

RBM Partnership To End Malaria

Vector Control Working Group

Novel Tools for Outdoor Malaria Control

VCWG WS2 TT2 WEBINAR

Dates: 30th October 2025

Time: 13:00–14:15 UTC / 16:00–17:15 EAT

RBM Partnership To End Malaria

Vector Control Working Group

Welcome and Introduction

Moderators:

S. Tullu Bukhari

Samantha M O'Loughlin



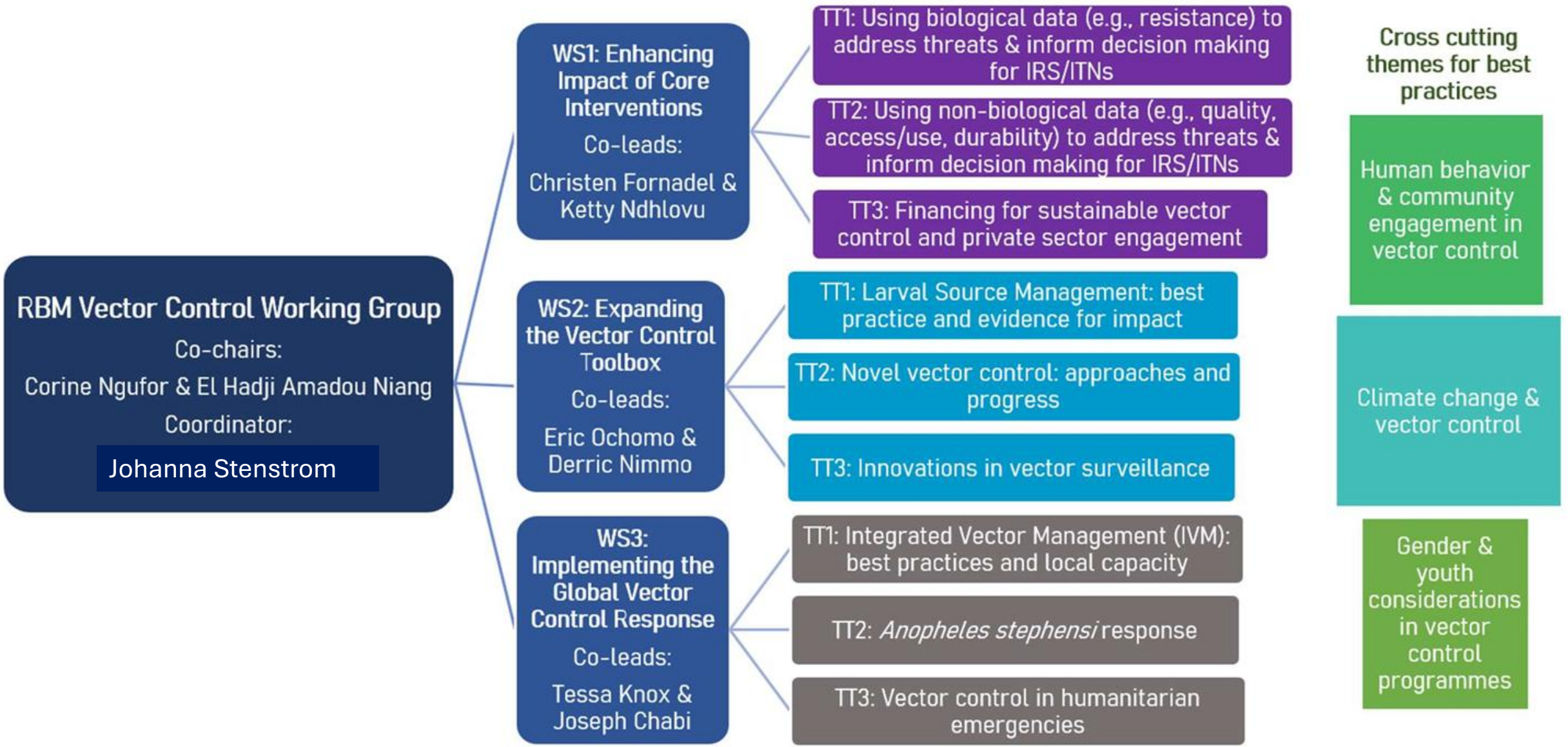
Webinar

VCWG Workstream 2

Task team 2 Expanding the vector control tool box

Novel control tools for outdoor malaria transmission

30th October 2025 4pm EAT


RBM Vector Control Working Group
Co-chairs:
Corine Ngufor & El Hadji Amadou Niang
Coordinator:
Johanna Stenstrom
WS1: Enhancing Impact of Core Interventions
Co-leads:
Christen Fornadel & Ketty Ndhlovu
TT1: Using biological data (e.g., resistance) to address threats & inform decision making for IRS/ITNs
TT2: Using non-biological data (e.g., quality, access/use, durability) to address threats & inform decision making for IRS/ITNs
TT3: Financing for sustainable vector control and private sector engagement
WS2: Expanding the Vector Control Toolbox
Co-leads:
Eric Ochomo & Derric Nimmo
TT1: Larval Source Management: best practice and evidence for impact
TT2: Novel vector control: approaches and progress
TT3: Innovations in vector surveillance
WS3: Implementing the Global Vector Control Response
Co-leads:
Tessa Knox & Joseph Chabi
TT1: Integrated Vector Management (IVM): best practices and local capacity
TT2: Anopheles stephensi response
TT3: Vector control in humanitarian emergencies
Cross cutting themes for best practices
Human behavior & community engagement in vector control
Climate change & vector control
Gender & youth considerations in vector control programmes

Working stream Leaders and Coordinator



Eric Ochomo
KEMRI, Kenya



Derric Nimmo
IVCC/Liverpool School of Tropical Medicine, UK



Johanna Stenstrom
Swiss TPH, Switzerland



Sunghea Park
Swiss TPH, Switzerland

Task team 2: Co-leads



Rinki Deb (Vestergaard)



S. Tullu Bukhari (International Centre of Insect Physiology and Ecology, Kenya)



Samantha M O'Loughlin (Target Malaria)

Programme

16:00-16:05	Welcome and Introduction to the Task team.
16:05-16:20	Residual transmission and potential risks without adding (outdoor biting) innovation (**Ellie Sherrard Smith**)
16:20-16:35	Harnessing daily habits to fight malaria: the MAÏA approach (**Franck Langevin**)
6:35-16:50	Insecticide Impregnated Barriers. A novel concept against malaria vectors (**Neil Lobo**)
16:50-17:05	Permethrin-treated baby wraps for the prevention of malaria (**Ross Boyce**)
17:05-17:15	Wrap up



Ellie Sherrard Smith
Imperial College London



Franck Langevin
MAÏA Africa



Neil Lobo
University of Notre Dame



Ross M. Boyce
University of North Carolina

3 minutes for questions after each presentation. Please submit via Q&A

RBM Partnership To End Malaria

Vector Control Working Group

Residual transmission and potential risks without adding (outdoor biting) innovation

Ellie Sherrard-Smith

30th October 2025

Residual transmission and potential risks without adding (outdoor biting) innovation

Ellie Sherrard-Smith

Article | Open access | Published: 11 June 2021

Maps and metrics of insecticide-treated net access, u and nets-per-capita in Africa from 2000-2020

Amelia Bertozzi-Villa, Caitlin A. Bever, Hannah Koenker, Daniel J. Weiss, Camilo Vargas-Ruiz, Anita Nandi, Harry S. Gibson, Joseph Harris, Katherine E. Battle, Susan F. Rumisha, Suzanne Keddie, Punam Amratia, Rohan Arambepola, Ewan Cameron, Elisabeth G. Chestnutt, Emma L. Collins, Justin Millar, Sv Mishra, Jennifer Rozier, Tasmin Symons, Katherine A. Twohic Samir Bhatt

Nature Communications **12**, Article number: 3589 (2021)

Ga

Context is key

Refining the resistance-to- Treated Net lifespan and i

Frank Mechan, Stephen Poyer, Albert Kilian, Hannah Koenker, Amy Wheldrake, Fadi Junaid, Christen Fornadel, Stephen J. Russell, Angus Spiers

doi: https://doi.org/10.1101/2025.03.02.641027

The attrition, physical and insecticidal durability of two dual active ingredient nets (Interceptor® G2 and Royal Guard®) in Benin, West Africa: results from a durability study embedded in a cluster randomised controlled trial

Corine Ngufor [1,2,3], Josias Fagbohoun [2,3], Augustin Fongnikin [2,3], Juniace Ahoga [2,3], Thomas Syme [1,2,3], Idelphonse Ahogni [2,3], Manfred Accrombessi [1,2], Natacha Protopopoff [1], Jackie Cook [1], Edouard Dangbenon [2], Arthur Sovi [1,2], Marie Baes [4], Olivier Pigeon [4], Damien Todjinou [2,3], Renaud Govoetchan [1,2,3], Germain Gil Padonou [2], Martin Akogbeto [2]

Author information · Article notes · Copyright and License information

PMCID: PMC11459981 PMID: 39375740

The impact of pyrethroid resistance on the efficacy and effectiveness of bednets for malaria control in Africa

Thomas S Churcher, Natalie Lissenden, Jamie T Griffin, Eve Worrall, Hilary Ranson

Imperial College London, United Kingdom; Liverpool School of Tropical Medicine, United Kingdom; Queen Mary's University, United Kingdom

Aug 22, 2016 • https://doi.org/10.7554/eLife.16090

ITN access: – does the community have enough nets?
physical integrity: (some nets will rip sooner which could c h
resistance: the phenotype of vectors drives efficacy (more r

community preferences: people may choose to stop using or discard the nets at different moments

activity: do people wake up throughout the night and leave the "safe space" beneath the ITN?

Gaps in Protection from Indoor Residual Spray

Context matters for estimating the efficacy of IRS.

Key information that does not depend on the product includes:

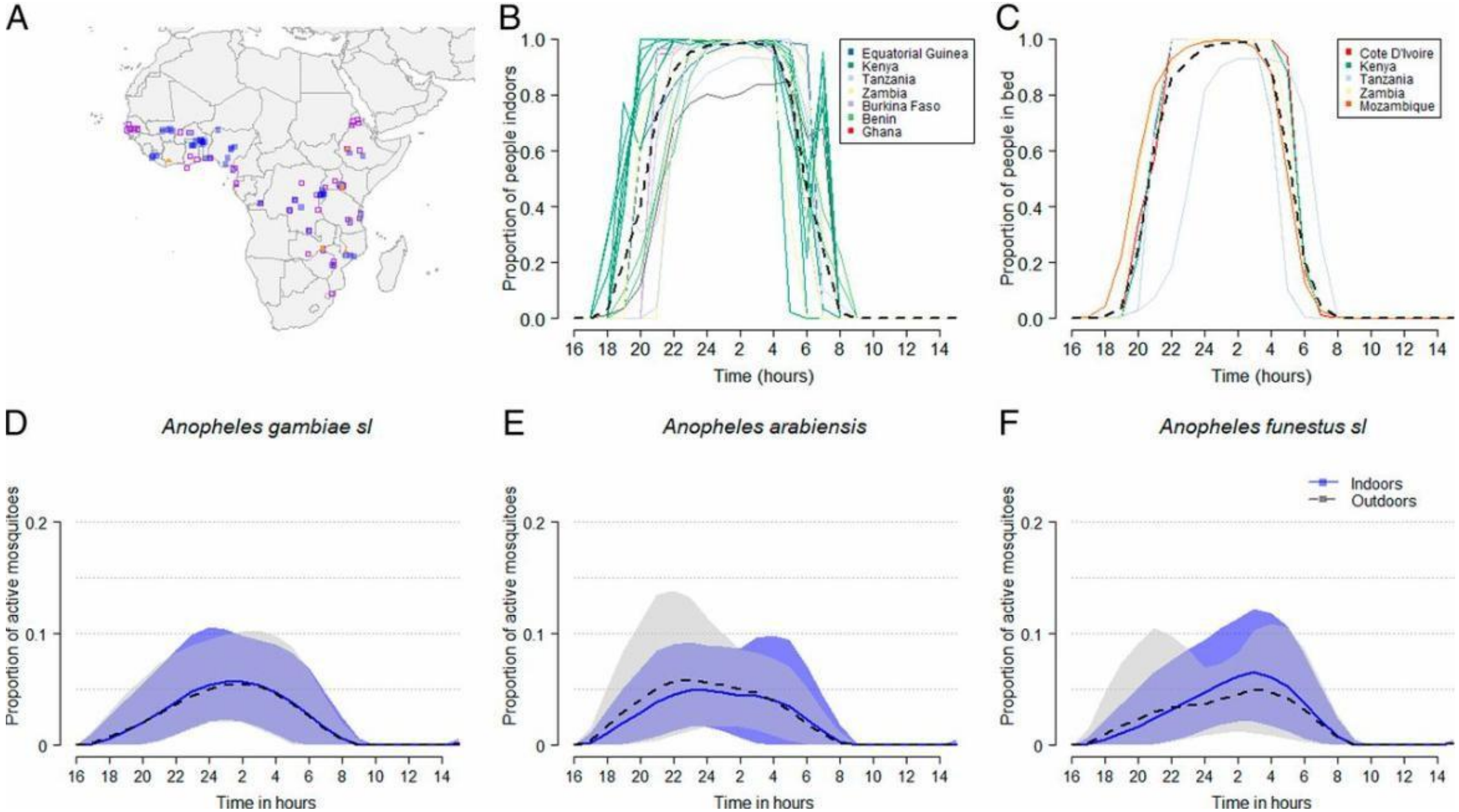
- **Location characteristics:** Local vector population characteristics and behaviour (species composition, phenotypic and genotypic resistance profiles, endophily versus exophily, biting time, and other behaviours). Human community nighttime outdoor exposure risks.
- **Environment:** Accessibility of indoor spaces for vectors due to house structure, use of pesticide in agriculture.
- **Climate and weather:** explicit weather patterns that may drive mosquito dynamics, year-on-year differences in risk, bioavailability of insecticide on sprayed surfaces.
- **Product delivery:** Spray quality, spray campaign timing, equipment quality, spray coverage, type of coverage (partial, full spraying of all spaces of just sleeping spaces), sufficient spray operators.

