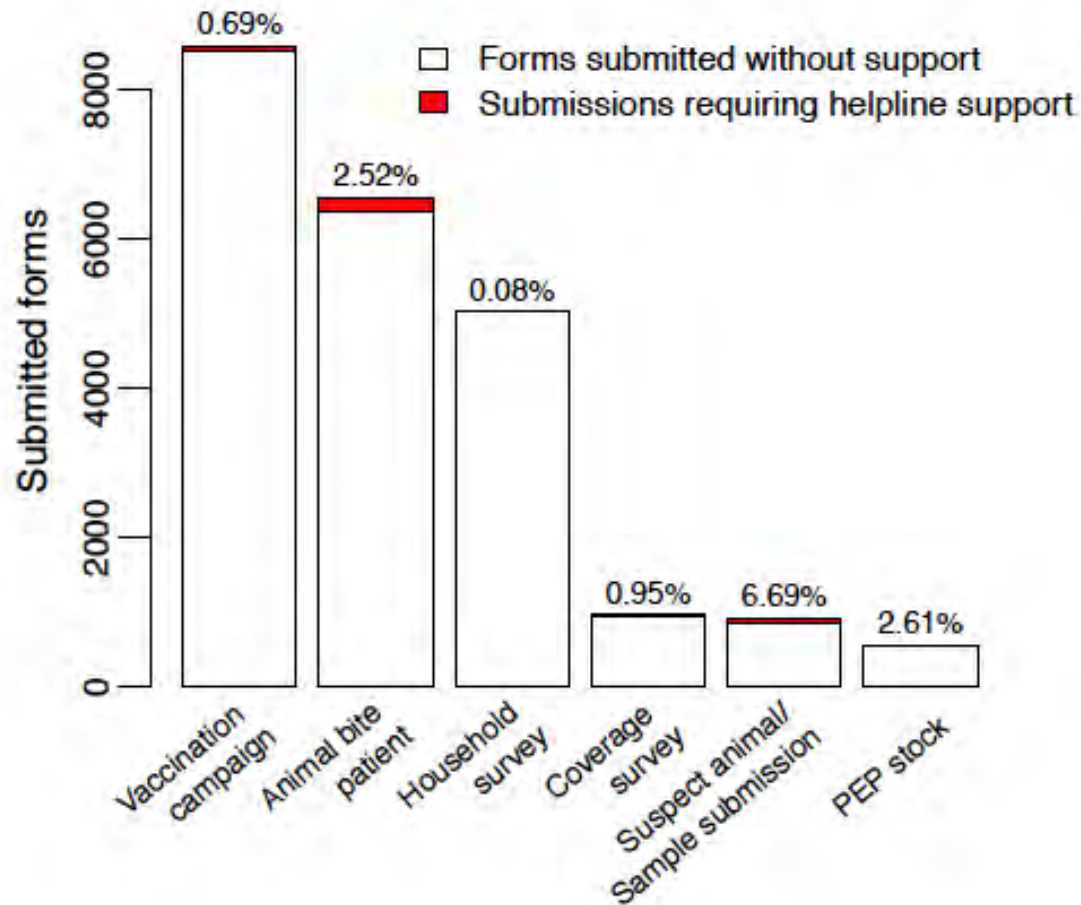
19/06/2015

PARACON - Jun 9 - 11, 2015, RSA

Raw data can be downloaded, saved & analyzed

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	campaign	start_time	end_time	LFO	Region	District	sub-village	Vials	Batcl	Dogs	Cats	Comments	
2	02/05/2010	5:00:00 AM	11:15:00 AM	All Mkangama	morogoro	ulanga	Mahenge	11	L263998	87	32	Mwitikio mzuri.	
3	03/05/2010	5:00:00 AM	12:30:00 PM	Joseph Komba	morogoro	ulanga	Mbagula	14	L263998	58	10	Mikanda haikutosha	
4	03/05/2010	6:05:00 AM	11:30:00 AM	Peter Paul	morogoro	ulanga	Epanko	8	L263998	70	10	Zoezi limefanikiwa kwa zaidi	
5	03/05/2010	6:00:00 AM	11:30:00 AM	Shania Said	morogoro	ulanga	Nawenge	9	L263998	72	14	Mikanda na kadi haikutosha	
6	03/05/2010	6:15:00 AM	12:30:00 PM	Brayson Mwin	morogoro	ulanga	Vigoi	4	L263998	32	11	Zoezi lirudiwe tena	
7	03/05/2010	6:00:00 AM	12:00:00 PM	Respiclus Lugo	morogoro	ulanga	Kisewe	8	L263998	71	9	Zoezi liwe endelevu	
8	03/05/2010	6:10:00 AM	11:00:00 PM	Elisha Mgona	morogoro	ulanga	Makanga	9	L263998	76	12	Zoezi limeenda vizuri	
9	04/05/2010	6:00:00 AM	12:00:00 PM	Theofrida Chilu	morogoro	ulanga	Isongo	12	L263998	107	5	Mikanda na kadi hazikutosh	
10	04/05/2010	5:30:00 AM	11:00:00 AM	Yusuf Ali	morogoro	ulanga	Mbangayao	6	L263998	48	3	Kazi nzuri	
11	04/05/2010	7:30:00 AM	11:33:00 AM	Juma Kapilima	morogoro	ulanga	Lyandu	6	L263998	45	11	Mwitikio ulikuwa unaridhish	
12	04/05/2010	5:40:00 AM	11:05:00 AM	Sixbertha Alex	morogoro	ulanga	Uponera	7	L263998	60	12	Njanjo iwe inafanyika mara	
13	05/05/2010	6:00:00 AM	11:07:00 AM	M.HAKIRA	morogoro	ulanga	Chikuti	9	L263998	74	13	Zoezi limekwenda vizuri.	
14	05/05/2010	4:15:00 AM	12:00:00 PM	Abdallah Kiluta	morogoro	ulanga	Msogezi	8	L263998	58	22	Kadi hazikutosha	
15	05/05/2010	7:00:00 AM	11:00:00 AM	Lazaro Luholi	morogoro	ulanga	Majengo	2	L263998	19	1	Uhamasishaji ufanyike zaidi	
16	05/05/2010	6:07:00 AM	12:21:00 PM	Olektok Meel	morogoro	ulanga	Mdindo	7	L263998	59	15	Mwitikio umekuwa mzuri	
17	06/05/2010	6:10:00 AM	12:27:00 PM	Tatu Ngopi	morogoro	ulanga	Chigandugand	1	L263998	6	2	Viongozi wa kijiji hawakuon	
18	06/05/2010	7:30:00 AM	11:15:00 AM	Izack Punduka	morogoro	ulanga	Ketaketa	2	L263998	15	6	Chanjo iwe mara kwa mara	
19	06/05/2010	5:30:00 AM	11:15:00 AM	Augustino Wile	morogoro	ulanga	Luhombero	3	L263998	14	13	Muda wa chanjo uongezwe	
20	06/05/2010	7:00:00 AM	12:03:00 PM	Odila Mgaya	morogoro	ulanga	Nanungu	2	L263998	5	11	Muda wa chanjo uongezwe	
21	07/05/2010	11:30:00 AM	5:00:00 PM	Leonard Lukoc	morogoro	ulanga	Mwaya	5	L:26399	20	28	Wananchi waendeleo kuhan	
22	07/05/2010	11:30:00 AM	5:30:00 PM	Leonard Lukoc	morogoro	ulanga	Nkongo	4	L:26399	26	10	Zoezi limefanikiwa	
23	07/05/2010	1:07:00 PM	12:00:00 PM	Grace Zeno	morogoro	ulanga	Libenanga	4	L263998	15	19	Uwamasishaji uongezeke	
24	07/05/2010	6:25:00 AM	1:03:00 PM	Stahimili Sang	morogoro	ulanga	Gombe	5	L263998	38	5	Chanjo iendeleo kila mwaka	
25	07/05/2010	5:00:00 AM	11:00:00 AM	Credo Florian	morogoro	ulanga	Lukande	4	L263998	26	17	Chanjo iwe endelevu	
26	08/05/2010	5:36:00 AM	11:11:00 AM	Godfrey Lama	morogoro	ulanga	Mbuga	4	L263998	22	17	Watu wapo mashambani, ch	
27	08/05/2010	6:49:00 AM	11:01:00 AM	Fredrick Kapu	morogoro	ulanga	Ebuyu	3	L263998	25	5	Muda wa kazi uongezwe iwe	
28	08/05/2010	5:45:00 AM	11:19:00 AM	Said Said	morogoro	ulanga	Euga	3	L263998	10	18	Zoezi lifanyike kiangazi	
29	08/05/2010	5:45:00 AM	11:19:00 AM	Said Said	morogoro	ulanga	Euga	3	L263998	10	18	Zoezi lifanyike kiangazi	
30	08/05/2010	5:30:00 AM	11:13:00 AM	Renatus Ngold	morogoro	ulanga	Iputi	2	L263998	4	12	Zoezi liwe endelevu.	
31	08/05/2010	5:30:00 AM	11:13:00 AM	Renatus Ngold	morogoro	ulanga	Iputi	2	L263998	4	12	Zoezi liwe endelevu.	
32	08/05/2010	6:55:00 AM	12:55:00 PM	Eleonora Pene	morogoro	ulanga	Mzelezi	7	L263998	53	19	Watu wengi wapo mashamb	
33	08/05/2010	6:55:00 AM	12:55:00 PM	Eleonora Pene	morogoro	ulanga	Mzelezi	7	L263998	53	19	Watu wengi wapo mashamb	
34	08/05/2010	6:15:00 AM	1:20:00 PM	Angela Monge	morogoro	ulanga	Chirombola	3	L263998	14	16	Chanjo itolewe mwezi Augu	
35	09/05/2010	7:00:00 AM	11:20:00 AM	Jastine Lwamb	morogoro	ulanga	Isyaga	6	L263998	48	14	Chanjo iwe endelevu	
36	09/05/2010	6:30:00 AM	12:30:00 PM	Isaya Mshimik	morogoro	ulanga	Mgolo	4	L263998	25	12	Uhamasishaji uongezeke	
37	09/05/2010	7:00:00 AM	11:20:00 AM	Jastine Lwamb	morogoro	ulanga	Isyaga	6	L263998	48	14	Chanjo iwe endelevu	

