World Malaria Day

Malaria Vector Biology and Control

JOHNS HOPKINS
BLOOMBERG SCHOOL
of PUBLIC HEALTH
Malaria Research Institute

LIGHTNING TALKS

Malaria Epidemiology Breakout Room

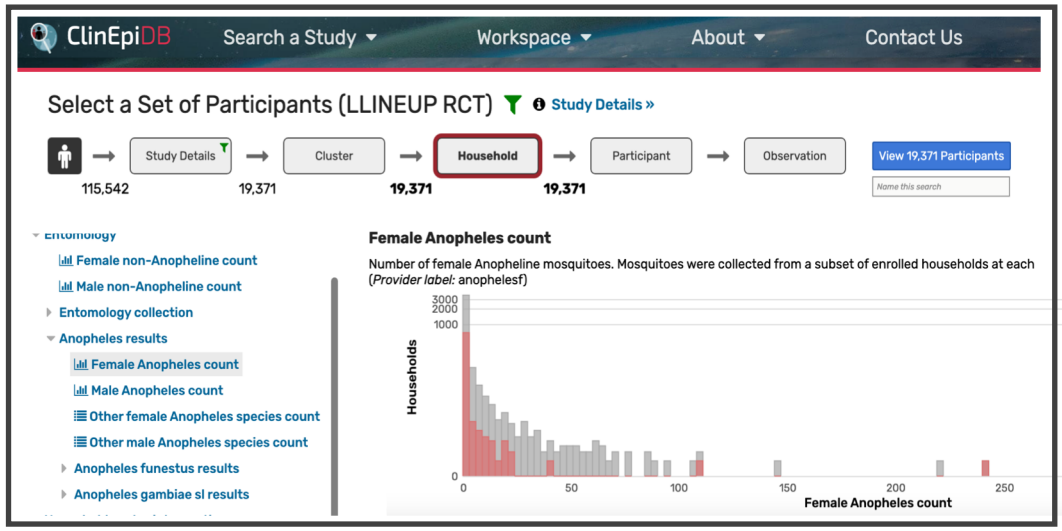
All Presenters: Please be prepared to speak when your slide is queued up. Presentation order is indicated in the Lightning Talk Program circulated by email. The moderator will introduce you by name and affiliation, and then your time will start. To stay on time the moderator must advance to the next presentation at 3 minutes.

Attendees: This rapid-fire format does not allow for live questions, but we encourage you to contact any speaker for further networking.

ClinEpiDB.org
Clinical Epidemiology Resources

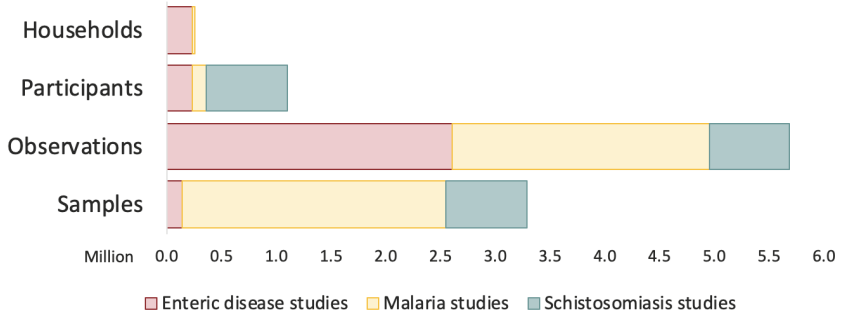
Lowering barriers for exploratory analysis of global health and malaria studies

Danica Helb[1], Jessica Kissinger[2], Nupur Kittur[2], David Roos[1], Steph Schulman[1], Chris Stoeckert[1], Sheena Tomko[1], VEuPathDB Team[1,2,3]
[1]*University of Pennsylvania, Philadelphia, PA,* [2] *University of Georgia, Athens, GA,* [3]*University of Notre Dame, South Bend IN*



Making data F.A.I.R.

29 studies (15 with data on malaria)



VEuPathDB
Eukaryotic Pathogen, Vector & Host Informatics Resources

ClinEpiDB.org
VectorBase.org
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Spring 2021 Webinar Series

When: *Tuesdays, 2 PM UTC April 20 – May 18 2021*
Where: *Register at https://tinyurl.com/4esuvehf*

ANALYSIS OF MALARIA PROFILES BY RISK OF THE MUNICIPALITY IN THE BRAZILIAN AMAZON USING PRINCIPAL COMPONENT ANALYSIS IN 2011-2013 and 2016-2019

Natália Martins Arruda[1]*, Bianca Cechetto Carlos[1], Carlos Eduardo Beluzo[1], Vinícius de Souza Maia[1] and Luciana Correia Alves[1]

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[1]Elza Berquó Population Studies Center - University of Campinas, PROMALARIA Project

Objective: to analyze the different profiles related to the risk of incidence in the municipalities in the period 2011-2013 and 2016-2019 and understand in the aggregate level, the main environmental, health, socioeconomic and demographic profiles related to the municipalities with low and high risk of malaria incidence.

Method: Principal Component Analysis algorithm in order to see patterns between this characteristics that could be related to the different incidence risks of the municipality. The data was divided by Annual Parasite Index (API) and classified by the risk index for malaria infection - municipalities at low risk (API <10 cases / 1,000 inhabitants) and high risk (API ≥ 50), by *Falciparum* and *Vivax*.