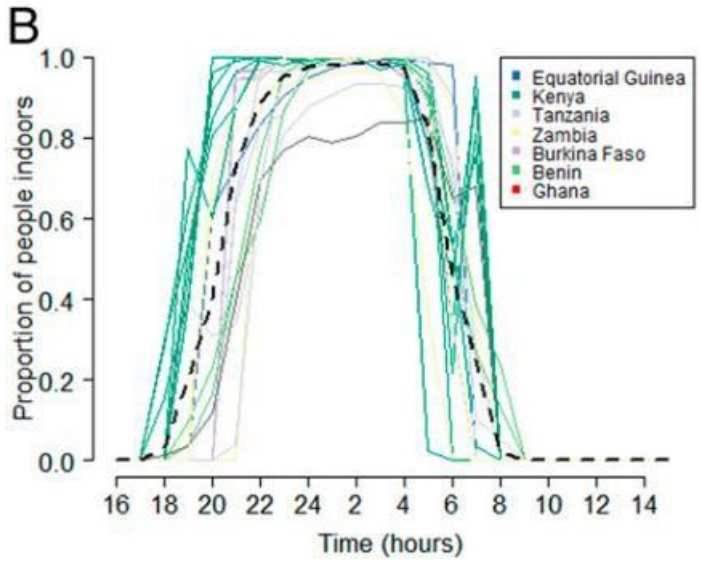
Key information that does depend on the product includes:

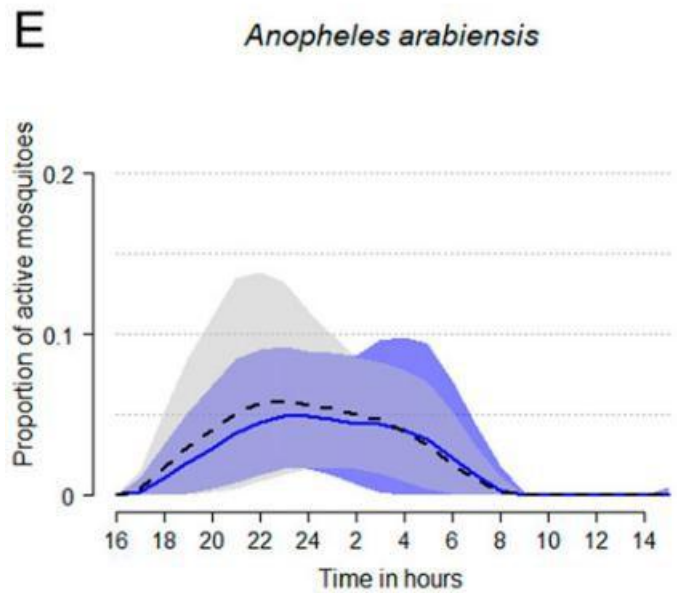
- **End user acceptance and actions:** refusal rates, wall modifications post application (this might depend on aspects of the product such as its smell).
- **Product quality:** insecticide use efficiency.
- **Climate and weather:** climatic factors affecting insecticide migration differently across products.
- **Insecticide durability:** phenotypic resistance profile of local mosquitoes will alter performance of products depending on the insecticide.
- **Insecticide batch quality:** variability over time and potentially between products.

Quantifying residual transmission

Sherrard-Smith et al. 2019 PNAS







$$\lambda_h(t) = \frac{\textit{Sum of Bites at hour}(t)\textit{for location (inside or outside)}}{\textit{Sum of bites for all hours for both locations}}, \quad [1]$$

where subscript h indicates whether bites are taken indoors ($h = 1$) or outdoors ($h = 0$) (23).

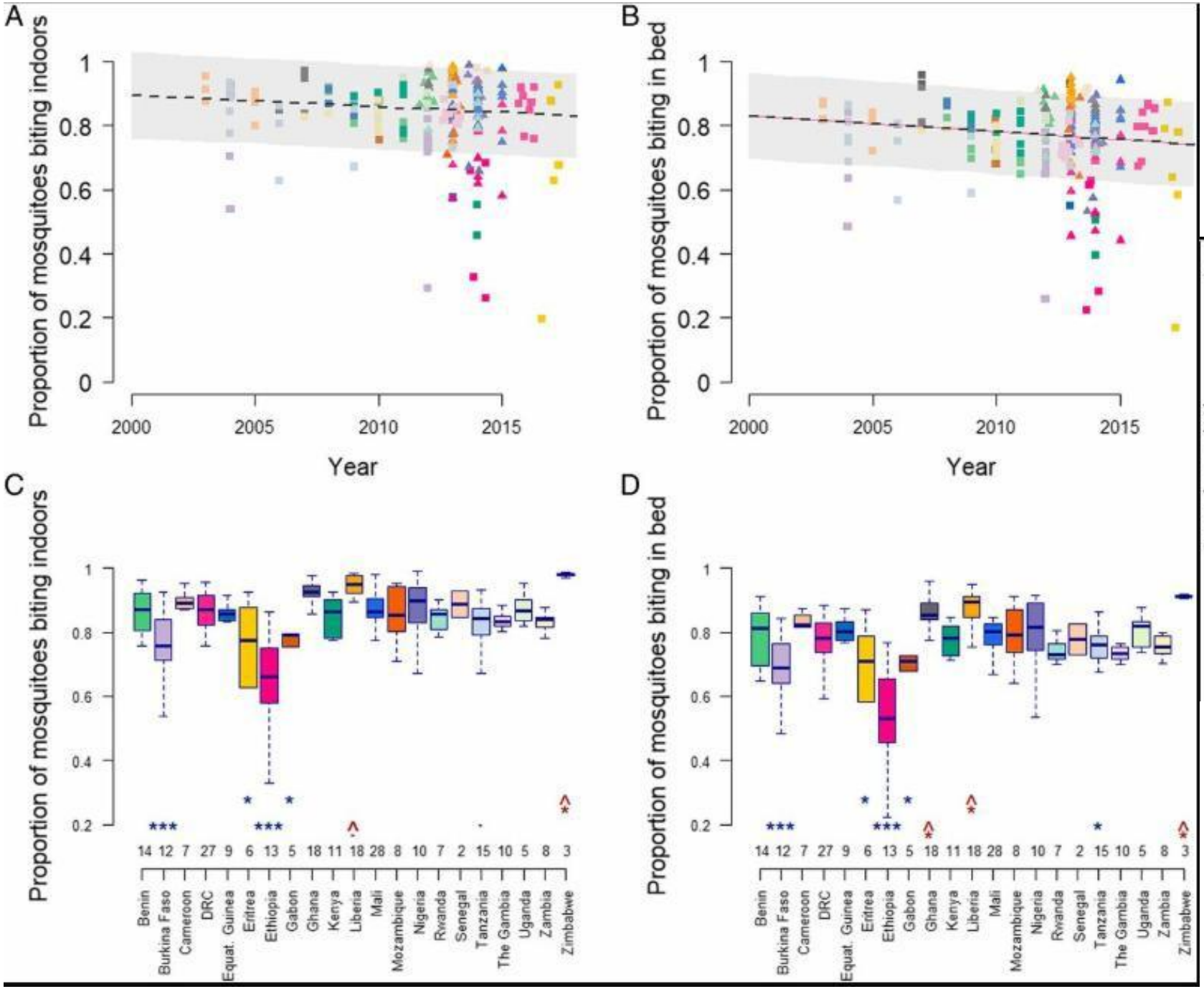
The proportion of mosquito bites taken on humans indoors (ϕ_I) and the proportion of mosquito bites taken on humans in bed (ϕ_B) are calculated as follows (23):

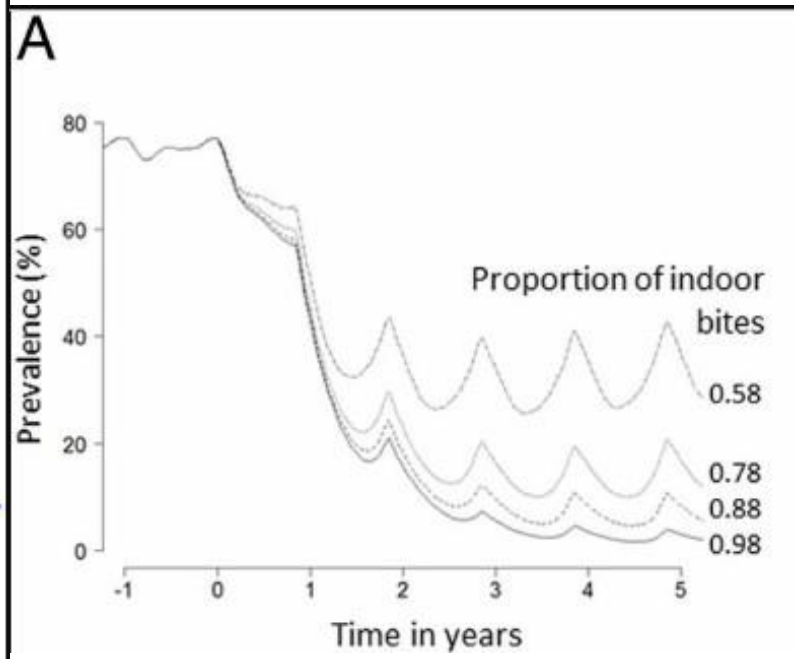
$$\Phi_I = \frac{\sum_t p_I(t)\lambda_I(t)}{\sum_t ((1-p_I(t))\lambda_o(t) + P_I(t)\lambda_I(t))}, \quad [2]$$

where, $p_I(t)$ is the proportion of people inside at hour (t), $\lambda_I(t)$ is the biting rate indoors at hour (t), and $\lambda_O(t)$ is the biting rate outdoors at hour (t). Similarly,

$$\Phi_B = \frac{\sum_t P_B(t)\lambda_I(t)}{\sum_t ((1-p_I(t))\lambda_o(t) + p_I(t)\lambda_I(t))}, \quad [3]$$

Sherrard-Smith et al. 2019 PNAS





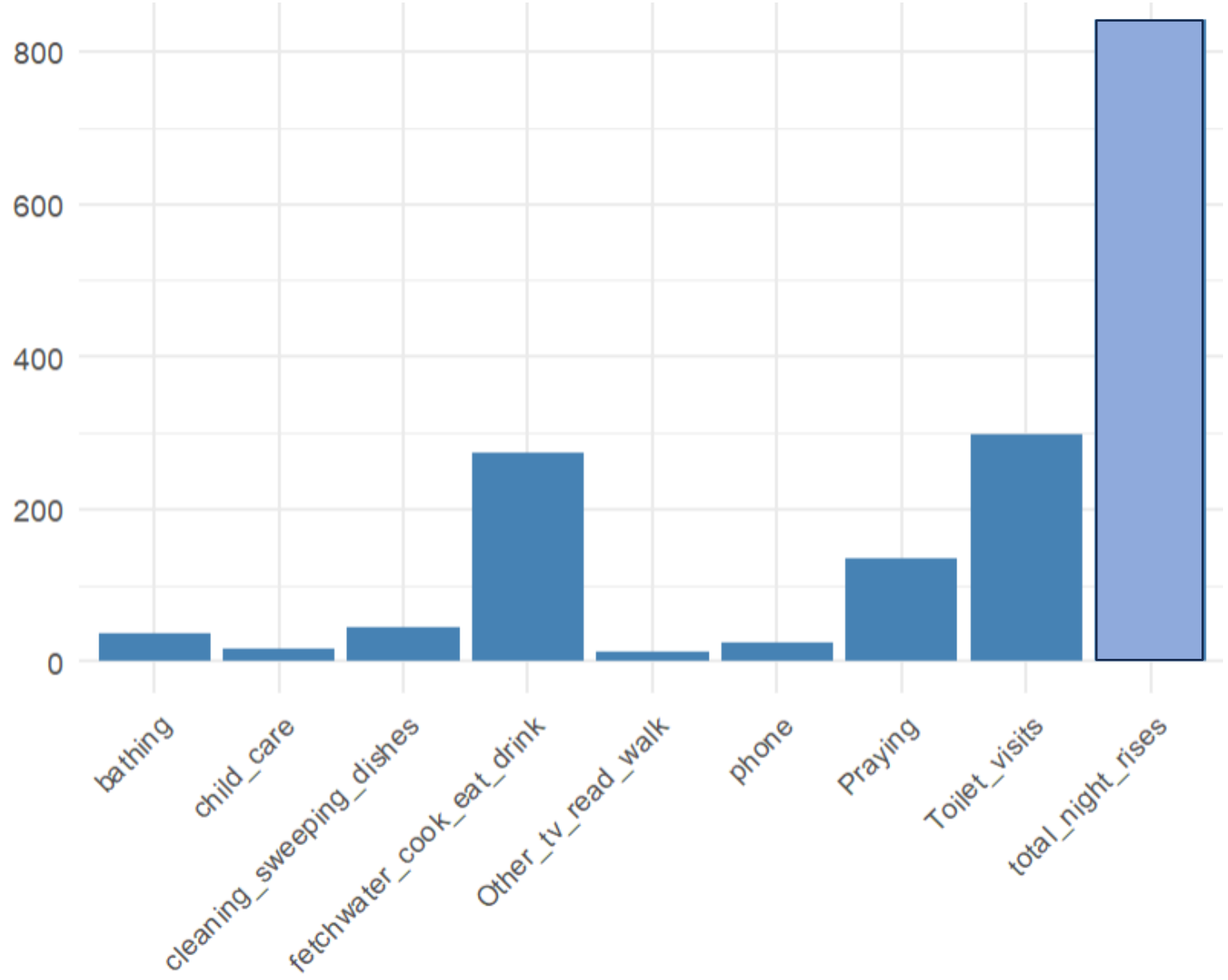
activity: do people wake up throughout the night and leave the “safe space” beneath the ITN?