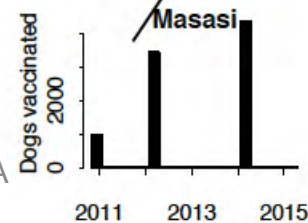
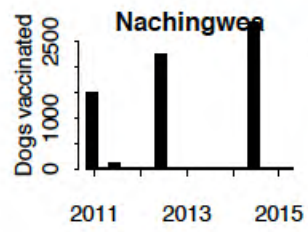
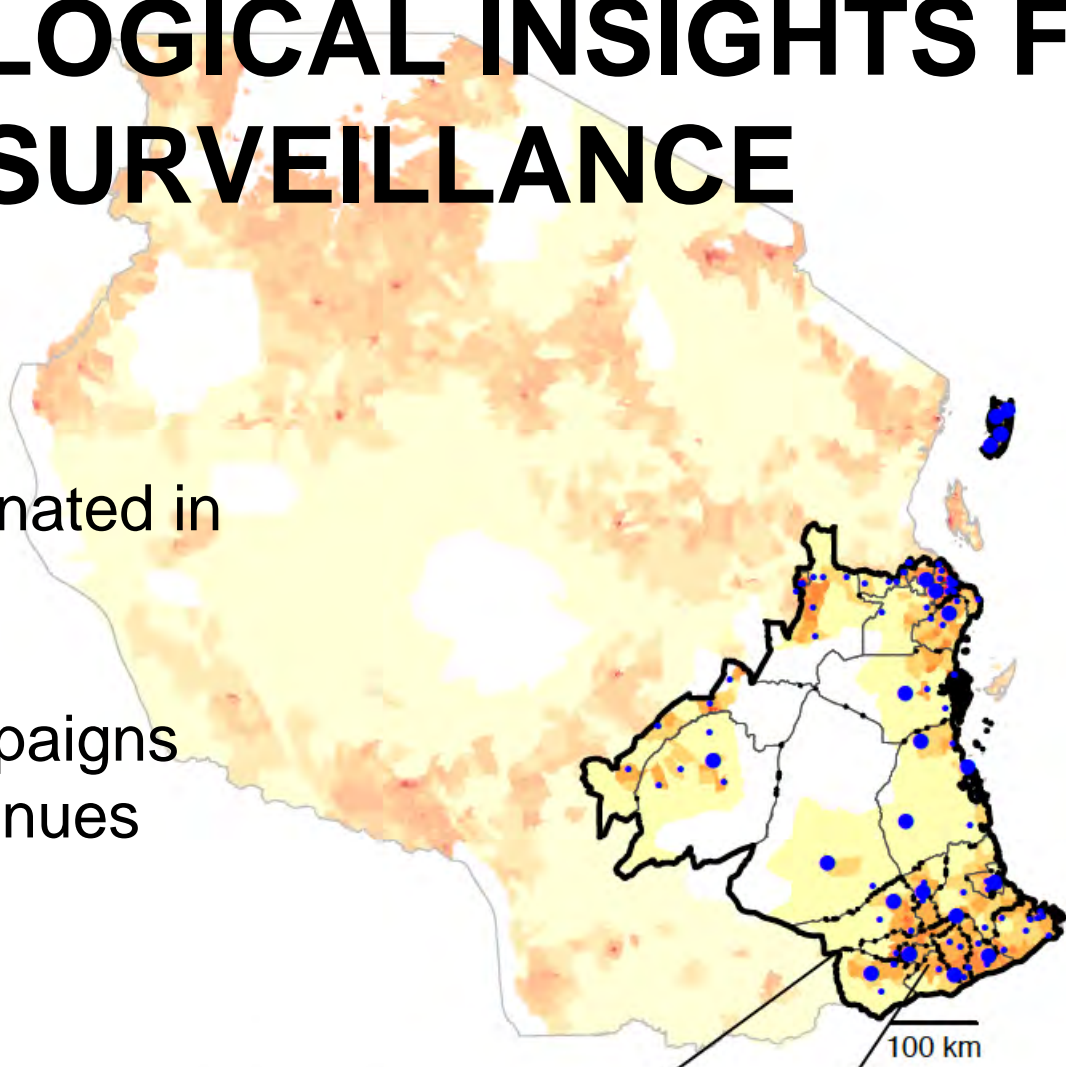
Experience: Very few problems encountered during online form submissions