Main Results: important differences in the characteristics of those who contract malaria in municipalities that have a low risk compared to higher risk municipalities and between the *Falciparum* and *Vivax* cases.

Funding:
CNPq Conselho Nacional de Desenvolvimento Científico e Tecnológico
Bill & Melinda Gates foundation

Human-centered design processes to promote malaria testing and treatment-seeking behavior in Guyana

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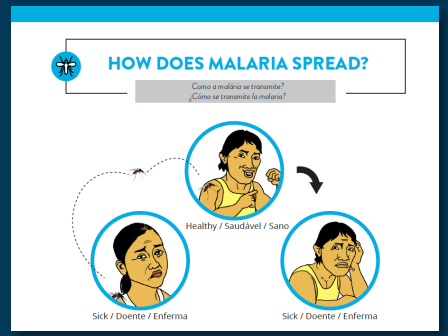
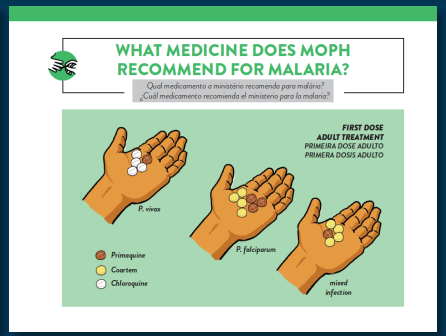
1. Breakthrough ACTION Guyana
2. Guyana Ministry of Health
3. USAID

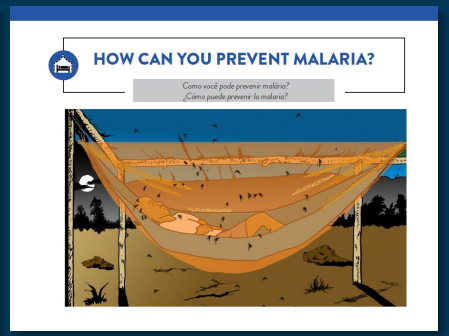
Co-authors:
Camille Adams (1), Gabrielle Hunter (1), Sean Wilson (1), Joann Simpson (1), TrishAnn Davis (1), Horace Cox (2), Neil Trotman (2), Helen Imhoff (2), Jen Orkis (1), Doug Storey (1), Amalhin Shek (3)

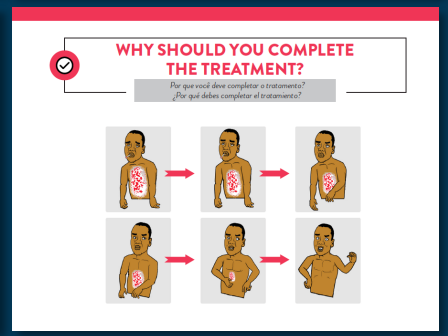
How might we improve malaria testing and treatment outcomes among mining communities?

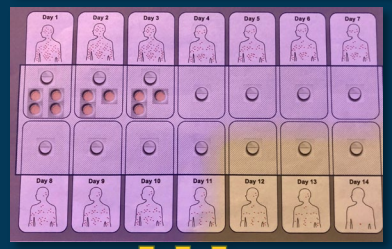
lil mosquito BIG PROBLEM



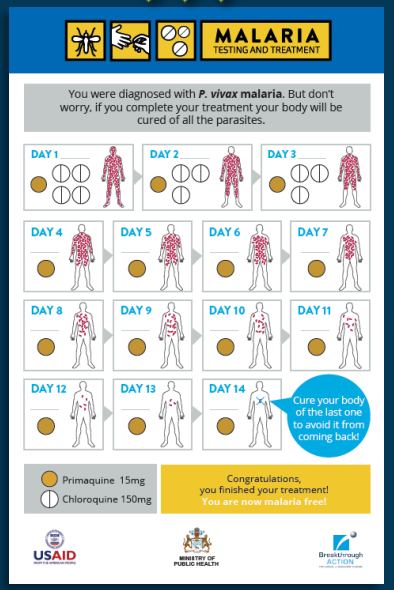


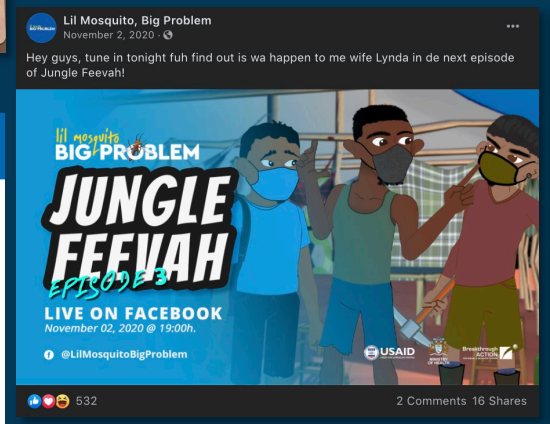


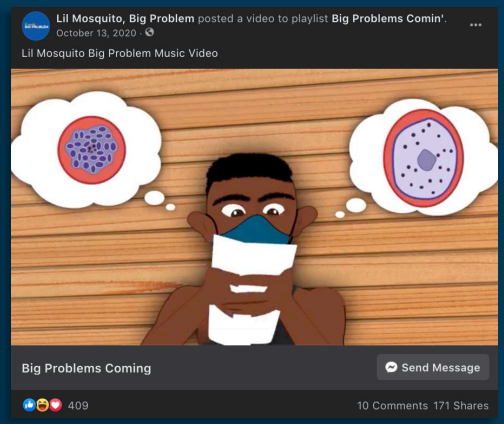




792 ideas → **5 prototypes**







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USAID FROM THE AMERICAN PEOPLE
MINISTRY OF HEALTH
JOHNS HOPKINS Center for Communication Programs
Breakthrough ACTION FOR SOCIAL & BEHAVIOR CHANGE

Malaria care-seeking and treatment ideation among gold miners in Guyana

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Health, Behavior and Society, JHSPH

Background

Malaria risk is highest among gold miners in the hinterland regions 1, 7 and 8 of Guyana.