New Nets Project Pilot data (Aug 2021)

Nigeria:

5 households
5 people per each household
7 nights
6 villages

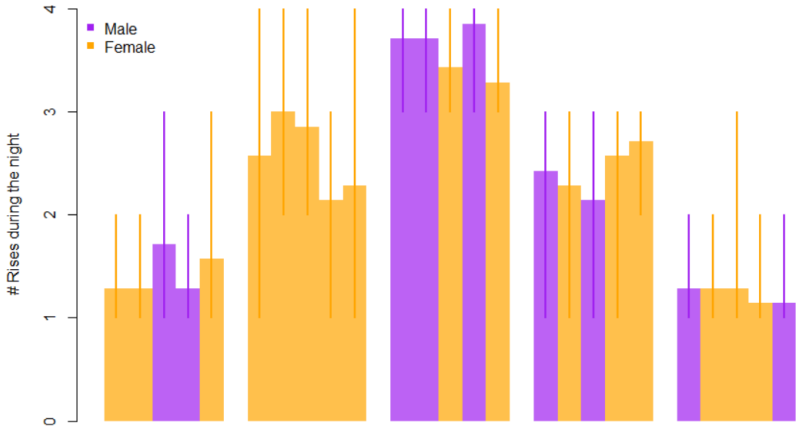
Total nights surveyed = **1,050**
Total rises reported 841



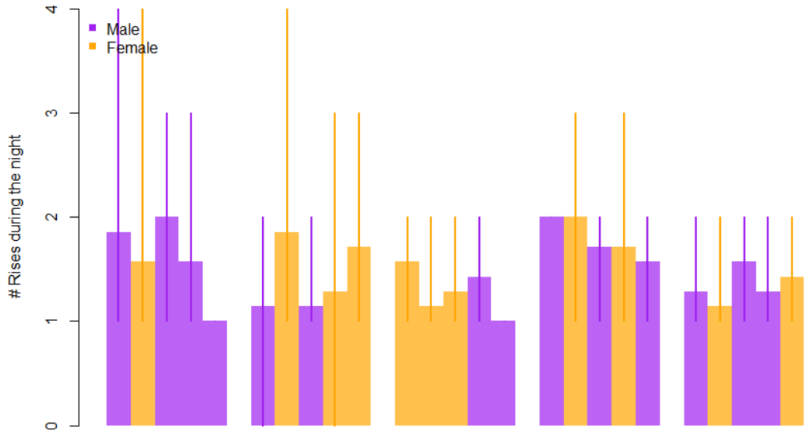
Visualising the raw data: Moro, Nigeria

Generating estimates of the proportion of bites received in bed using Nigerian data from the PNAS review (3 HLC studies) and the human data from the NNP pilot

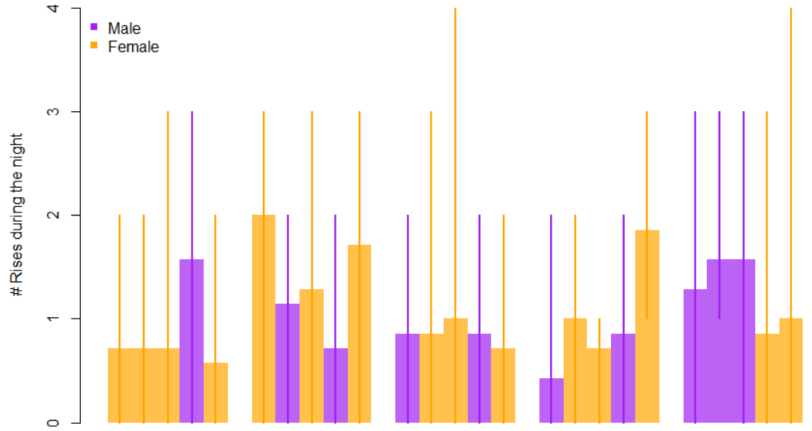
Village A



Village B



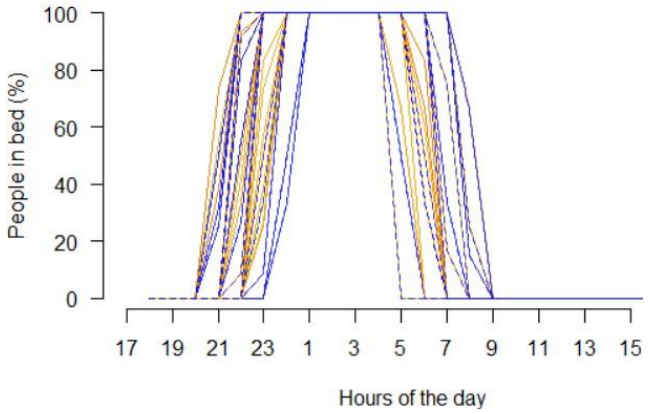
Village C



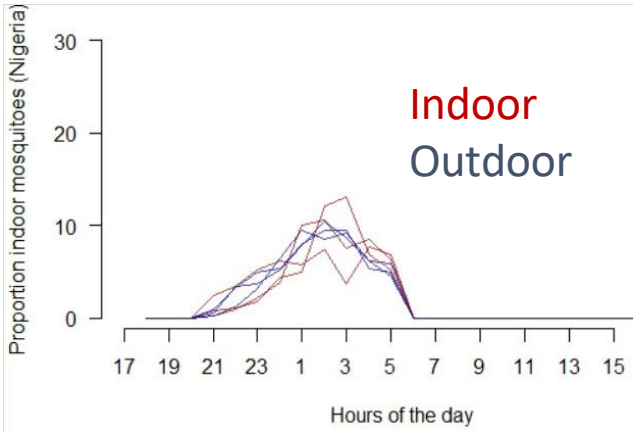
NNP Data (owned by PATH and IVCC)
Analysis: Ellie Sherrard-Smith

Visualising the raw data: Moro, Nigeria

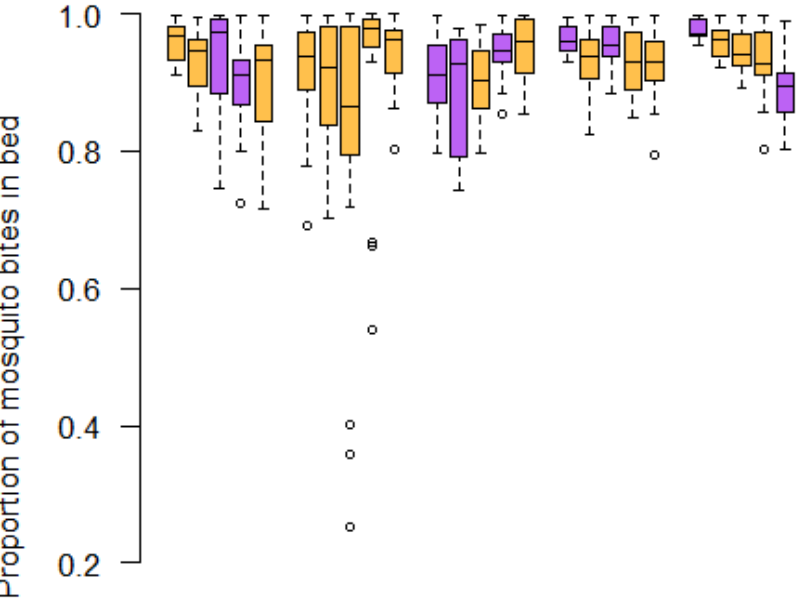
Generating estimates of the proportion of bites received in bed using Nigerian data from the PNAS review (3 HLC studies) and the human data from the NNP pilot



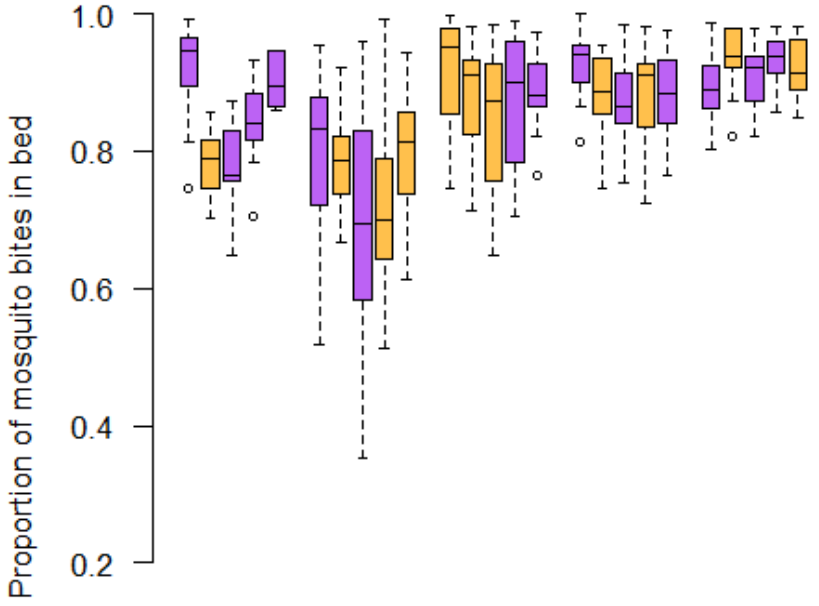
For each person, each nightly pattern is summed with the mosquito nightly pattern of activity



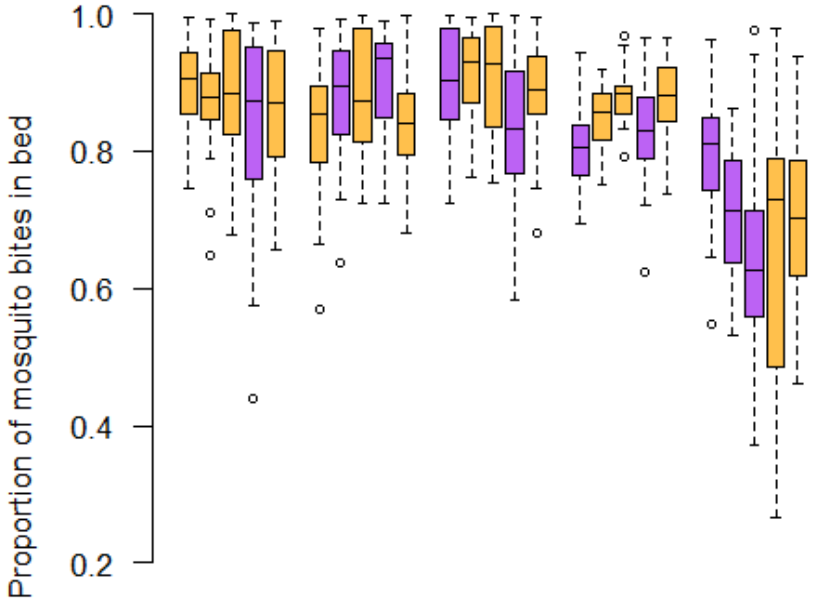
Village A



Village B

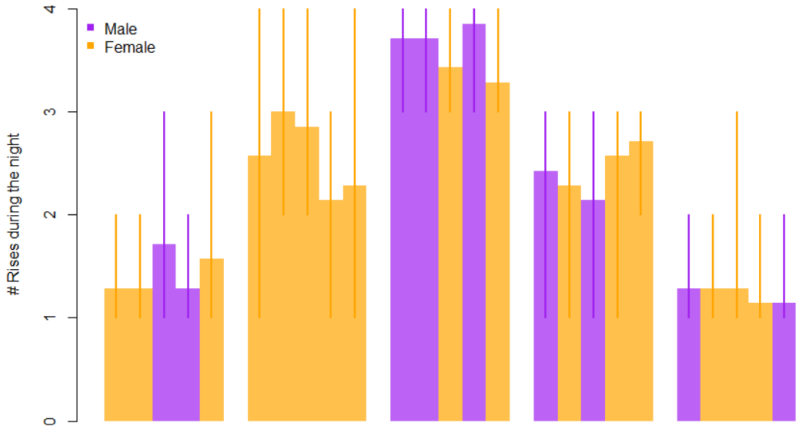


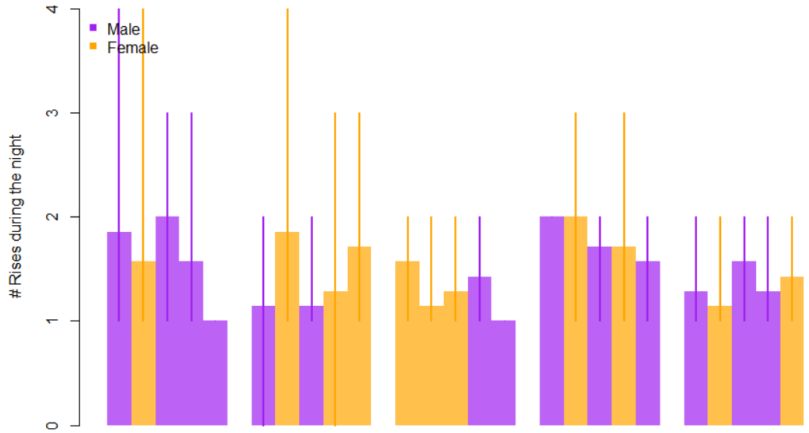
Village C

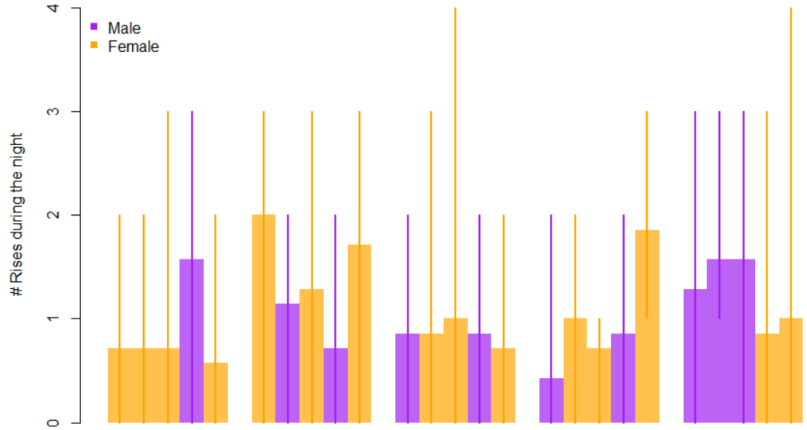


Visualising the raw data: Moro, Nigeria

Generating estimates of the proportion of bites received in bed as previous but now accounting for the possible effects of getting up multiple times in the night (bootstrapping)