EPIDEMIOLOGICAL INSIGHTS FROM SURVEILLANCE

MASS DOG VACCINATION:

- Numbers vaccinated in 2000+ villages
- Improving campaigns as project continues

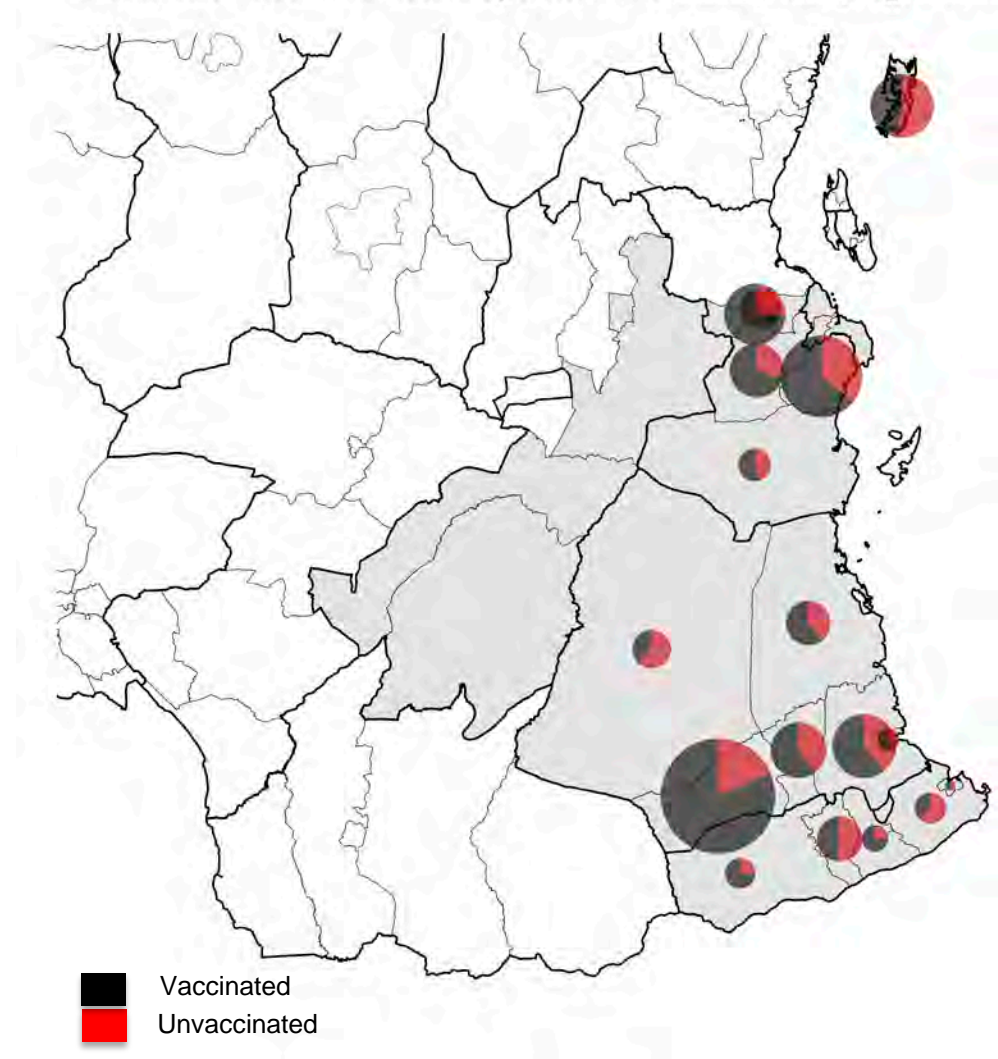


EPIDEMIOLOGICAL INSIGHTS FROM SURVEILLANCE

MASS DOG VACCINATION:

- Vaccination coverage of between 34%-80% across the districts
- Identifies problem areas (e.g. 2 districts with vaccination coverage < 50%)

Estimated vaccination coverage from vaccination campaigns in 2014

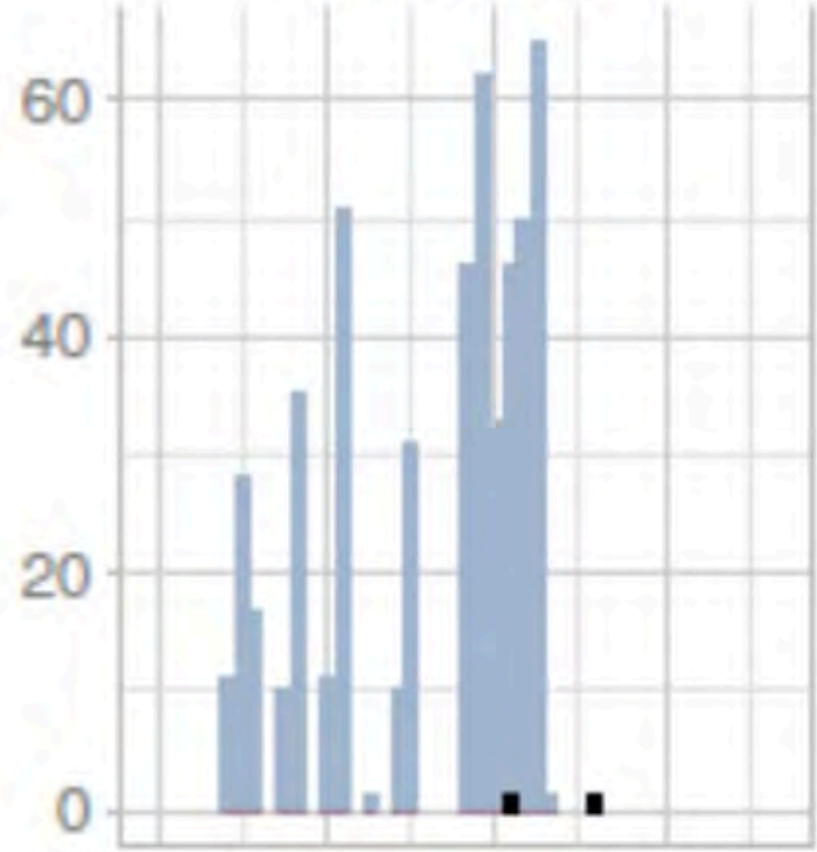
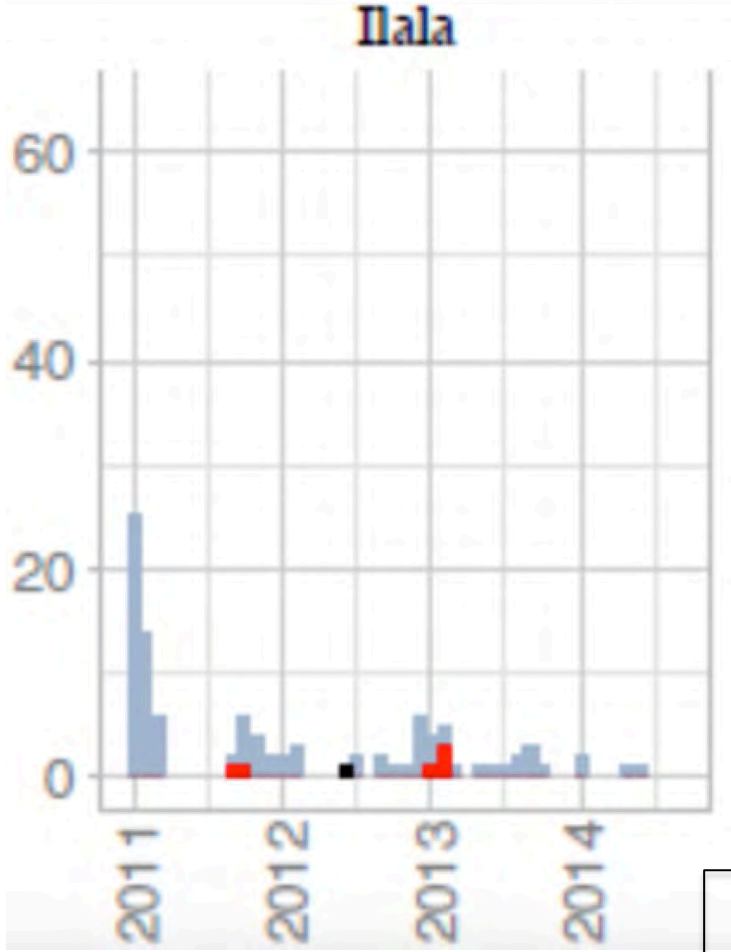