Methodology

Survey of 1685 miners in 233 mining camps sociodemographics, knowledge, beliefs.

Key outcomes were self-reported care seeking, testing and avoidance of self-medication

Results

Care-seeking/treatment ideation scores ranged from 0 to 8. Mean (SD) 3.8 (1.7)
Higher scores were associated with
↑ care-seeking (aOR: 1.19),
↑ malaria testing (aOR: 1.22);
↓ lower rates of self-medication (aOR: 0.80)

Implications

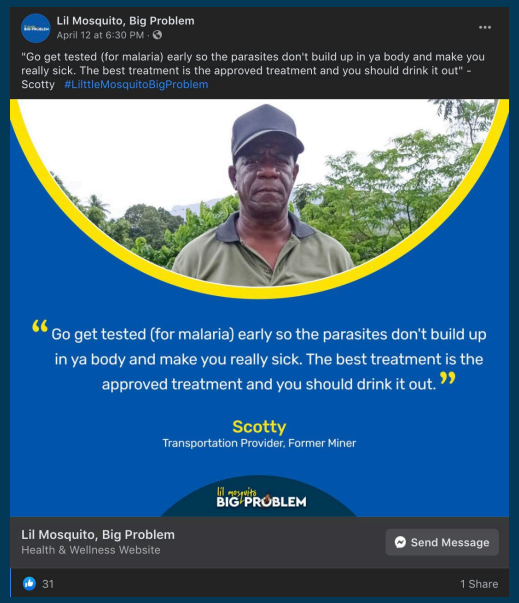
Community case management

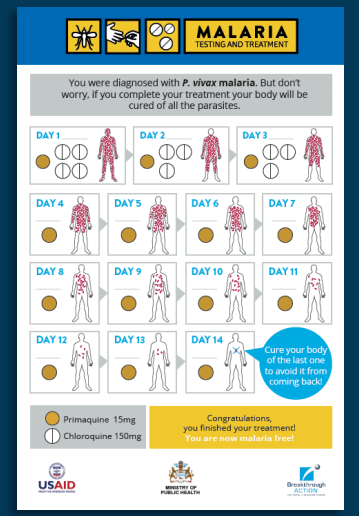
- National Malaria Program initiative
- Trained volunteers to test and treat Social and behavior change
- Counseling materials and job aids
- Visibility of testing and treatment locations
- Facebook campaign to promote demand.

Acknowledgements

- Breakthrough ACTION Guyana
- Guyana Ministry of Health
- USAID

Guyana gold miners' malaria care-seeking/treatment ideation was linked with improved care-seeking, testing and avoidance of self-medication





Access related manuscript:

scan code with your device camera

Co-authors:
Camille Adams, Gabrielle Hunter, Sean Wilson, Joann Simpson, TrishAnn Davis, Lyndsey Mitchum, Horace Cox, Neil Trotman, Helen Imhoff, Jen Orkis, Doug Storey, Amalhin Shek.

Factors in time to malaria treatment in the Brazilian Amazon: a survival analysis

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Population Studies Center - University of Campinas
PROMALARIA Project
Demographic Data Analysis in Demography Lab

Falciparum malaria increases the risk of hypertensive disorders of pregnancy in women followed from the first trimester