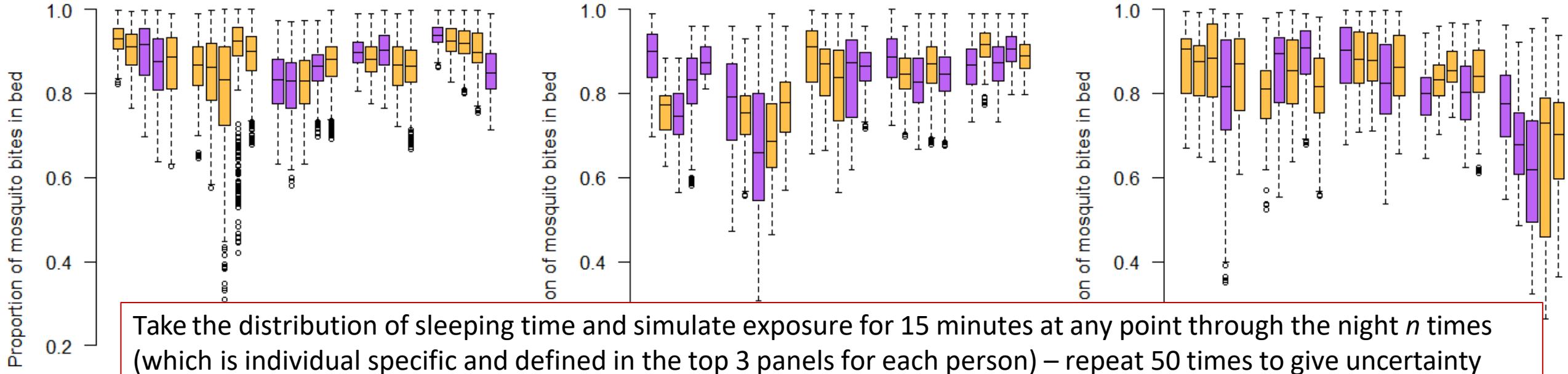




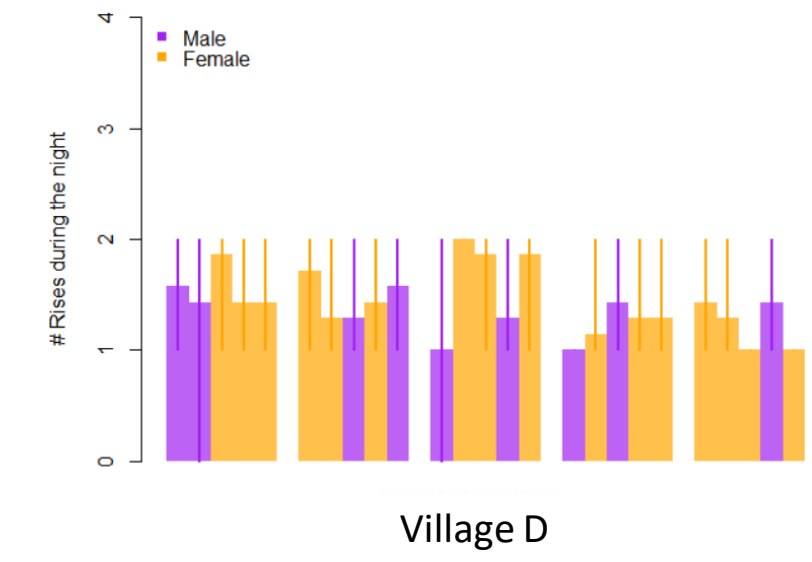
Village A

Village B

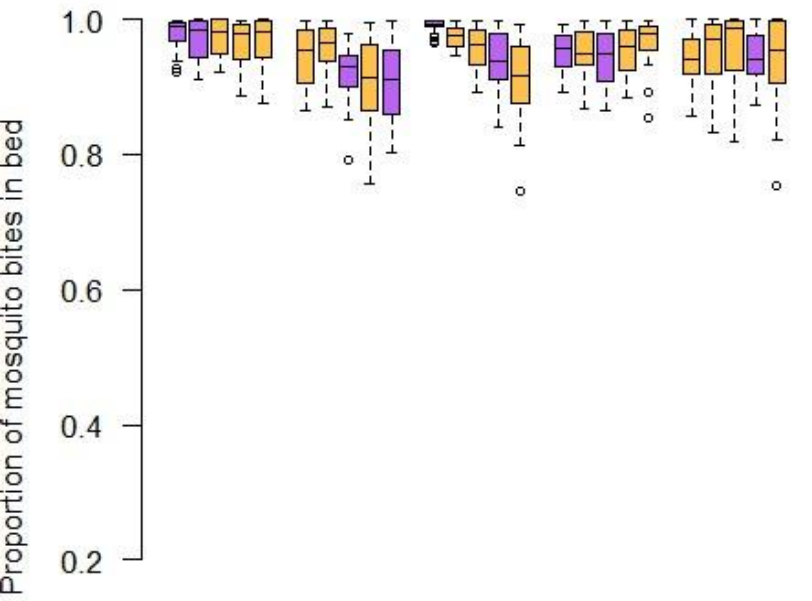
Village C

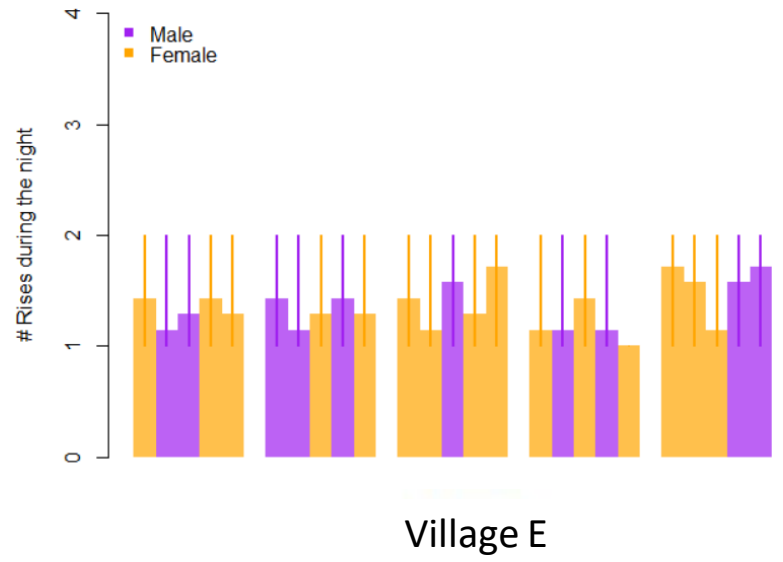


Take the distribution of sleeping time and simulate exposure for 15 minutes at any point through the night *n* times (which is individual specific and defined in the top 3 panels for each person) – repeat 50 times to give uncertainty