EPIDEMIOLOGICAL INSIGHTS FROM SURVEILLANCE

SUSPECT RABIES CASES

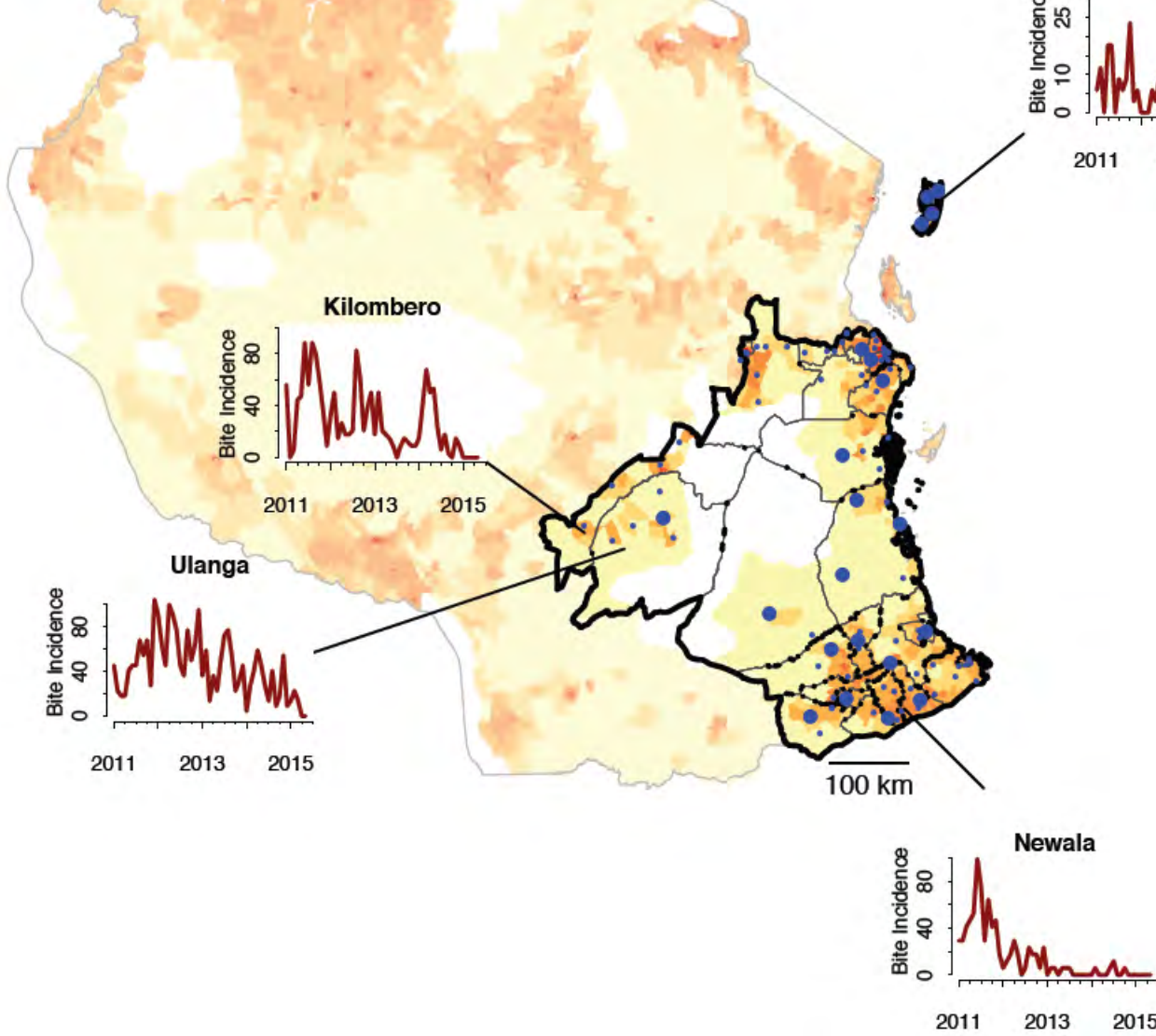
Kinondoni

Ilala



- Suspect rabies cases
- Samples collected
- Samples not collected

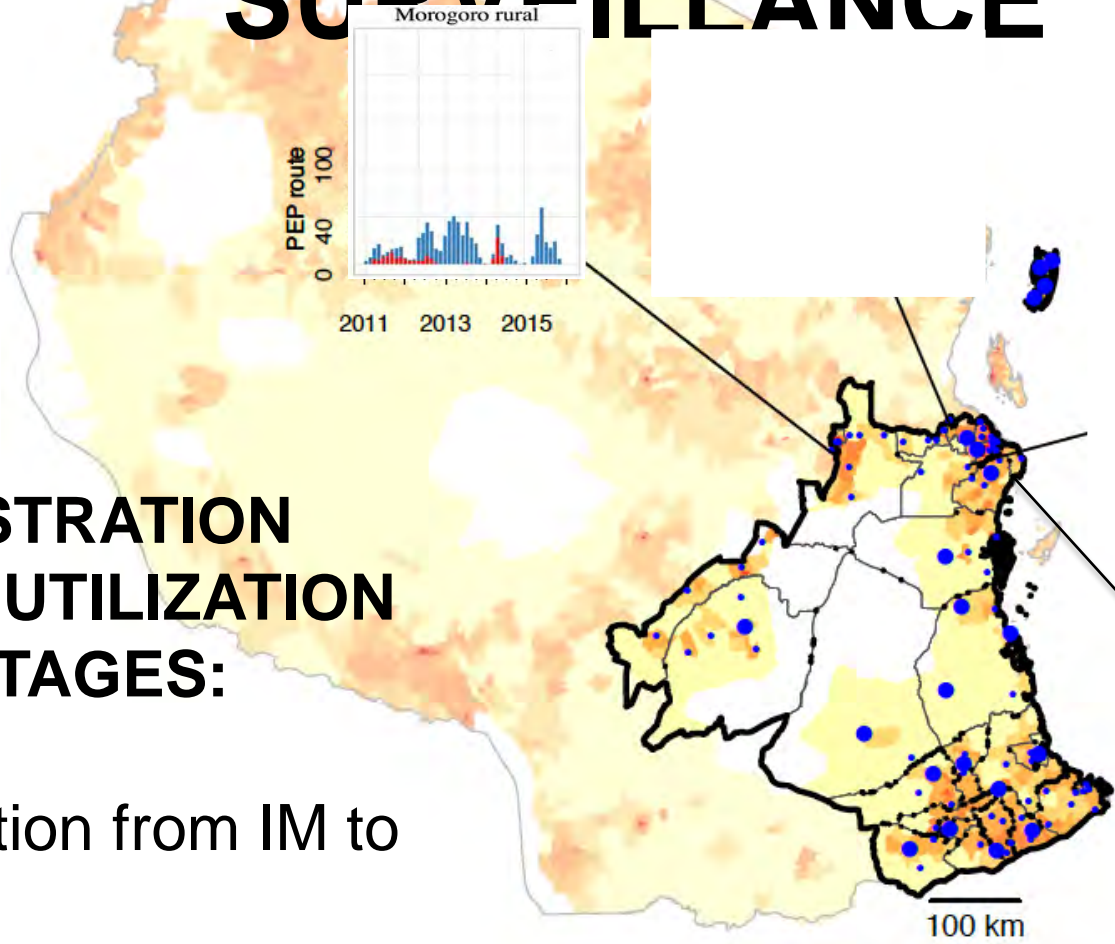
EPIDEMIOLOGICAL INSIGHTS FROM SURVEILLANCE