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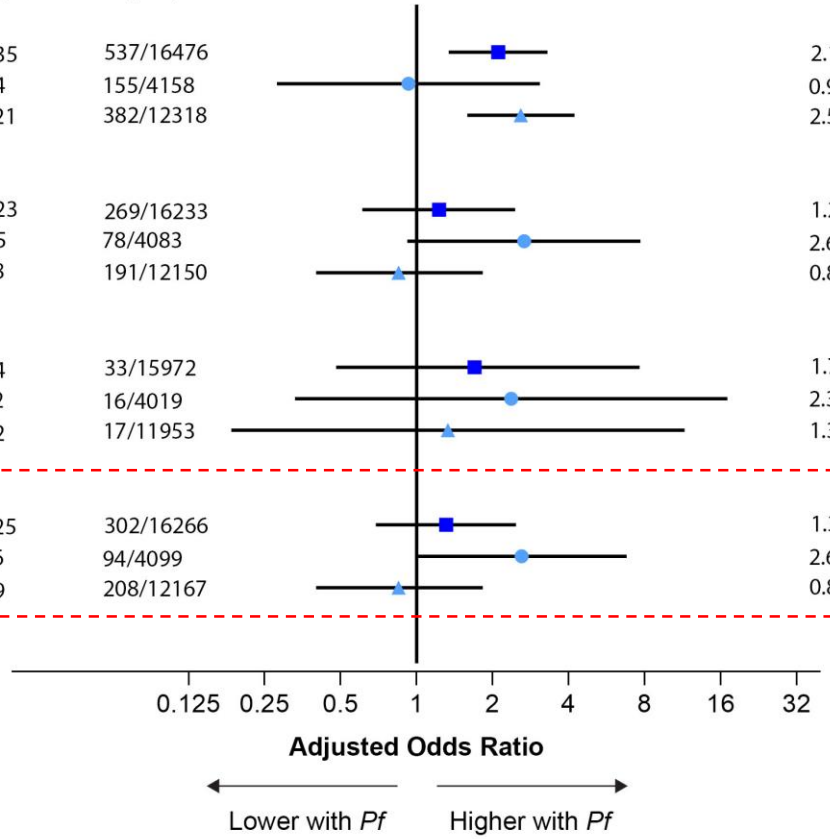
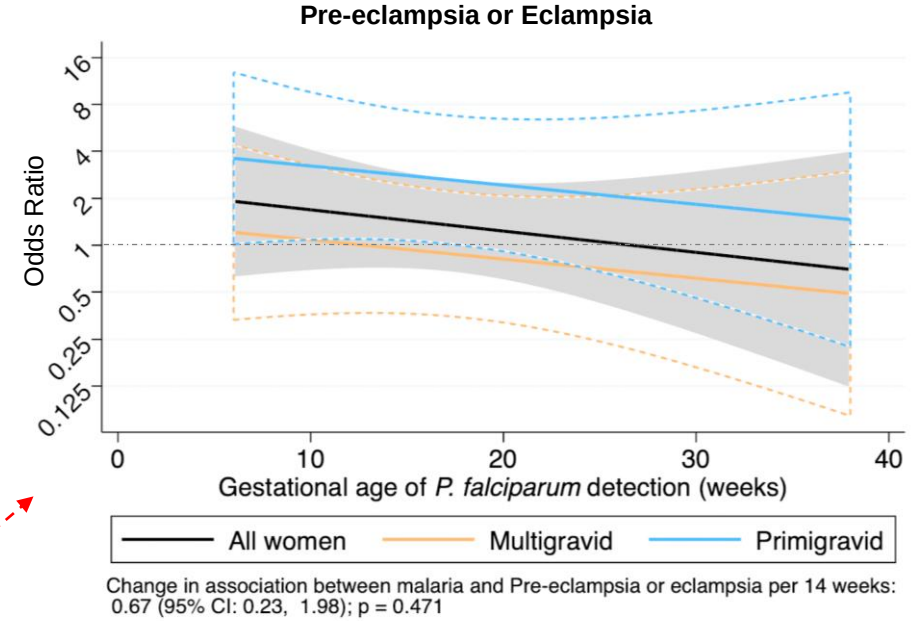
	Yes *P. falciparum* (n/N)	No *P. falciparum* (n/N)	AOR (95% CI); *p*-value
Gestational Hypertension			
All women	23/835	537/16476	2.11 (1.34, 3.30); $p = 0.001$
Primigravidae	3/214	155/4158	0.93 (0.28, 3.08); $p = 0.910$
Multigravidae	20/621	382/12318	2.59 (1.59, 4.23); $p < 0.001$
Pre-eclampsia			
All women	11/823	269/16233	1.23 (0.61, 2.46); $p = 0.567$
Primigravidae	4/215	78/4083	2.67 (0.92, 7.71); $p = 0.070$
Multigravidae	7/608	191/12150	0.85 (0.40, 1.83); $p = 0.684$
Eclampsia			
All women	2/814	33/15972	1.70 (0.48, 7.65); $p = 0.488$
Primigravidae	1/212	16/4019	2.37 (0.33, 17.05); $p = 0.392$
Multigravidae	1/602	17/11953	1.33 (0.15, 11.53); $p = 0.798$
Pre-eclampsia or Eclampsia			
All women	13/825	302/16266	1.31 (0.69, 2.48); $p = 0.407$
Primigravidae	5/216	94/4099	2.61 (1.01, 6.79); $p = 0.048$
Multigravidae	8/609	208/12167	0.85 (0.40, 1.83); $p = 0.684$





Change in association between malaria and Pre-eclampsia or eclampsia per 14 weeks: 0.67 (95% CI: 0.23, 1.98); p = 0.471

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A LOOMING APE-MALARIA PANDEMIC

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Problem

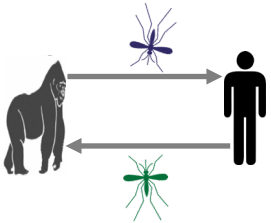


Fig.1: Malaria infection cycle

Apes harbour several other malaria parasites that can potentially spill over into humans with time.