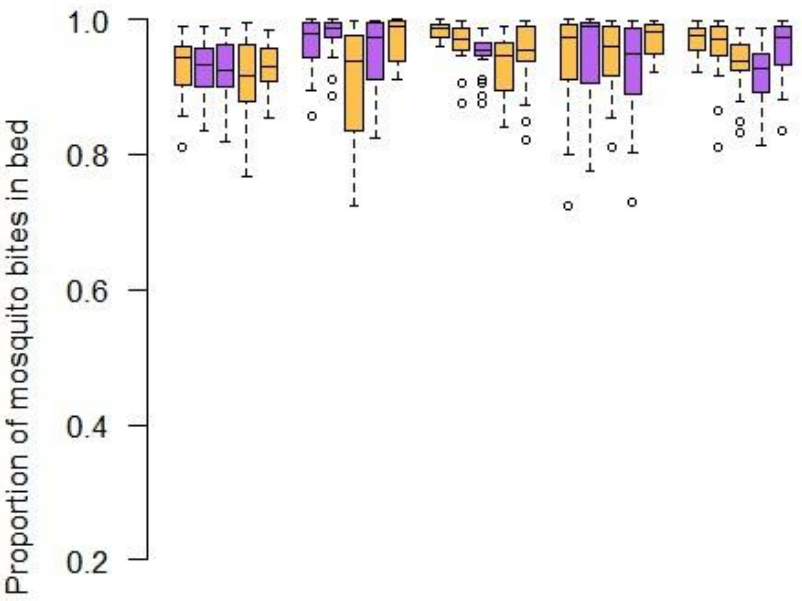


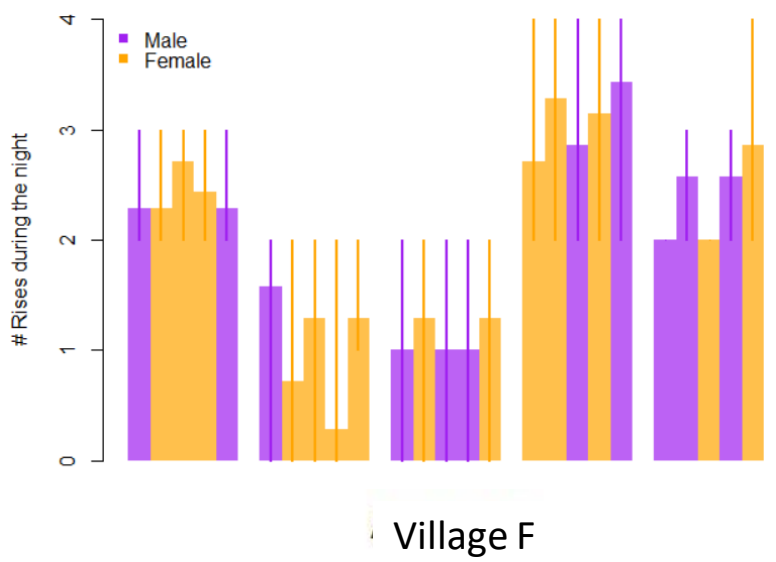
Village D



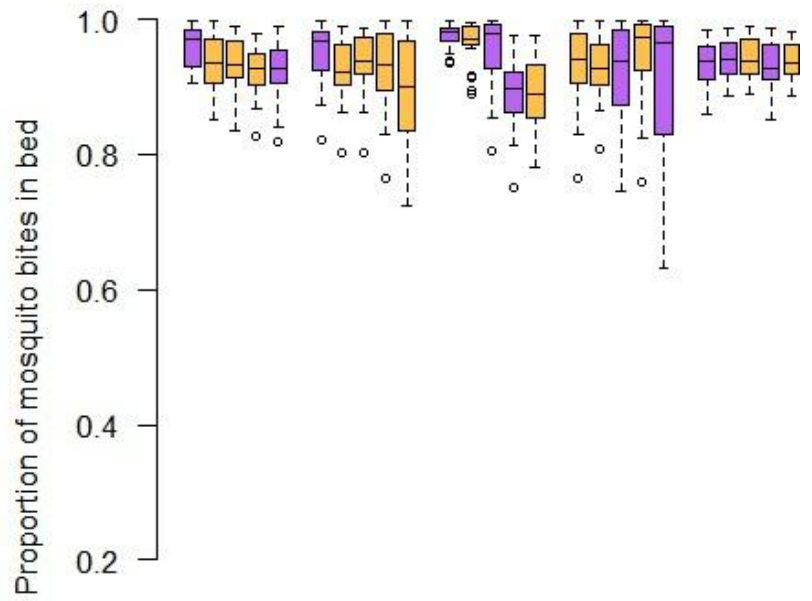


Village E

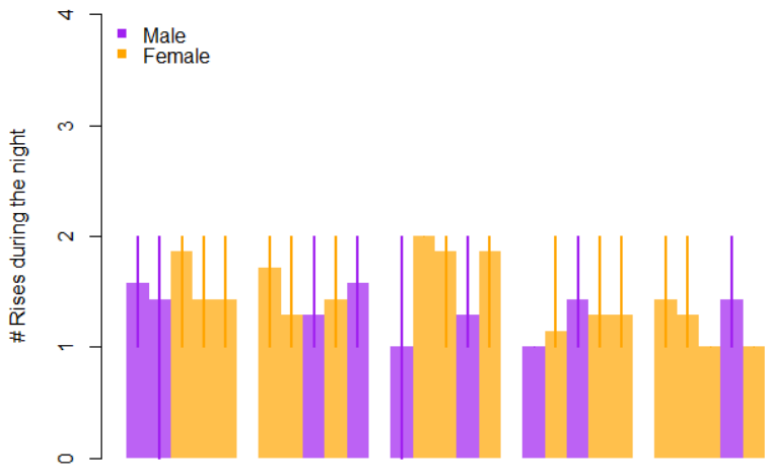


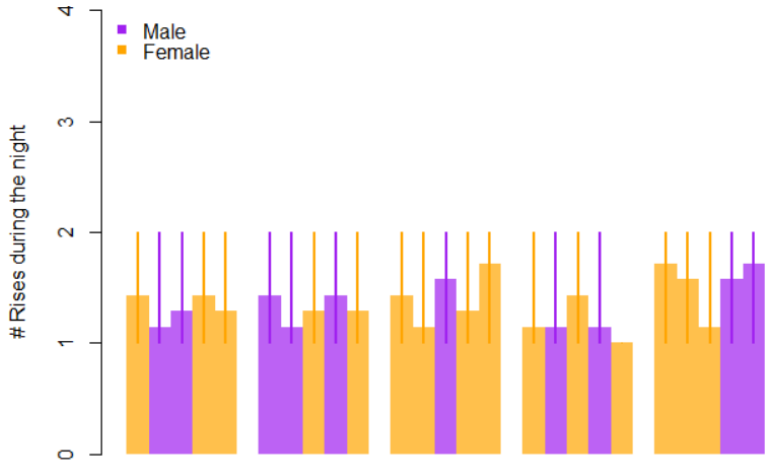


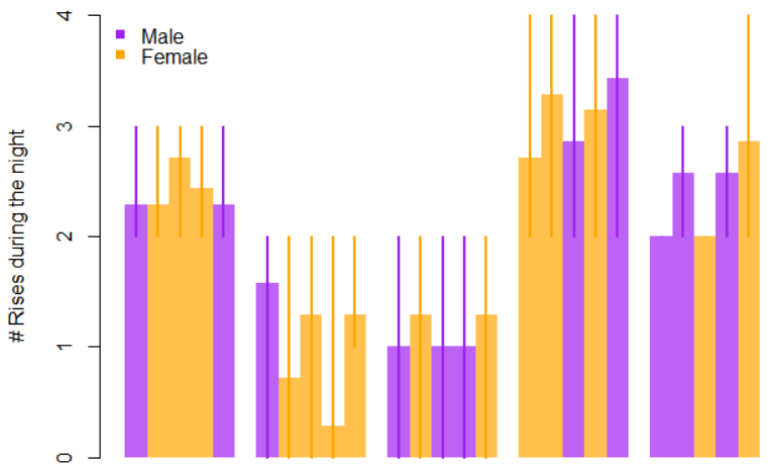
Village F



Repeating for Asa:
Without accounting for rises through the night



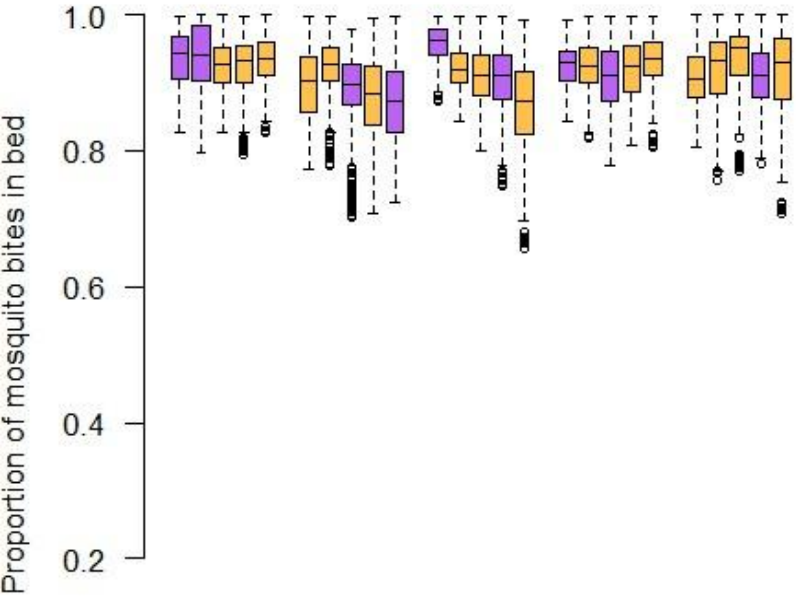


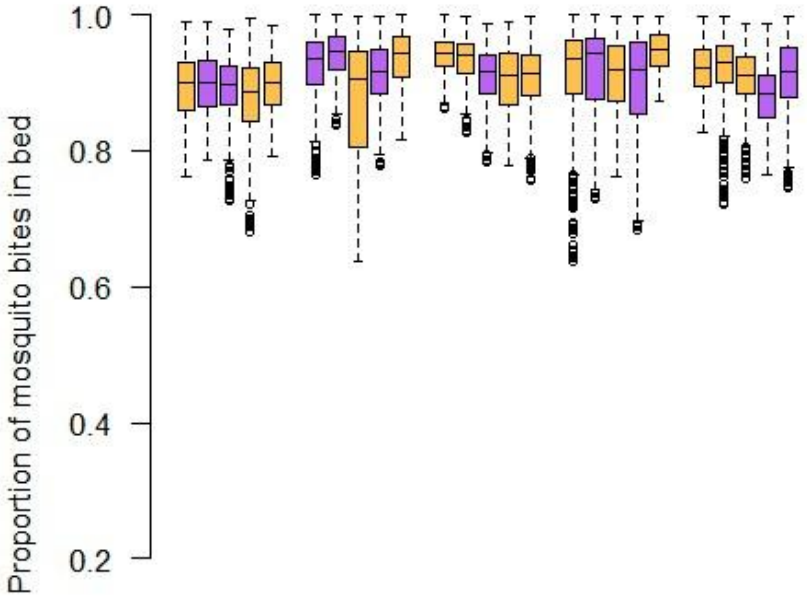


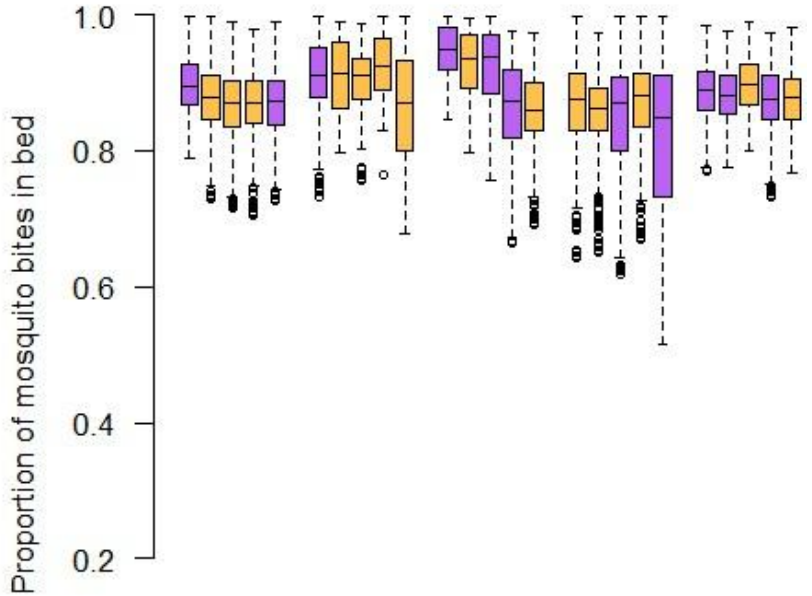
Village D

Village E

Village F







Repeating for Asa:
With accounting for rises through the night

Analysis

Fitted a hierarchical model to the individual data (nested in households, nested in villages)

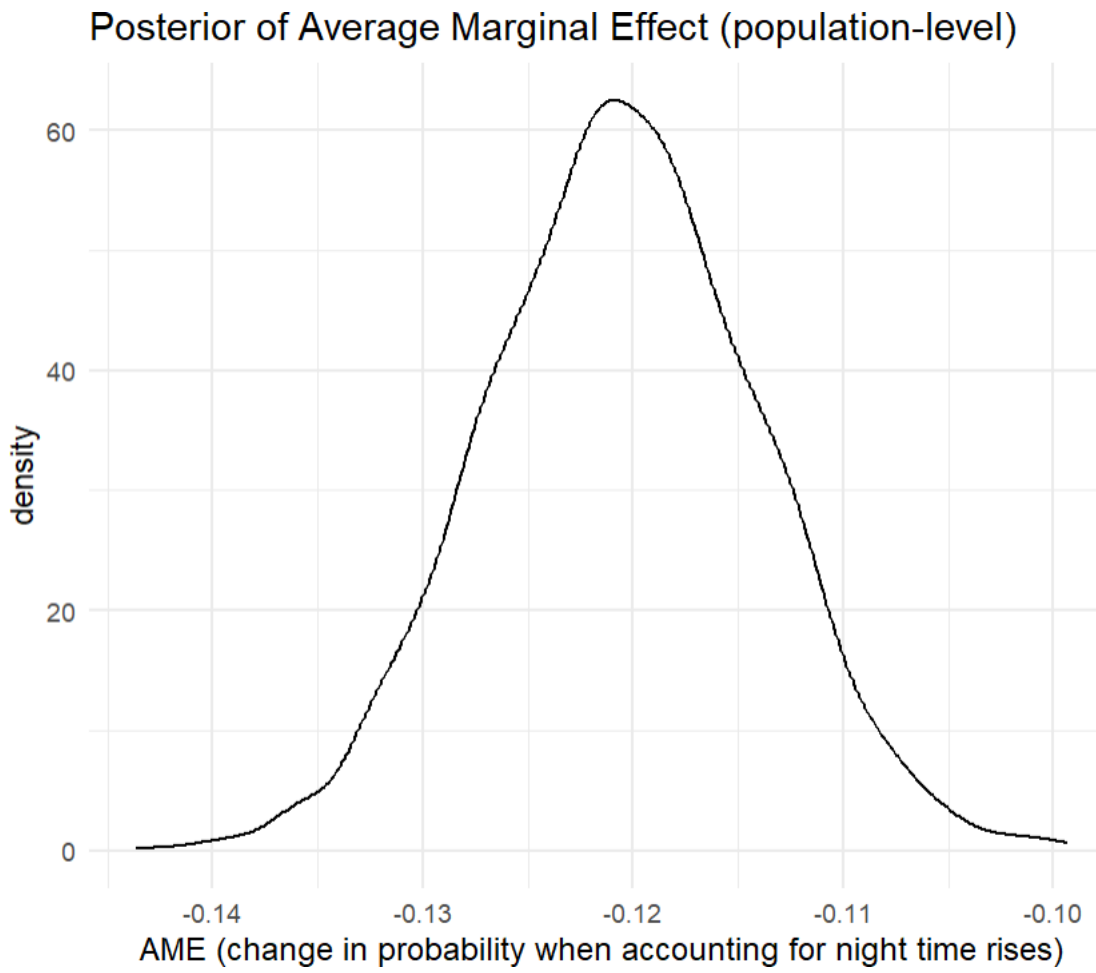
Covariates: Sex and Age and whether the data were adjusted for rises or not (the data were repeated to include this logical covariate)

The coefficients for terms with rises included give us an indication in the shift in probability of mosquitoes biting while a person is in bed.

When we include estimates for rising in the night, there is a probable change in the estimate of proportion of mosquitoes biting at night of about -0.**12 (95% CrI: 0.135 – 0.109)**

i.e. if we were assuming the proportion of bites at night was **0.9,** including the probable rises throughout the night shifts this estimate to 0.9 x (1 – 0.12) = **0.792 (0.78 – 0.80)**

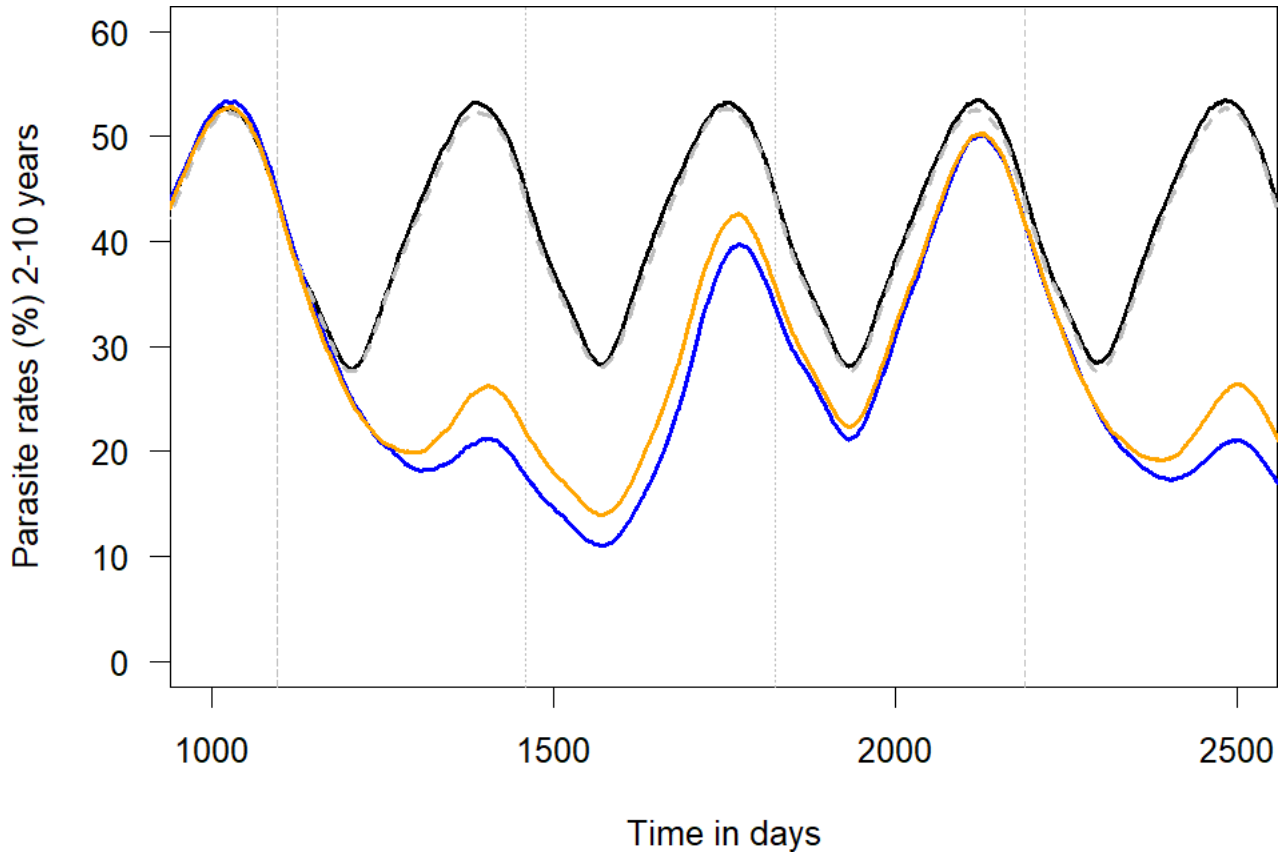
Posterior mean change: -0.12
95% CrI: -0.135 -0.109