INCIDENCE OF BITE INJURIES REPORTED AT CLINICS:

- Village of origin of patients recorded
- Considerable decline in demand for PEP
- Likely reflects health seeking

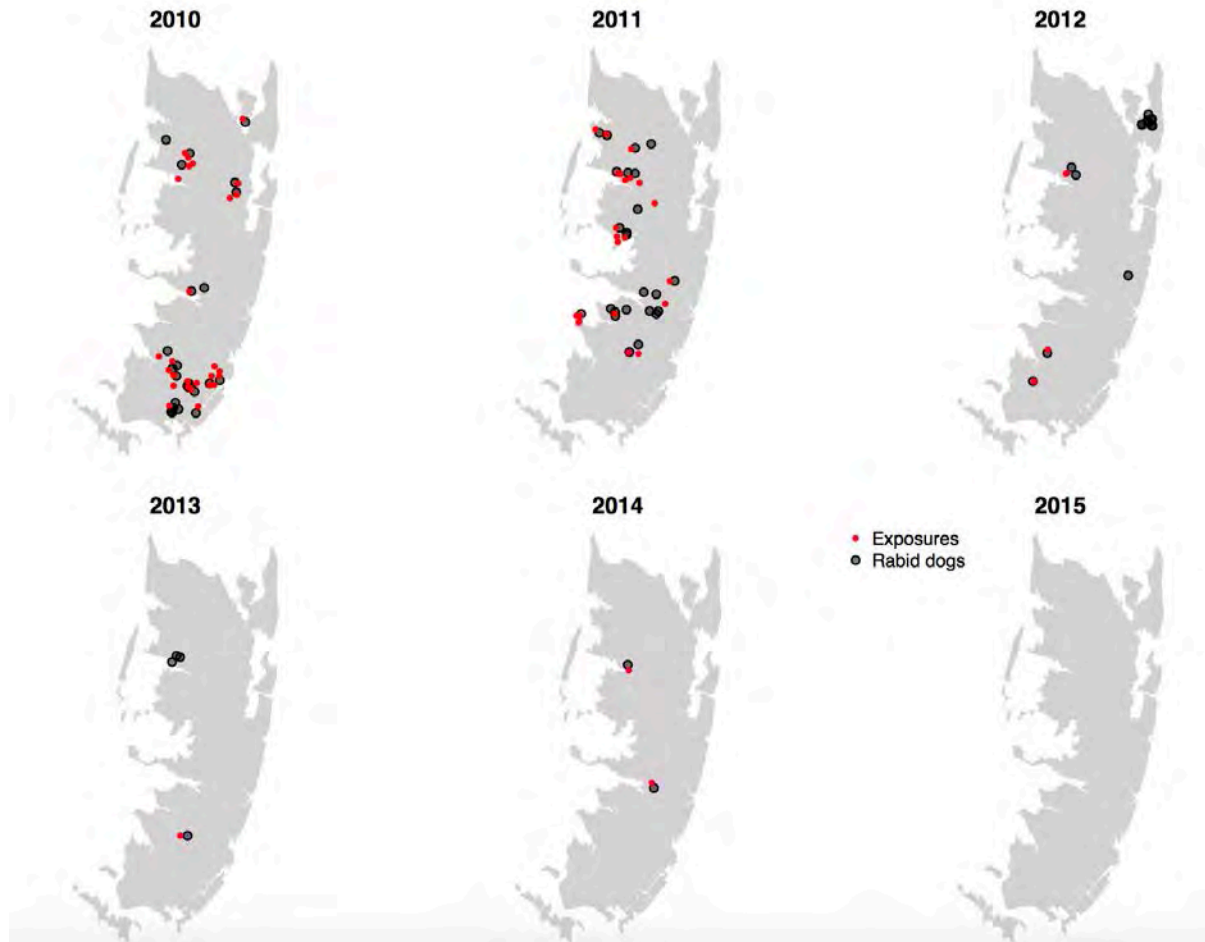
EPIDEMIOLOGICAL INSIGHTS FROM SURVEILLANCE



**PEP:
ADMINISTRATION
ROUTE, UTILIZATION
& SHORTAGES:**

- Transition from IM to ID
- Alerts of PEP shortages

EPIDEMIOLOGICAL INSIGHTS FROM SURVEILLANCE (CASE OF PEMBA ISLAND)



Mass dog vaccination campaigns have brought the island close to canine rabies elimination

THE WAY FORWARD

- Sustainable integration within government health systems and with other technical networks to improve system
- Develop application for direct download to users' own phone
- Explore the potential role of public-private partnerships (e.g. mobile phone companies, service providers) to offset costs
- Improve the feedback and bidirectional flow of information to increase participation of frontline workers (e.g. SMS alerts to relevant stakeholders)
- Expand the system to other zoonotic and infectious diseases in close collaboration with ministries

Acknowledgments



UBS Optimus Foundation



Acknowledgments

- WHO Country Office, TZ
- Ministry of Livestock and Fisheries Development, TZ
- Ministry of Health and Social Welfare, TZ
- Directorate of Veterinary Services, TZ
- Tanzania Veterinary Laboratory Agency, TZ
- Sokoine University of Agriculture (SUA), TZ
- University of Glasgow, UK

Thank You!