Solution

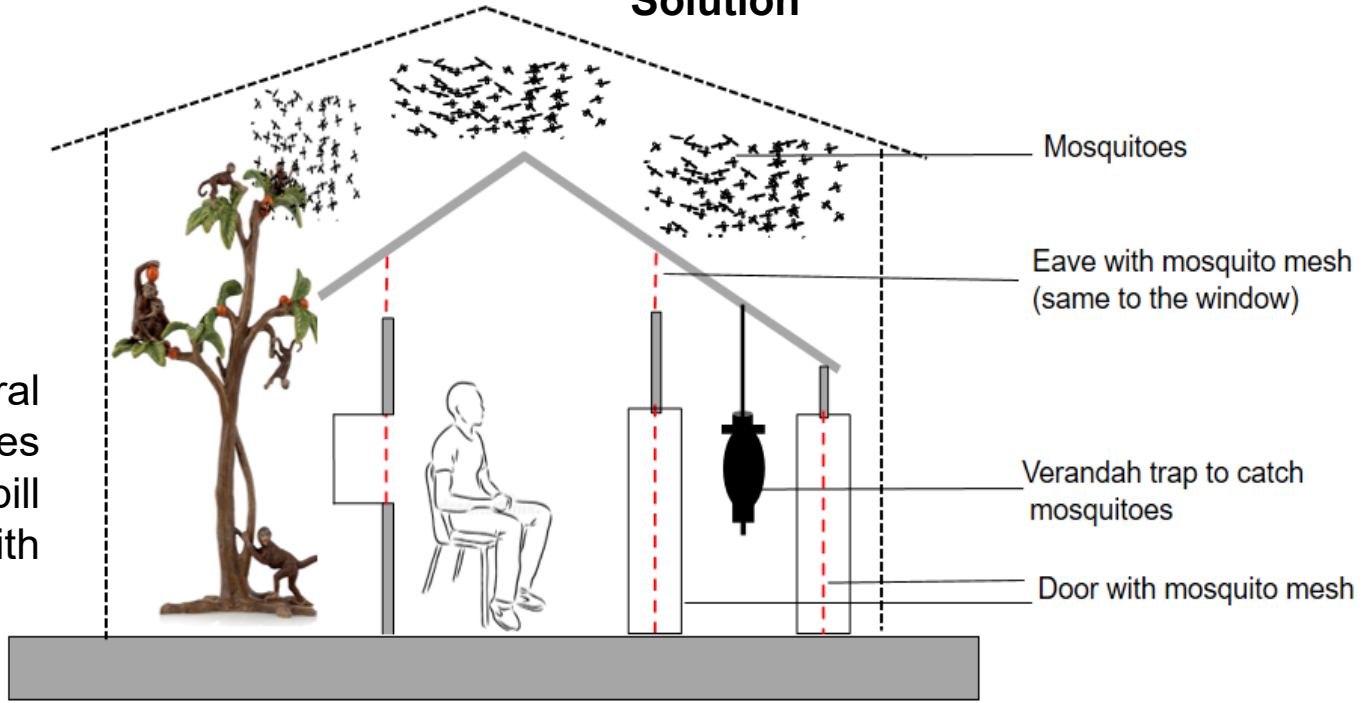


Fig.2: Screen houses around the forest with mosquito mesh &trap mosquitoes that may enter houses

A Mathematical Modelling Analysis of the Potential Impact of COVID-19 and COVID-19 NPIs on Malaria in Nigeria

UNIVERSITY OF OXFORD

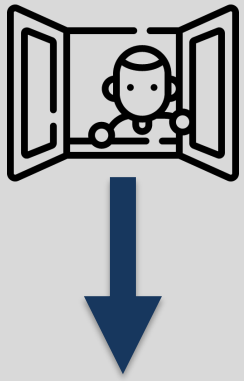
Key Findings From Malaria Model

1. Predicted increase in incidence can give rise to a surge in malaria burden in Nigeria which could range from **9% to 35%** compared with a scenario in which there was no COVID-19 epidemic.

2. Main drivers of increased incidence:

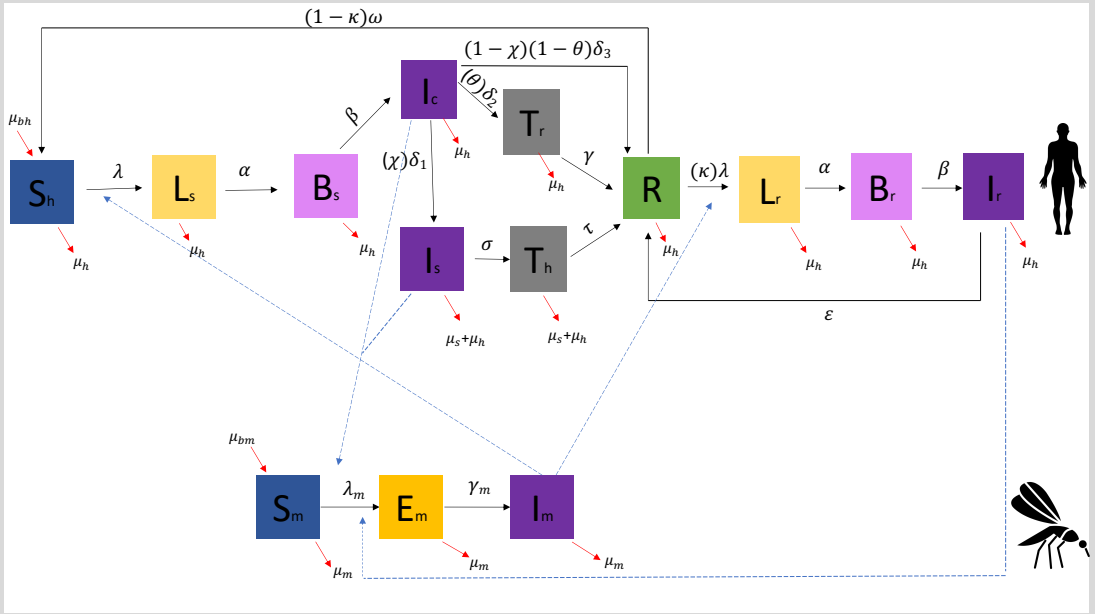
- Delay in care seeking
- decreased bed net distribution
- high demand on the health system due to COVID-19