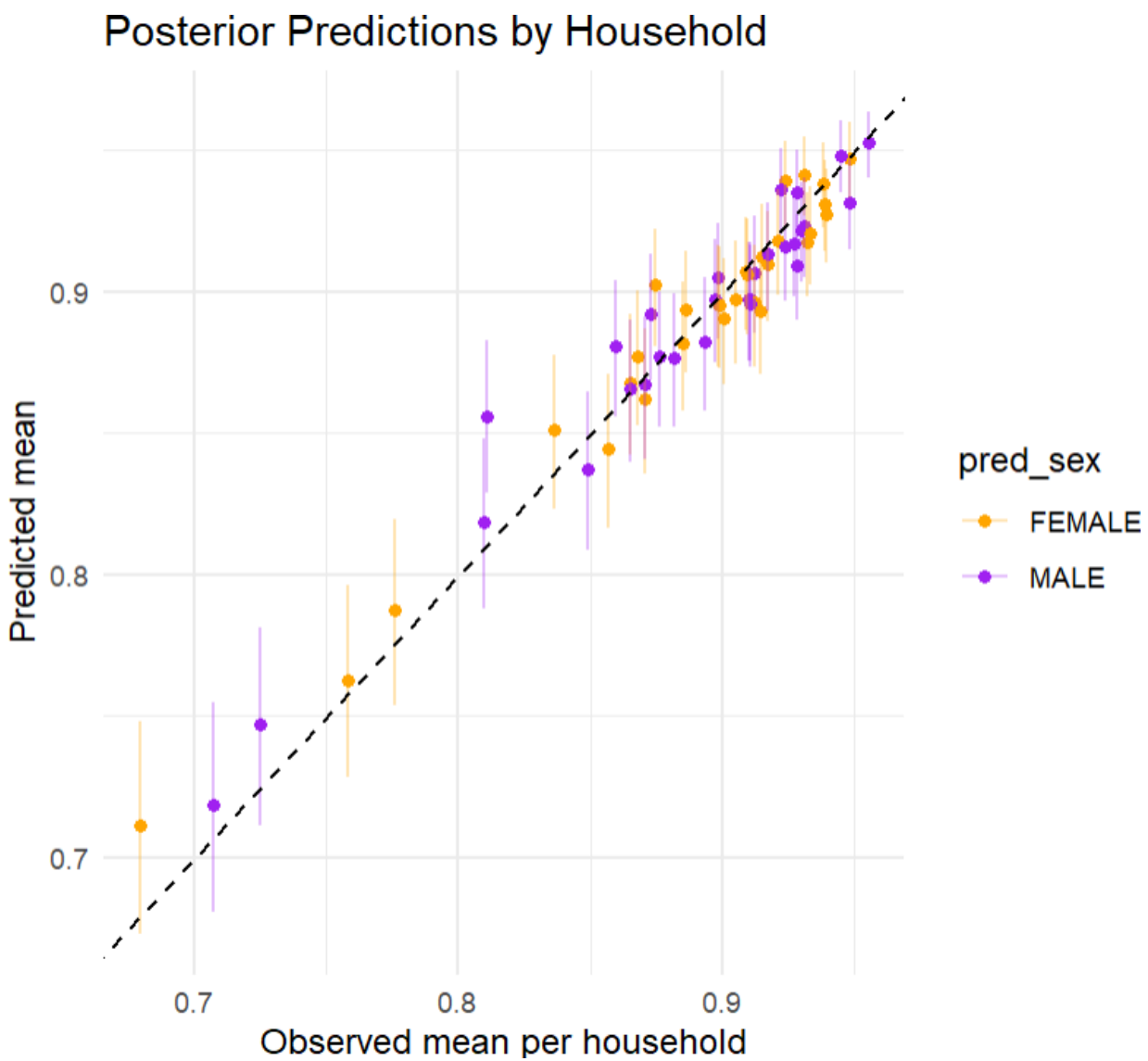
No interventions simulated

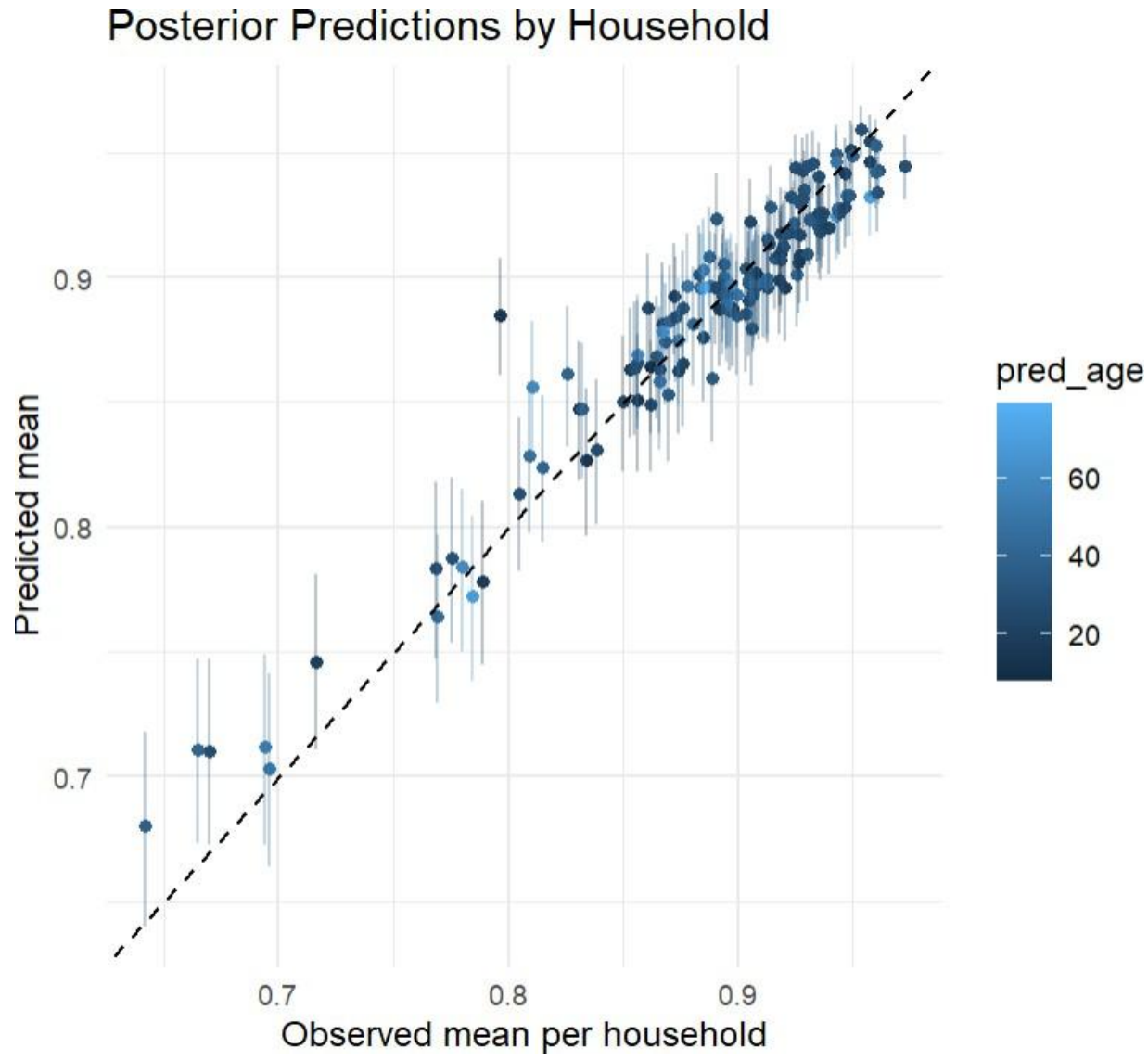
3-yearly ITN campaign with
Assumption of 0.9 bites indoors

3-yearly ITN campaign with
Assumption of 0.79 bites indoors



Assuming 0.9 bites indoors corresponds to a **46.3%** reduction in U5 clinical cases over 3 years
Assuming 0.79 bites indoors corresponds to a **39.9%** reduction in U5 clinical cases over 3 years
In this entirely theoretical simulation this corresponds to about 3000 cases


Posterior Predictions by Household
Predicted mean
0.9
0.8
0.7
0.7
0.8
0.9
Observed mean per household
pred_sex
FEMALE
MALE

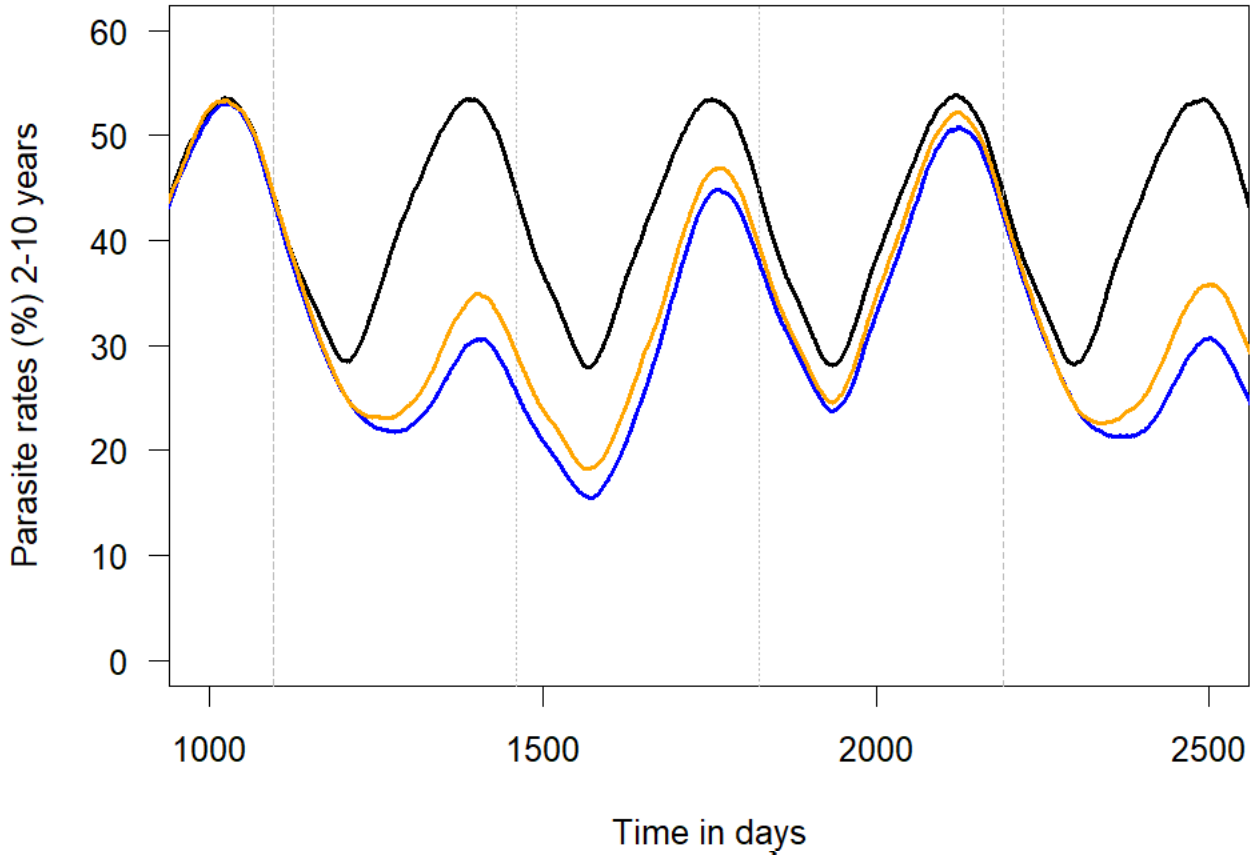

Posterior Predictions by Household
Predicted mean
0.9
0.8
0.7
0.7
0.8
0.9
Observed mean per household
pred_age
60
40
20

ITN access:
Assume 80% use → 60% use

Physical integrity/Community choice:
Assume 2.1 years → 1.5 years

Resistance:
Assume susceptible 100% mortality → 10% mortality

Activity: **No rises** → **some nighttime rises**



[Glover et al 2025 Subnational tailoring of ITN distributions to maximise malaria control | medRxiv]

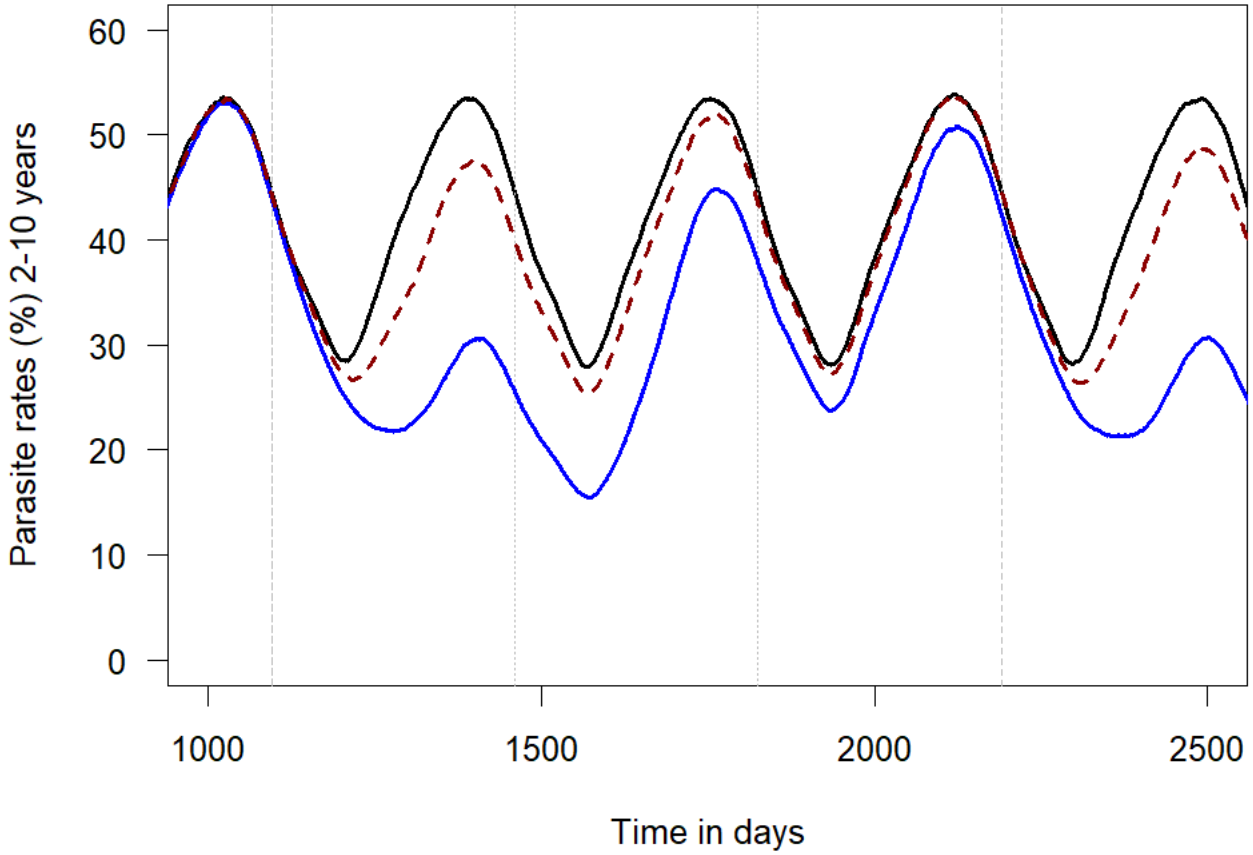
ITN access:
Assume 80% use → 60% use

Physical integrity/Community choice:
Assume 2.1 years → 1.5 years

Resistance:
Assume susceptible 100% mortality → 10% mortality

Activity: **No rises** → **some nighttime rises**

If all these effects are simulated….



Gaps in protection from Insecticide Treated Nets (and Indoor residual spraying)

Conclusion: ….context is key

ITN access: – does the community have enough nets?
physical integrity: higher durability could avert more cases over the course of a 3- year campaign?
resistance: the phenotype of vectors drives efficacy (more resistance = less efficacy)

community preferences: people may choose to stop using or discard the nets at different moments

activities: we need interventions can continue to protect people when rising throughout the night…

- ✓ Interventions that protect the whole space?

Thank you & questions welcome!

Janetta E. Skarp

Andrew D. Beale

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Laura C. Norris

Sarah J. Moore

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Jacques Derek Charlwood

Samir Bhatt

Peter Winskill

Jamie T. Griffin

Thomas S. Churcher

All those generating data

IVCC Vector Control Saving Lives

Dave Malone, Christen Fornadel, Kyra Arnett, Joseph Wagman, Kenzie Tynuv, Julia Mwesigwa, Molly Robertson, Christelle Gogue, and Peder Digre



NATIONAL MALARIA ELIMINATION PROGRAMME
Federal Ministry of Health, Abuja

Unitaid
SAVE LIVES FASTER

amp The Alliance for Malaria Prevention

UKRI MRC Centre for Global Infectious Disease Analysis Imperial College London

LSTM LIVERPOOL SCHOOL OF TROPICAL MEDICINE

LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

PATH

RBM Partnership To End Malaria

Vector Control Working Group

Harnessing daily habits to fight malaria: the MAÏA approach

Franck Langevin
MAÏA Africa

30th October 2025



Harnessing daily habits to fight malaria: the MAÏA approach

Franck Langevin, CEO & Co-Founder – MAÏA Africa


Maia

Residual exposure beyond the net

In Southwestern Mali, **78 % of people were still outdoors at 8 pm**, during peak mosquito activity.
Source: Sarrassat S. et al., Parasites & Vectors, 2025.

In Burkina Faso, **up to 30 % of mosquito bites occur when families are not under nets**.
Source: Sanou A. et al., Scientific Reports, 2021.

LLINs **do not protect against early-evening biting** Anopheles mosquitoes.



Starting from family habits



Most African children are coated with ointment

In Burkina Faso, 80% of children receive an ointment daily to moisturize their skin.



when mosquitoes start biting

The ointment is generally used in the evening at 5 p.m., when the Anopheles begin to bite.



where they are most vulnerable

The ointment is particularly used in rural and semi-urban areas.

Source: Roger Zerbo Maria Theresa Somé Arcens (2018), Personal hygiene and protection against mosquitoes in Burkina Faso, Institute of Social Sciences (INSS)

MAÏA, from care to protection



Inspired by everyday care
Co-designed with mothers and entomologists

Safe for children
Non-irritant, non-sensitizing, and non-phototoxic.