100 km

100 km

19/06/2015

PARACON - Jun 9 - 11, 2015, RSA

Mobile Phone and Clicker Technology

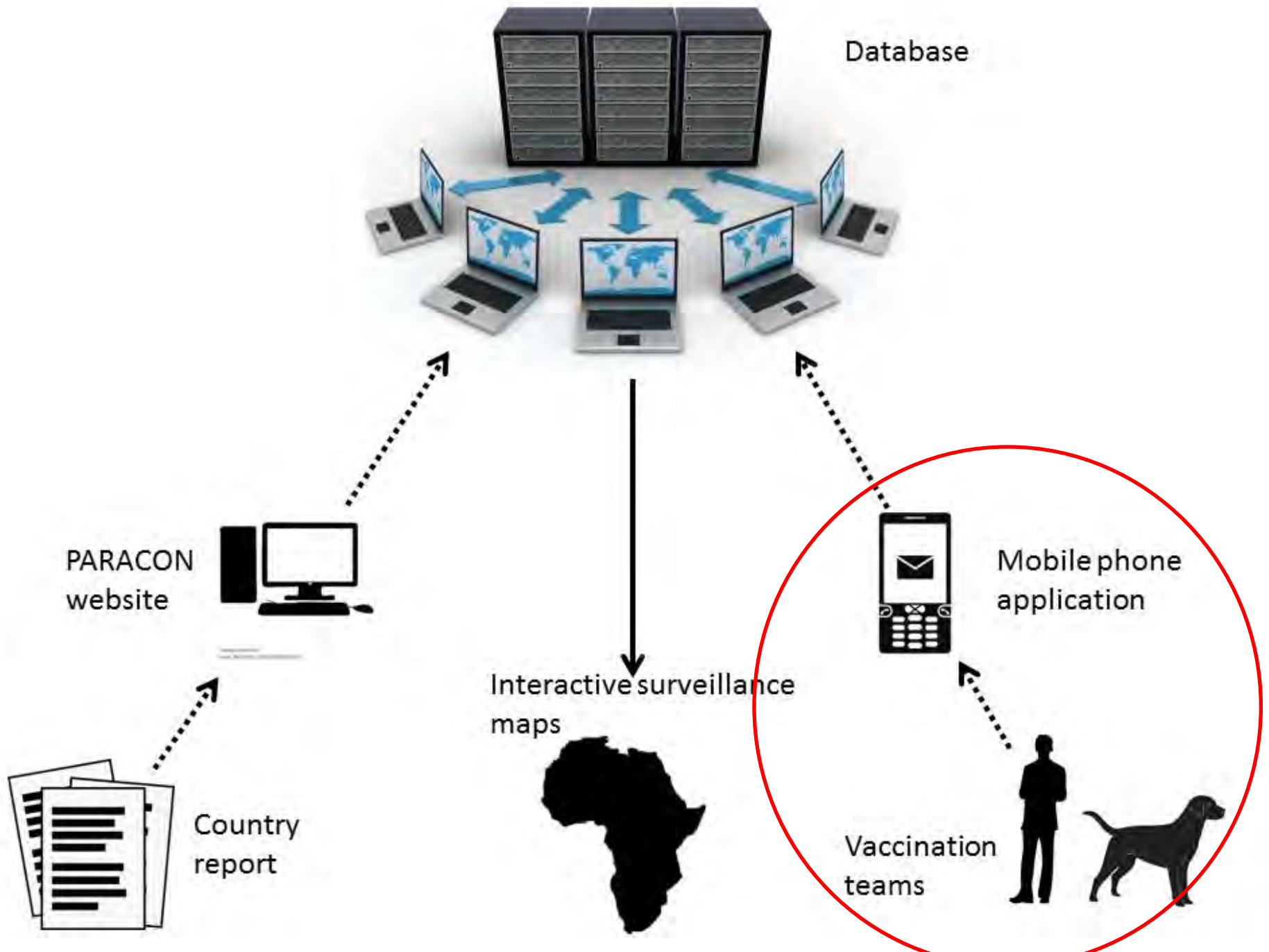
Global Alliance for Rabies Control

PARACON 2015



Introduction

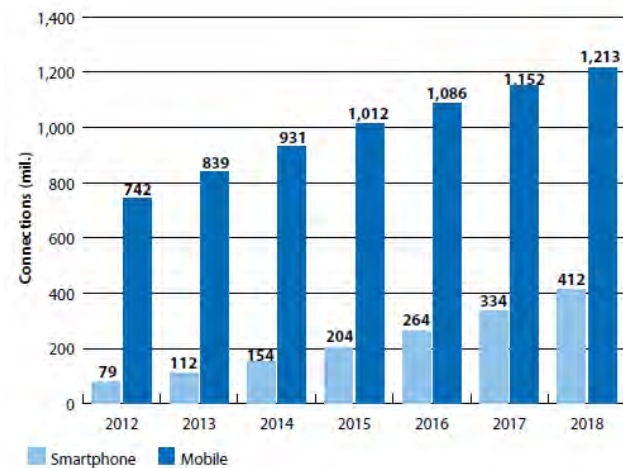
- Need for improved surveillance
- Accurate data
- Easy-to-use methods
- “Real-time” data collection



Benefits of mobile phones

- Mobile phones:
 - Multi-functional tools
 - Variety of uses
 - Improving technology

Fig. 3: Africa, smartphone connection forecasts, 2012-2018



- Increasing growth of Mobile phone market
 - More mobile phones than laptops and PCs
 - Increased network coverage
 - Reducing prices of smartphones

Benefits of mobile phones

- Paper based systems
 - Slow
 - Loss of info
 - Cumbersome
 - Transmission of data to electronic format
 - Error prone
- Mobile phone apps
 - Mission rabies
 - Data not freely available
 - Too complicated
 - Epicollect etc.



Why should a new app be developed?

- Simplify
 - Too complicated for single person vaccinator
 - Problems of loss, theft and breakage
- Target specific info
 - Ties in with info from bulletin
 - Supplement to country reports
 - Useful data on a large scale
 - Compare with government reported figures
- Data freely accessible

Overcoming challenges

- Challenges
 - Difficult conditions
 - Theft
 - Breakage
 - High costs related to devices
 - Insufficient time
 - Multiple tasks required of vaccinators
 - Single person vaccinators

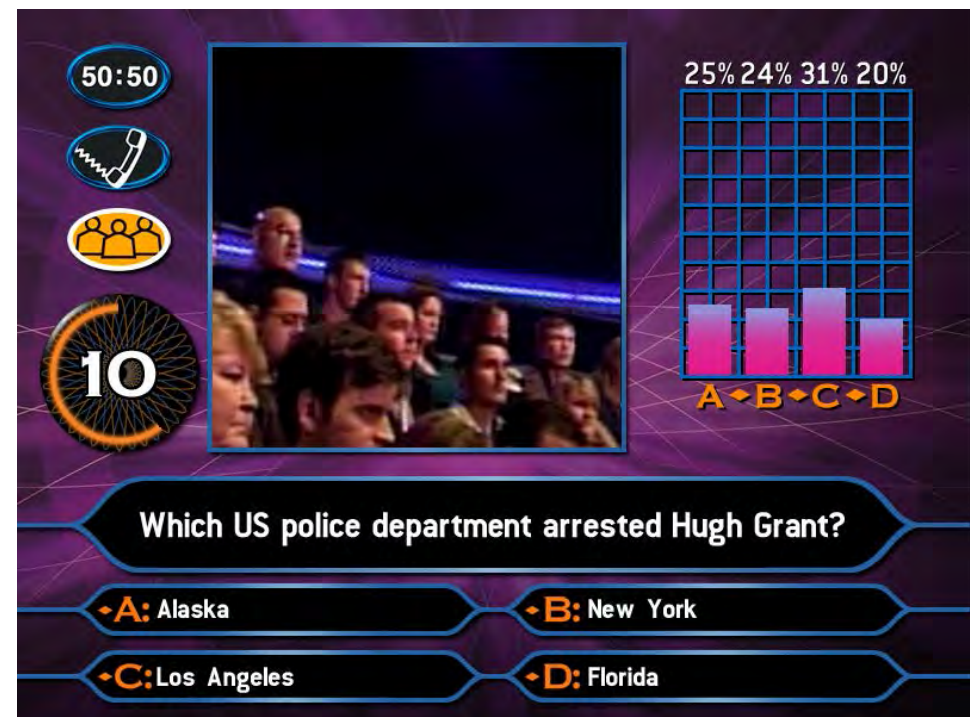


Proposed solution: Clicker system



Proposed solution: Clicker system

- Remote polling device
- Works on RF or IR
- Multiple clickers to a single device
- Simple, cheap