COVID-19 NPIs



Malaria Services

Bed net distribution
Treatment
Hospitalisation



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Digital Smart Surveillance in Malaria Elimination

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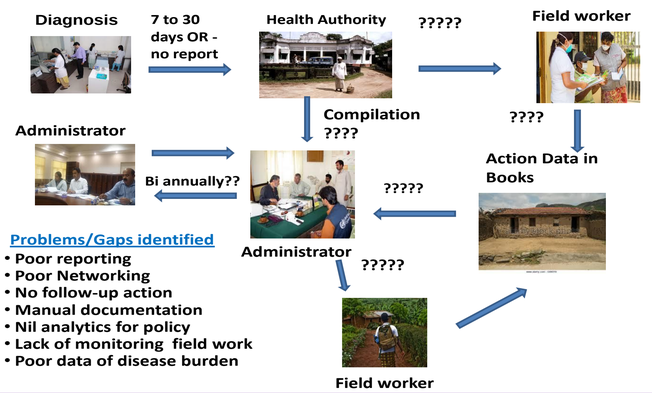
3. I-Point Consulting, Mangalore, Karnataka, India, Email: naren.koduvattat@gmail.com;

Background – Malaria endemic city of Mangaluru, India

- Metropolitan coastal city of Karnataka state
- Population of 623841 -- Endemic since 1995.
- Implemented various national control programs such as Modified Action-Plan(1995), National Malaria Eradication Program (1999),National
- Vector Borne Disease Program NVBDCP (2002) and subsequent modified versions of these control strategies have been implemented in the city from 1995 till 2014.
- Negligible impact on the incidence of malaria. ity has remained malaria endemic with increasing trends 5327 (2012), 4714 (2013) 11714 (2014).
- Manual Documentation of all the activities pertaining to surveillance, treatment and vector control
- Negligible analytics to control & measure impact.
- We analyzed implementation of various control measures and studied the deficiencies in the systems & processes as shown in the diagram
- Developed indigenously digital smart surveillance device currently used in Mangalore City, India for five years
- Android Tablet (TAB)-based device tagged with geographical positioning system (GPS).
- Malaria control system (MCS) software is loaded on the TAB which is `system driven'
- Data is captured at real time, can work offline and be uploaded in the system in the online coverage.
- It supports the WHO mandate for Global Malaria Elimination from 2016 to 2030 under Global Technical Strategy (GTS)
- It follows the National Vector Borne Disease Control Programme, India
- Follows `1-3-7-14' strategy. Malaria is diagnosed on day 1, treatment completed within day 3, follow-up smear check and vector control activities on day 7. In case of *Plasmodium vivax* radical treatment with primaquine on day 14.
- Can be used for other diseases also.

Status of malaria control measures pre project period



Problems/Gaps identified

- Poor reporting
- Poor Networking
- No follow-up action
- Manual documentation
- Nil analytics for policy
- Lack of monitoring field work
- Poor data of disease burden

Objectives of the software-Based on the deficiencies/ gaps identified

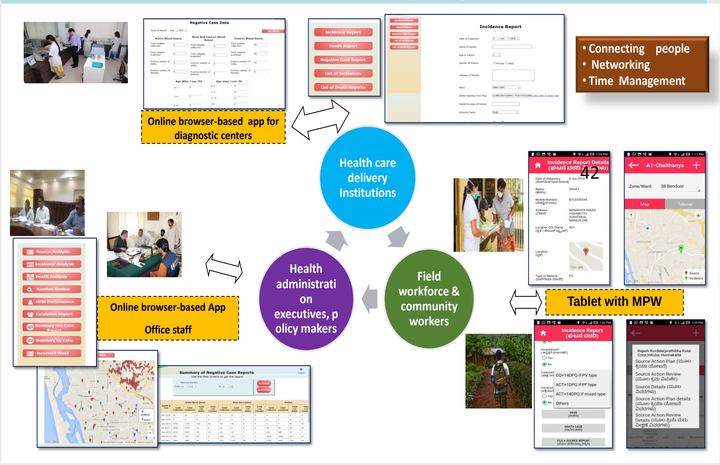
- To improve surveillance and reporting of malaria cases
- Connect all the stake holders instantaneously for transfer of information thereby translate reporting of incidence into action
- Facilitate geospatial mapping of the incident cases of malaria
- To ensure closure of cases/ mosquito breeding after effective action
- Document evidences of activity, parasite clearance, and field work.

Project context and goals

On identification of the gaps and deficiencies an IT solution was designed and proposed as "Public Private Partnership" Project and was implemented in the city.