Affordable
Less than 1.3€ per jar

Proven efficacy

8-9 hours of complete protection against Anopheles gambiae and An. a
Burkina Faso and Tanzania field trials.
Source: Traoré et al., Malaria Journal, 2021 (CNRFP, BF);
Mbuba et al., Malaria Journal, 2021 (Ifakara Health Institute, TZ)

Mosquito landings reduced by > 90 % for 8 hours in Burkina Faso under
pressure.

Epidemiological study planned in 2026 in Côte d'Ivoire with Malaria Co
Institut Pierre Richet and LSHTM.



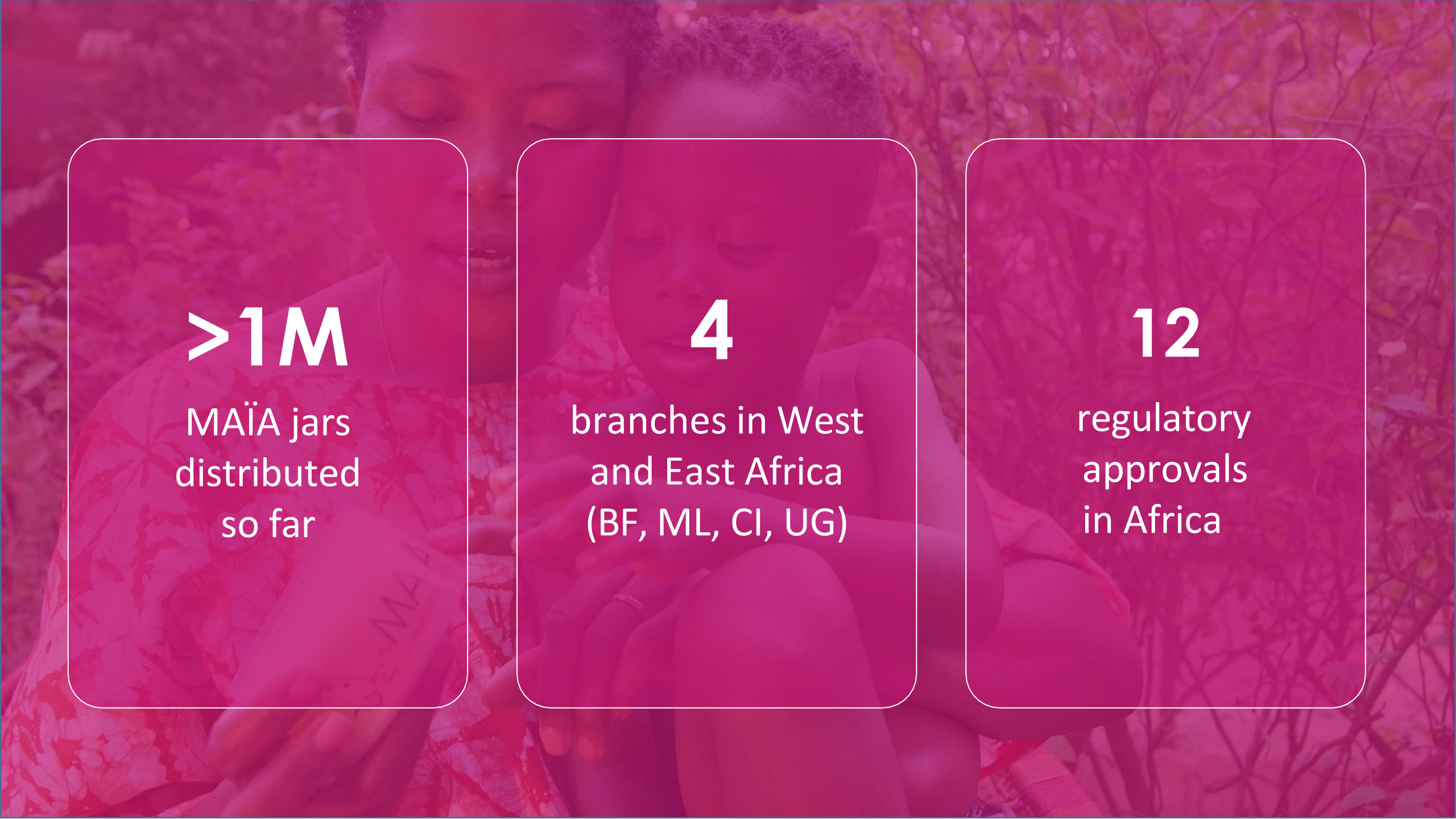
High compliance

3,000-household RCT in Burkina Faso in 2023/2024 showed that families adopt MAÏA once they experience it:

- **95 % used MAÏA when offered for free**
- Usage among paying households rose **from 24 % to 47 % in just 3 months**.
- Free or low-cost trials build lasting habits: a **temporary 50 % subsidy doubled adoption**, proving that short-term access unlocks long-term demand.

Source: Djemaï & Renard, Revue d'Économie du Développement, 2023





>1M

MAÏA jars distributed so far

4

branches in West and East Africa (BF, ML, CI, UG)

12

regulatory approvals in Africa

Scaling protection across Africa

Go where it matters

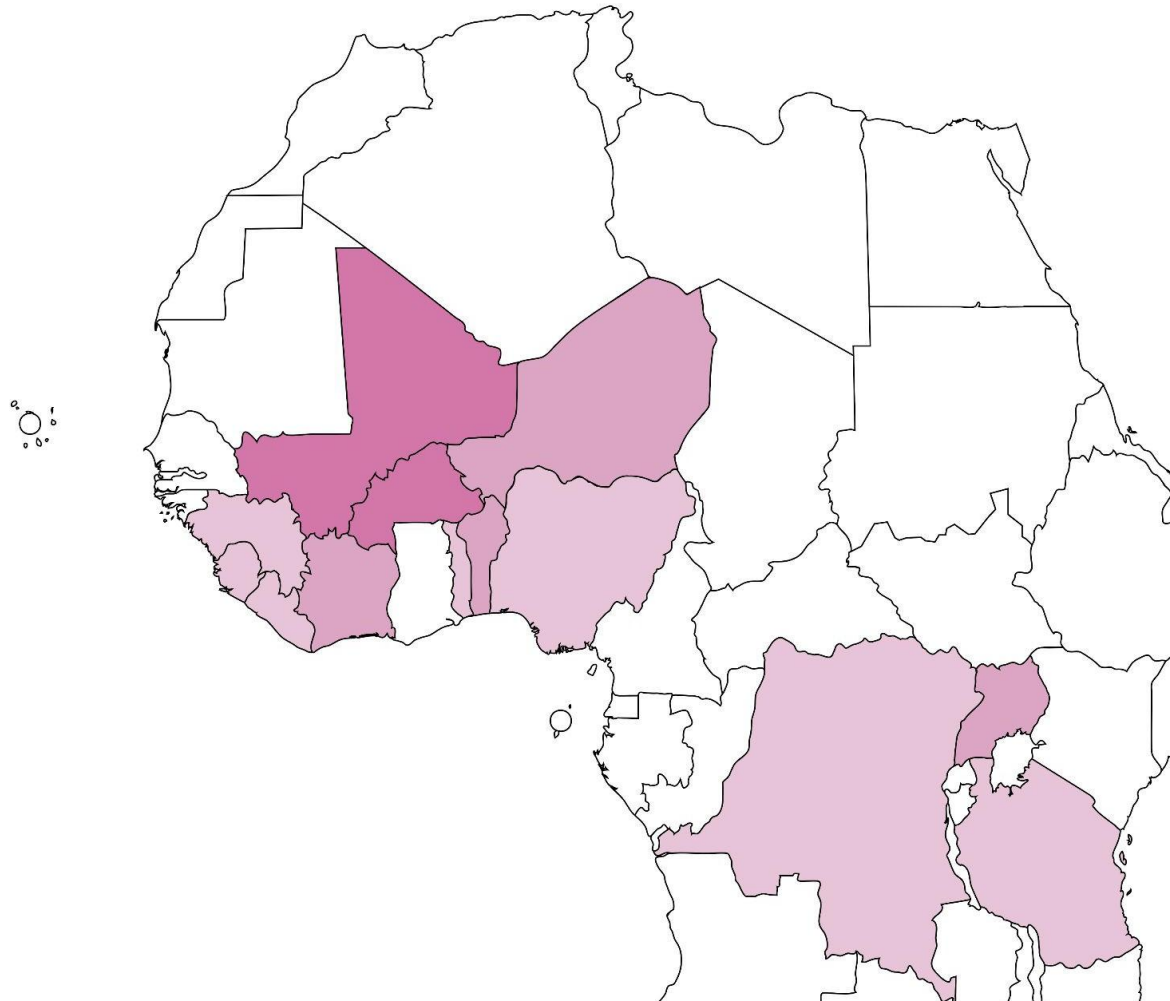
From 4 pilot countries (Burkina Faso, Côte d'Ivoire, Mali, Uganda) to 13 by 2030.

Produce in Africa

Regional manufacturing hubs in Abidjan and soon in Kampala ensure low-cost, high-quality production.

Ensure reach and equity

Deliver retail shops for urban families, community agents for rural areas, and NGO/government partnerships for the most vulnerable.



Next steps

Integrate MAÏA into national toolkits
Work with NMCPs to include topical repellents in malaria control strateg

Build public–private delivery partnerships
Collaborate with NGOs, social enterprises, and community health netwo
vulnerable rural populations at scale.

Innovate for the future
Develop new products building on MAÏA's model —open to scientific an
partnerships to accelerate impact.





Contact me at:
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RBM Partnership To End Malaria

Vector Control Working Group

Insecticide Impregnated Barriers. A novel concept against malaria vectors

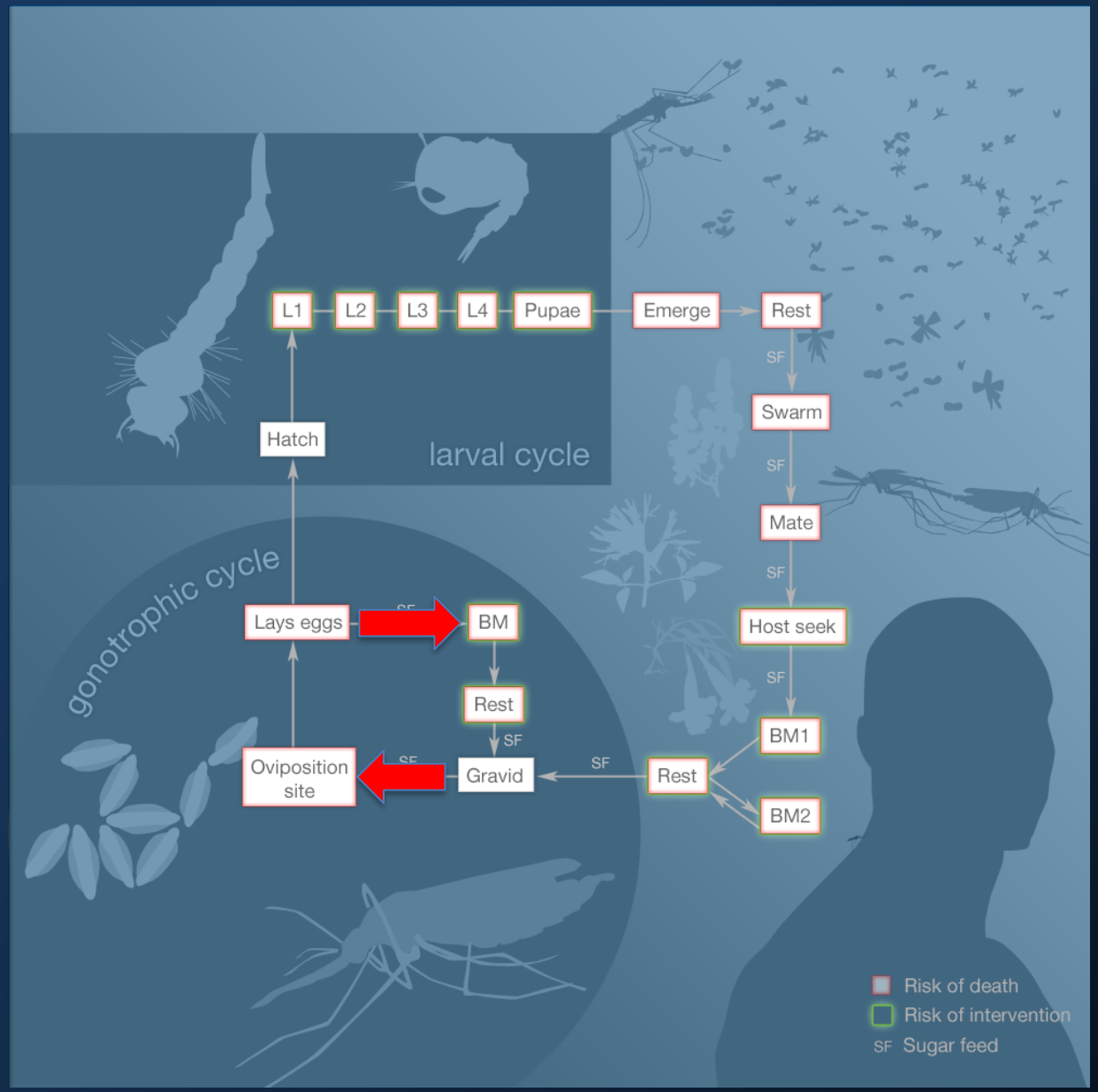
Neil Lobo
University of Notre Dame

30th October 2025

Insecticide Impregnated Barriers (IIBs)

Neil F. Lobo
University of Notre Dame

Mosquito Behavior and Barrier Screens



Barriers Screens



Food Source (village)

Barrier Screen

Larval Site

Barrier screens: a method to sample blood-fed and host-seeking exophilic mosquitoes, Burkot, Thomas R.; Russell, Tanya L.; Reimer, Lisa J.; Bugoro, Hugo; Beebe, Nigel W.; Cooper, Robert D.; Sukawati, Supratman; Collins, Frank H.; Lobo, Neil F., Malaria Journal (2013) Malar J. 2013 Feb 5;12:49.

Utility of Barrier Screens to sample outdoor mosquitoes in an area targeted for malaria elimination. Stevenson JC, Simubali L, Hamapumbu H, Lobo NF, Norris DE. American Journal of Tropical Medicine and Hygiene. Oct 2015; 93(4):427.

Using barrier screens to characterize mosquito composition, flight activity, and abdominal status in South Lampung, Indonesia. Davidson JR@, Sukowati S, Shinta, Asih PBS, Syafruddin D, Baskin RN, St Laurent B@, Hawley WA, Liu F, Burkot TR, Collins FH, Lobo NF. Parasit Vectors. 2018 Jul 31;11(1):440.