Ideal data collected

- Owner details
- Dog population numbers
 - Dog population turnover
 - Dog:human ratio
 - Reproductive status
 - Gender ratio
- Vaccination
 - Vaccine used
 - Batch
 - Type
 - GPS co-ordinates
 - Time and date
 - Previous vaccination status

Proposed data collected

- ~~Owner details~~
- Dog population numbers
 - ~~Dog population turnover~~
 - ~~Dog:human ratio~~
 - ~~Reproductive status~~
 - Gender ratio
- Vaccination
 - Vaccine used
 - Batch
 - Type
 - GPS co-ordinates
 - Time and date
 - ~~Previous vaccination status~~

Proposed data collected

- ~~Owner details~~
- Dog population numbers
 - ~~Dog population turnover~~
 - ~~Dog:human ratio~~
 - ~~Reproductive status~~
 - Gender ratio
- Vaccination
 - Vaccine used
 - Batch
 - Type
 - GPS co-ordinates
 - Time and date
 - ~~Previous vaccination status~~

Envisioned App

VacciTrac



User log in

Password

Campaign selection

Campaign name^

Gauteng, South Africa

Bushbuckridge, South Africa

+Add new campaign

Campaign selection

Gauteng, South Africa

Description^

Fixed point

Vaccine^

Vaccine brand 1

Vaccine batch number

Lot-34-523-2355

Select an animal

1) Dog

2) Cat

Select Sex and status

A) Adult female
>3 months

B) Adult male
>3 months

C) Juvenile female
≤3 months

D) Juvenile male ≤3
months

Other possible features

- Follow-up survey function
 - using the same device
 - Determine number of marked vs unmarked animals
- Can also use for basic dog population numbers survey
 - Simply click appropriate button when animal sighted

iclicker+

POWER



LOW BATTERY



A



B



C



D



E



Mobile technology summary

- Easy to use
 - Can be mounted onto a clipboard
- Simple
 - Yet gathers accurate data
- Cheaper
- Reduces costs of theft/breakage/loss

Overall Envisioned Results

- Freely available data
- Cohesion of different reporting systems within a country/region
- **Multiple sources of information** on a single database
- Interactive maps



World Rabies Day PARACON - June 2015



GARC

rabiesalliance.org

What is World Rabies Day?

- WHAT:** A day of communication, motivation, and action
- WHY:** To raise global awareness about rabies
To promote education in local communities to control and prevent rabies
- WHERE:** Worldwide
- WHEN:** Annually on September 28
- HOW:** Events organized regionally, nationally, and locally
- WHO:** At risk populations, stakeholders, donors & fundraisers



World Rabies Day launched 2007

GOALS

- ✓ Engage the support of all international health organizations and all stakeholders
- ✓ Establish a central website for information on WRD activities, educational material, reports
- ✓ Provide basic 'toolkits' for conducting events
- ✓ Create media interest through coverage of events
- ✓ Use WRD as a 'reminder' to get pets vaccinated
- ✓ Encourage communities at risk to 'do something' on WRD
- ✓ Set a goal of engaging 55,000 people to do something to increase awareness on WRD



Global Impact of World Rabies Day

- Since September 2007...
 - Reached over 200 million people
 - Events held in at least 51 countries



WRD parade in Indian village
Photo: Dr Ashwath Narayana



Children bringing pets to be vaccinated in Napak, Uganda during WRD 2010
Photo: Dr Inangolet Francis Olaki