Project initiated in 2014/08/01 coverage of entire city from 2015/10/01 and presently governed by the civic administration

Software features – networking stake holders



"Master strategy" incorporates proven interventions for malaria control

Flowchart showing malaria control operational steps after software

Case reports from Point of diagnosis - within 24 - 48 hrs

1st visit by multi purpose worker to the residence and surrounding houses within next 24-48 hrs

Ensure treatment /contact smears | Vector control measures/IEC

Revisit to be carried out 7-14 days

Document parasite clearance after sears | Reinforce vector control measures

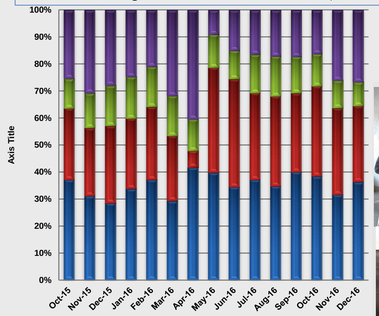
Data upload for backend analysis by administrators/policy makers

The malaria control data was digitized and coupled with time bound action

Impact Assessed in 5 areas

Impact 1

Improved surveillance and reporting malarial cases (Contact details, type of malaria, and demographic details were uploaded for next level of action)



	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16
>72 hrs	25.4	30.8	28	24.7	21	31.7	40.4	9.1	15	17.1	17.1	17.3	16.2	26.1	28.8
48-72 hrs	11	12.8	14.9	15.4	14.8	14.8	11.7	12.3	10.5	14.8	14.8	13.5	12	10.2	9.5
24 - 48 hrs	26.5	25.2	28.7	26.1	27	24.1	6.2	39.1	40	33.3	33.3	29.2	33.4	32.1	30.5
<24hrs	37.2	31.2	28.5	33.8	37.1	29.3	41.7	39.9	34.5	38.6	34.8	40	38.4	31.6	39.2

Impact 2

Improved networking to translate surveillance to intervention

Impact 3

Improved field work

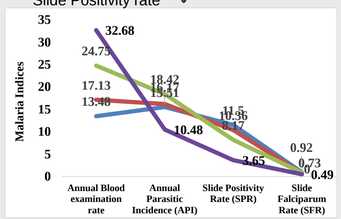
Field performance of MPW's: Monitored and documented

Indicator	Pre Digitization year	1st year after Digitization	2nd year after Digitization
Incidence reported			
Total	11073	11588	7793
Completely treated and documented	--	10813(93%)	7299 (94%)
Within 14 days	--	466 (4%)	211 (3%)
15-30 days	--	1088 (10%)	271 (4%)
30-60 days	--	2579 (24%)	464 (6%)
>60 days	--	7466 (69%)	6749 (92%)
Cases without visits (Open)	--	01	420 (6%)
Total smears	--	21023	36211
Contact smears	--	15423	32860
Smear of clearance of parasite	--	5600	3351
Source surveillance			
Total visits	--	205723	180036
Sources reported total	--	10,683	10396
Residential	--	5545	5861
Commercial	--	178	112
Construction	--	4393	4112
Number of sources closed after action		10195	9872
Number of sources without action (Open)		490	523

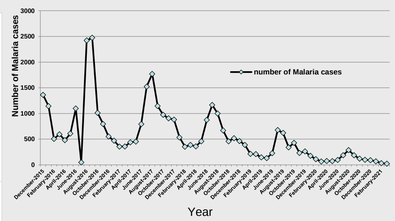
All visits and activities by field workers regarding case and vector source were ensured and documented

Impact 4

Annual Blood Examination Rate ⇑
Slide falciparum rate
Slide Positivity rate ⇓

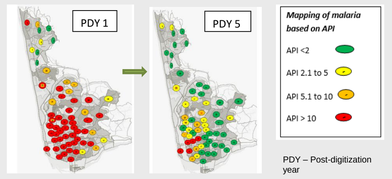


Reduction in malaria cases by 85% within 5 years



Impact 5

Map of Mangaluru with various wards depicting the areas based on change in API (cases per 1000 population) in PDY 1 over PDY 5



PDY – Post-digitization year

(Categorization of API is based on recommendation in the operational manual for malaria elimination in India)

Conclusion

- The malaria Control app resulted in conversion of smart surveillance into intervention resulting in significant reduction of malaria ($p<0.001$).
- All malaria indices significantly reduced. Annual Blood Examination Rate (ABER)
- Technology can be utilized for better program management
- Monitoring micro implementation is possible
- Early reporting leads to appropriate case management and vector elimination from incidence household and surroundings to break transmission cycle

The Way Forward

- The Device is very user-friendly and can be used with minimum technical skill
- This is very useful even in the COVID-19 pandemic situation.
- Ground-level micromanagement has become a reality
- Each patient can be tracked with minimum effort. This is a major problem in surveillance especially when patient follow-up is an essential of completion of treatment.
- Monitoring of vector control is also performed
- This device can be upgraded based on the local programme need.
- Looking forward for universal utilization of this device if we really need to achieve malaria elimination by 2030

Development of software | *Launch by Health Minister* | *Training of laboratory personnel*

Training of Malaria workers | Dr. Shantharam Baliga Concept , idea and logic | Naren Koduvatte – Architect of software | Dr Susanta K Ghosh Technical Support

Proposed Advanced Version of software will include: 1) Reminder systems for action 2) analytics and trend output 3) performance data output (field force), 4) predictive models 5) incorporate other mosquito-borne diseases 6) entomological features 7) Drug usage and resistance mapping 8) movement mapping

Acknowledgements

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Corporation & Karnataka Banks, Mangaluru
District Health Officials, Dakshina Kannada
Health workers at City corporation and District Malaria Office

TEMPORAL AND GEOSPATIAL PREVALENCE OF MALARIA: A RETROSPECTIVE STUDY IN WENTZ MEDICAL CENTER, KAMPALA DISTRICT, UGANDA FROM 2015-2019

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INTRODUCTION

The temporal and geospatial analysis of health facility-based malaria data on the health care system is crucially important to measure the success or failure of malaria control programs and identify malaria hot spots.

OBJECTIVES

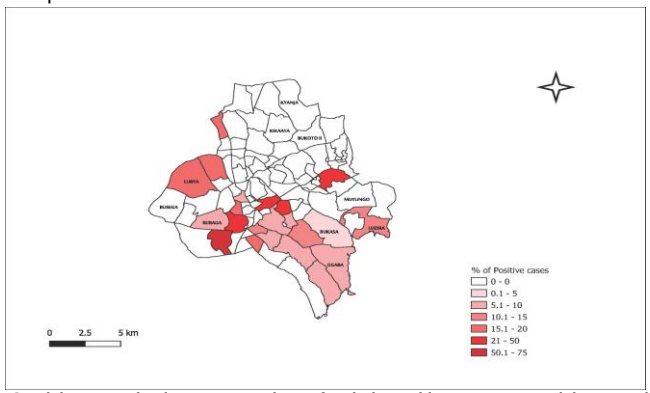
The objectives of this study were to analyze the prevalence of malaria, compare malaria prevalence trends, and map malaria prevalence around Kampala over five years.

METHODOLOGY

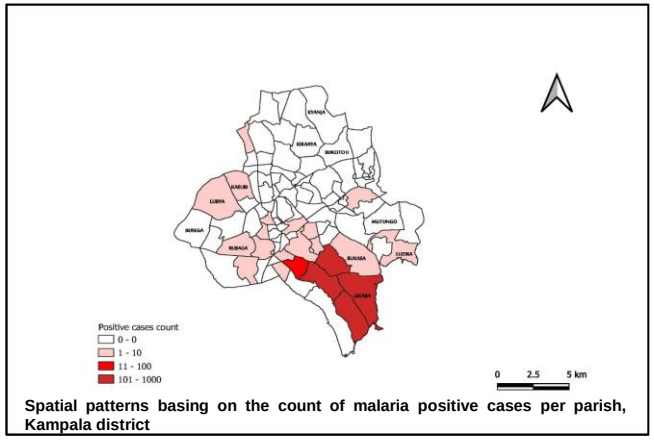
A retrospective study was conducted at Wentz medical center, Kampala district. All data from people that were tested for malaria (*Plasmodium Falciparum*) using RDTs and microscopy was retrieved from Laboratory logbooks and input in Microsoft Excel. Microsoft Excel was used to generate descriptive statistics and STATA was used to conduct bivariate analysis and logistic regression. A multivariate model was built using backward logistic regression and tested for fitness using the *l-fit* command in STATA to determine the best predictors of malaria prevalence. QGIS (version 3.12.3) was used to determine spatial patterns of malaria prevalence in the Kampala district indicating malaria risk areas.

RESULTS

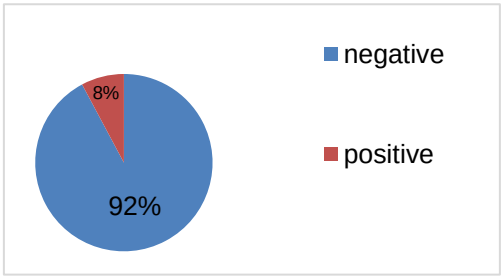
A total of 21506 samples were retrieved of which 8,929 were males and 12,571 were females. The overall prevalence of malaria was 8% (1681/21506) with 95% C.I=0.07-0.08.Age descriptive statistics revealed a median of 13years, a mean of 17 years, and SD=13. The prevalence of malaria based on gender showed 6.9% (861/125571) among females and 9.2% (819/8929) among males and this relationship was statistically significant OR= 0.7, 95%C.I= 0.7-0.8. The prevalence of malaria based on age revealed 8.1% (902/10155) among children and 7.6 %(767/10155) among adults and this relationship was statistically significant (P=<0.001). A surprisingly slightly higher prevalence of malaria in the dry season 8.8% (936/10595) compared to the rainy season 6.8% (745/10910), OR=1.3, 95%C.I=1.2-1.5 with a major seasonal peak in April-June and a minor seasonal peak in September-November. Prevalence of malaria based on residence showed Kampala-Metropolitan, 7.9 %(1466/18606) compared to other areas, 13.7% (921/670), OR=0.5, 95%C.I=0.4-0.7. Results from multivariate logistic regression and model fit tested using "*L-fit* command" in STATA revealed that residence, gender, and season were the best predictors of malaria with a P-value 0.1829.



Spatial patterns basing on proportions of malaria positive cases per parish, Kampala district



Spatial patterns basing on the count of malaria positive cases per parish, Kampala district



Malaria status of all people that tested for malaria parasites (*Plasmodium falciparum*)

CONCLUSION

Findings from this study revealed a 5-year malaria prevalence of 8% and was statistically significant with 95% C.I=0.07-0.08 indicating the need for continued implementation of malaria control interventions. Clear spatial patterns of malaria which showed high risk areas common in peri-urban parishes at the peripheral near Lake Victoria hence the need to shift the distribution of malaria control interventions to those areas throughout the year. The Government of Uganda under the Ministry of Health, partners and Non-Government organizations should continue funding the implementation of malaria control interventions and strategies promptly basing on seasons, age<18 years, gender, peri-urban areas around lakes among others. Training health workers on data collection from clinic master software.

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