World Rabies Day 2014



The vaccines division of sanofi-aventis Group



VÉTÉRINAIRES
SANS FRONTIÈRES GERMANY

VÉTÉRINAIRES
SANS FRONTIÈRES



WORLD VETERINARY ASSOCIATION



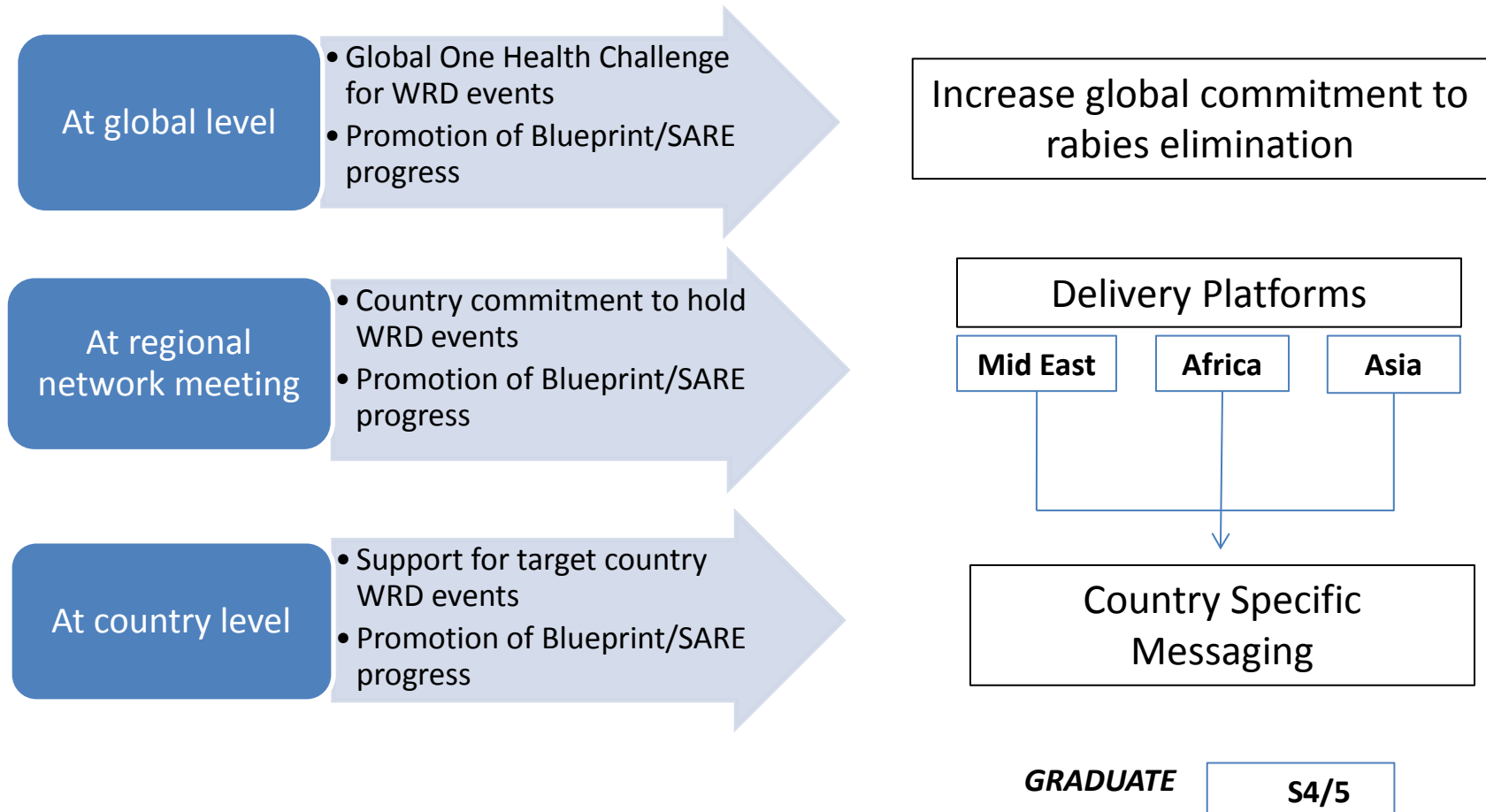
World Health
Organization



GARC

rabiesalliance.org

World Rabies Day – programme integration



A global event 2014

Global One Health Challenge

- Coordinated by GARC in partnership with IVSA and IFMSA
- 28 “One Health” events
- Teams had to include medical and vet students
- Total impact
 - > 12,000 animals vaccinated
 - > 1,600,000 reached with rabies prevention messages
 - Including 105,446 directly educated



Another global event 2014



Me and My Dog

- One Health message
- New audiences – social media
- Engagement 123,500 people
- Reached > 6,000,000 people
- 2nd most mentioned hashtag in Mumbai
- Also trended nationally in India

Global Alliance for Rabies Control
September 28 at 2:00pm · Edited (?) · 🌐

Help spread awareness about rabies. If you have vaccinated your dog against rabies share a picture with your healthy dog and nominate other dog owners to do the same #TogetherAgainstRabies

296,320 People Reached

2,630 Likes, Comments & Shares

2,519 Likes	2,431 On Post
59 Comments	51 On Post
52 Shares	50 On Post

6,663 Post Clicks

6,663 Photo Views	0 Link Clicks
-----------------------------	-------------------------

NEGATIVE FEEDBACK

17 Hide Post	0 H
0 Report as Spam	0 U



An example national event

Sri Lanka

“National Commemoration of World Rabies Day”

- Walk with the participation of school children, nursing trainees, and primary health care staff.
- Display of messages on rabies prevention developed by school children.
- Followed by seminar and prize giving. Chief guest honourable Minister of Health.



An example local event

Quiz Night

- Rabies awareness lecture for medical professionals including
 - doctors
 - interns
 - nurses
 - para-medical staff
- Followed by a quiz and social evening



Who holds World Rabies Day events?

Anyone who cares about ending rabies - organisers are people from all walks of life, including:

Physicians

Veterinarians

Teachers

Health workers

Students

Scientists

Municipalities

Animal welfare NGOs

Hospitals

Government departments

Fundraisers

Businesses

Clinics

Volunteers

Parents

Community leaders

Public health NGOs

And groups working together!



Tools

- Guides and tips to taking action on World Rabies Day
<http://rabiesalliance.org/world-rabies-day/publicizing-your-event/>
 - Organisers' summary
 - Ideas
 - Key messages
 - Event planning
 - Communications
 - Modifiable press releases
 - Presentation for getting buy-in from in-country stakeholders
 - Policy toolkit
- Share World Rabies Day events
<http://rabiesalliance.org/world-rabies-day/report-event/>
- World Rabies Day logos in different languages
<http://rabiesalliance.org/world-rabies-day/logos/>



Resources

- **Posters** to raise awareness of rabies prevention; to advertise events
- **Leaflets** to raise awareness of rabies prevention
- **Teaching materials** age appropriate lesson plans and worksheets in various target languages
- **Coloring pages** for younger children
- **Video links**

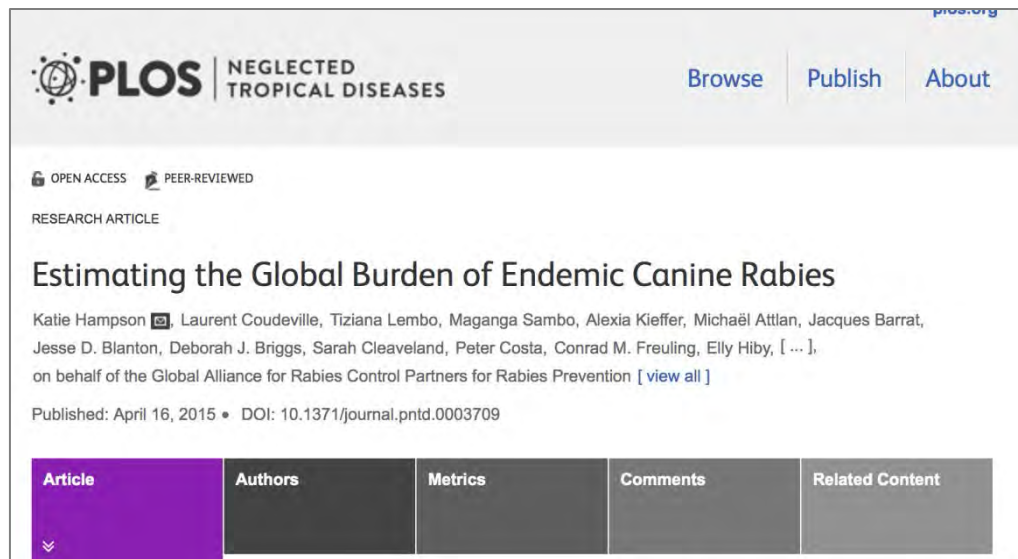
All available from

<http://rabiesalliance.org/resources/>



2015 Country Specific Messages

- Recent publications on Notifiability & Global Burden facilitate World Rabies Day messages specific to the needs of your country
 - to increase the relevance your messaging
 - To maximise the impact of your World Rabies Day efforts



The screenshot shows the PLOS Neglected Tropical Diseases website. The header includes the PLOS logo and the text "NEGLECTED TROPICAL DISEASES". Navigation links for "Browse", "Publish", and "About" are visible. Below the header, it indicates "OPEN ACCESS" and "PEER-REVIEWED". The article title is "Estimating the Global Burden of Endemic Canine Rabies". The authors listed are Katie Hampson, Laurent Coudeville, Tiziana Lembo, Maganga Sambo, Alexia Kieffer, Michaël Attlan, Jacques Barrat, Jesse D. Blanton, Deborah J. Briggs, Sarah Cleaveland, Peter Costa, Conrad M. Freuling, and Elly Hiby. The article is published on April 16, 2015, with a DOI of 10.1371/journal.pntd.0003709. At the bottom, there is a navigation bar with tabs for "Article", "Authors", "Metrics", "Comments", and "Related Content".



Next Steps

- Determine your country's priorities
- Develop country specific key messages
- Use GARC resources to support your efforts
- Share your event on rabiesalliance.org/world-rabies-day
 - this raises the profile of the disease and demonstrates your engagement to donors
- Work with and support your neighbours



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