Interventions

Interventions take advantage of mosquito behaviors

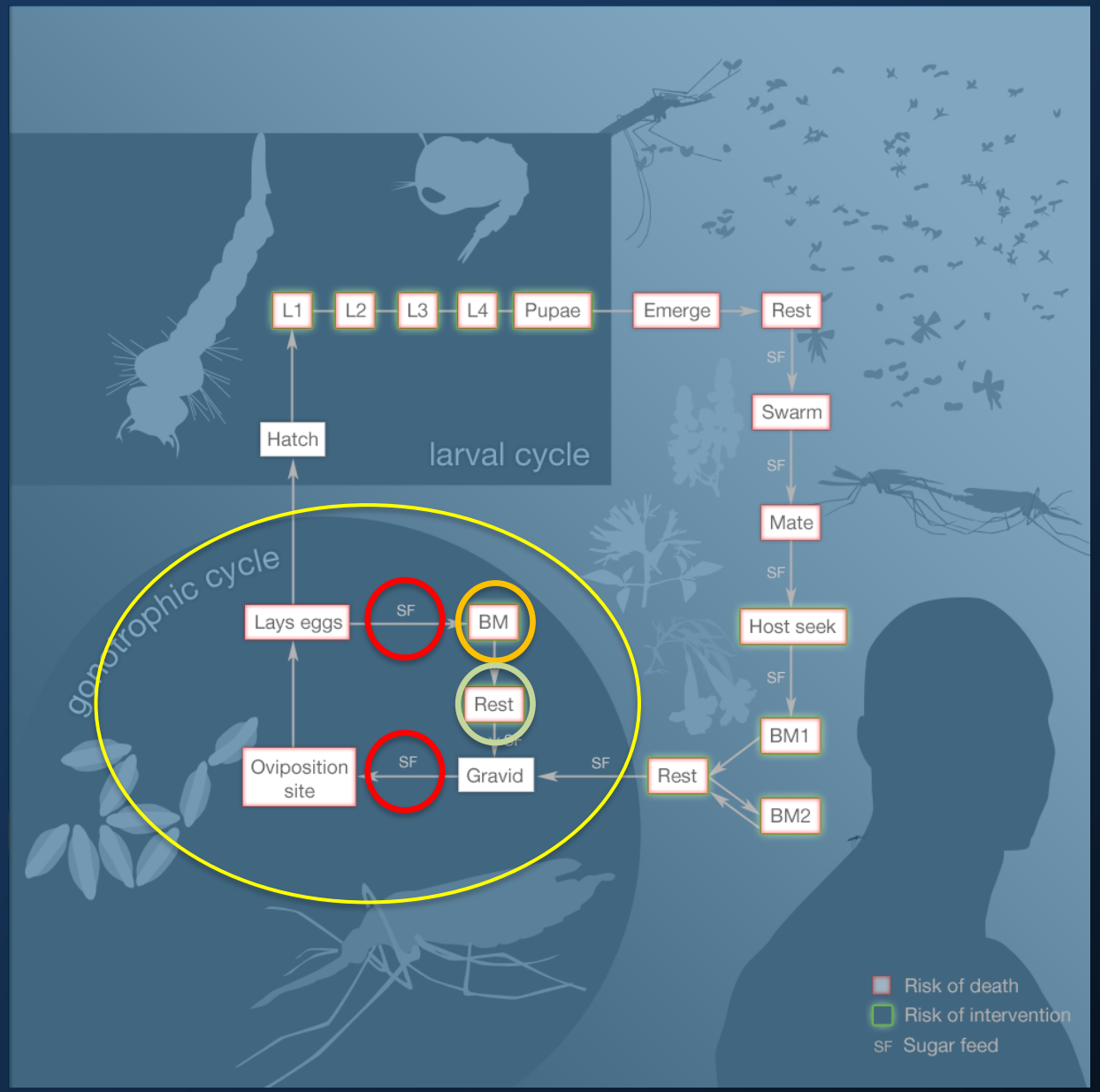
1. ITNs: Indoor, human feeding, late night feeding.

2. IRS: Indoor resting

3. Insecticide impregnated Barriers (IIBs)?



Interventions



ITNs

IRS

IIB

Insecticide Impregnated Barriers

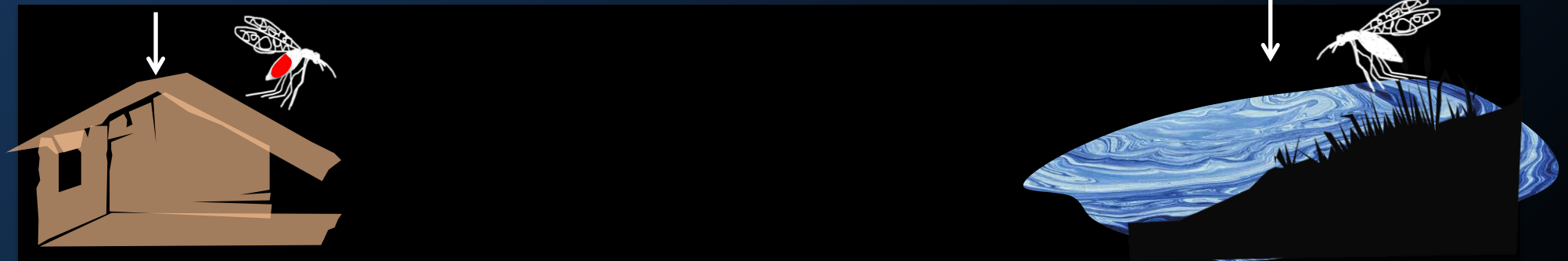
- Barrier Screens used to trap and characterize mosquito behavior
- **Insecticide Impregnated Barriers** may control malaria
  - Effects all vectors (indoor and outdoor feeding)
  - Would impact vectors twice in a gonotrophic cycle



Food Source
(village)

IIB

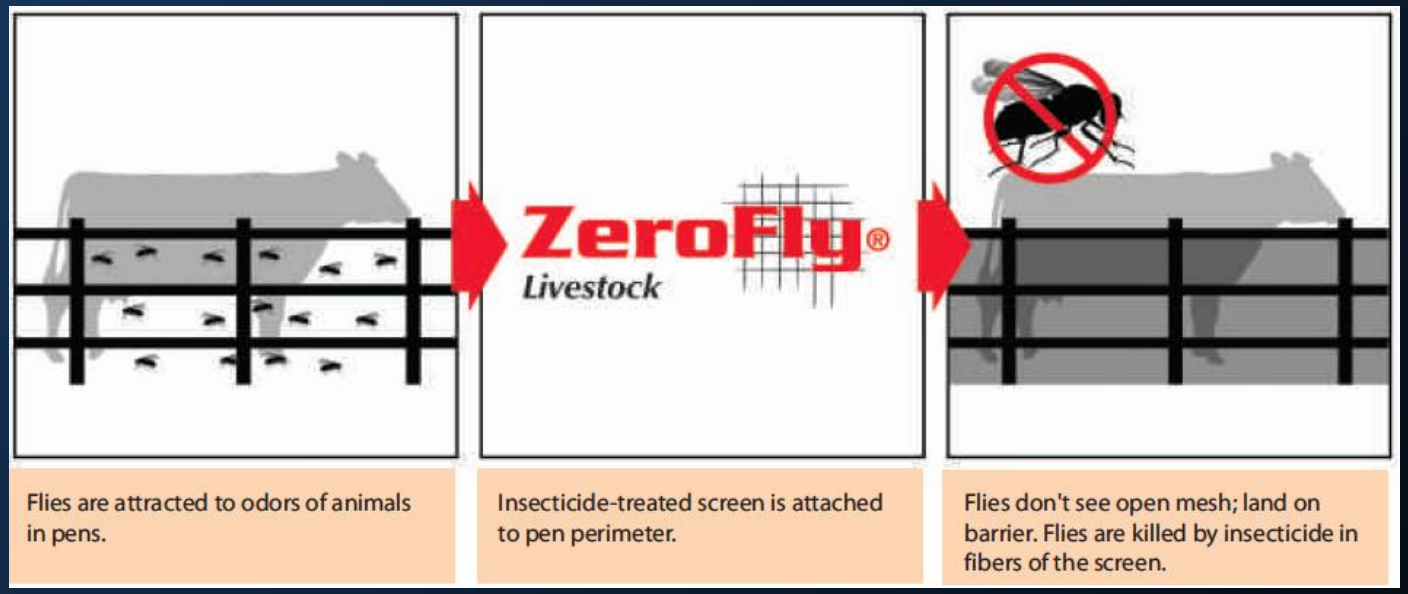
Larval Site



Product

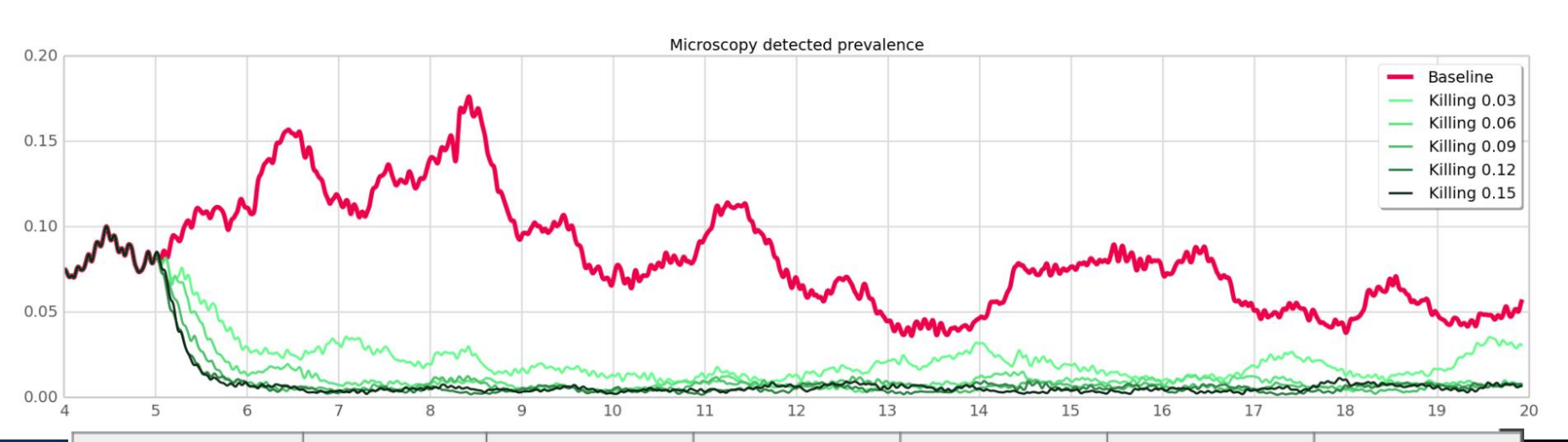
- Product : Vestergaard Frandsen
  - PermaNet®Screen
  - Deltamethrin-treated insect screening
  - sun and water stable insecticide impregnated screens

Formerly



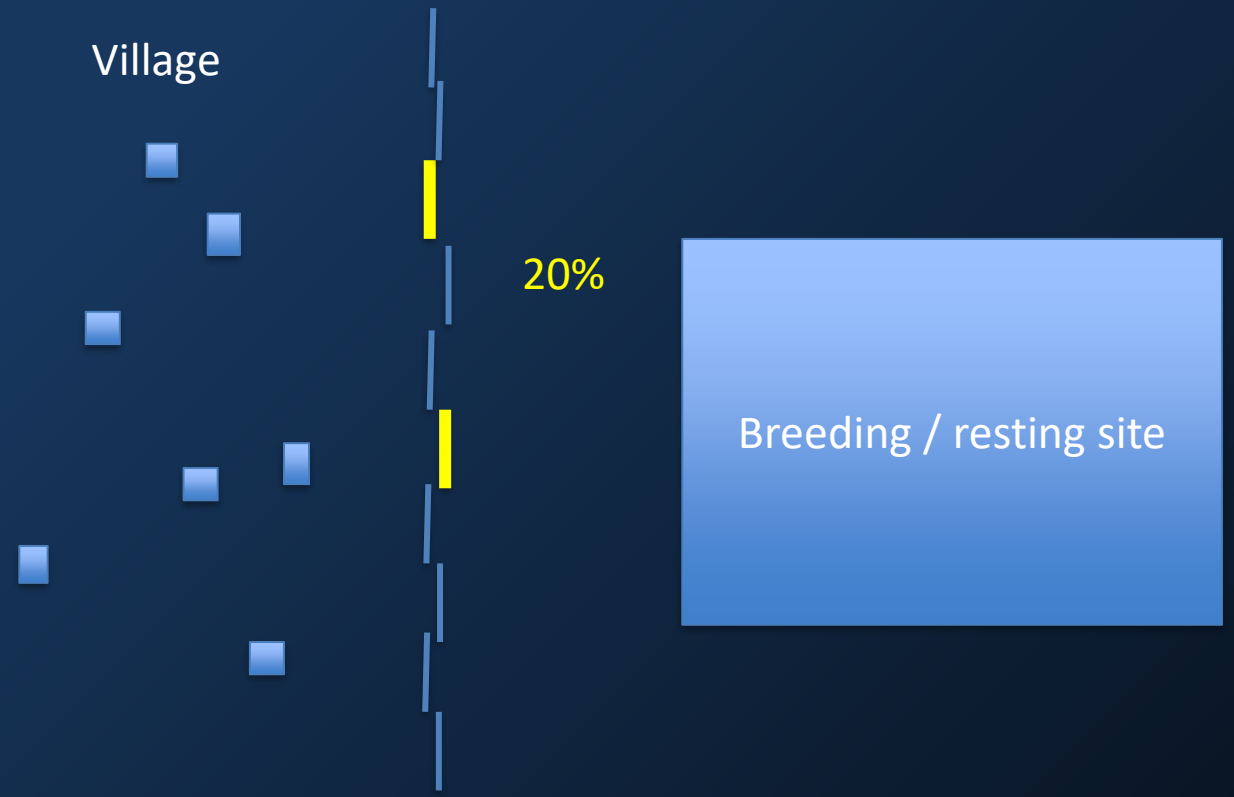
Solomon Islands Modeling - EMOD

- Simulations with IIBs
  - Fully effective for 2.5 years and exponential decay for 6 months
  - IIBs renewed every 3 years
  - Mosquito Killing from 2% to 15%
  - Low levels of introduced cases



Annual EIR	Baseline	3%	6%	9%	12%	15%
After 1 year	1.05	.41	.23	.12	.05	.04
After 2 years	1.31	.21	.09	.02	.01	.01
After 3 years	1.22	.20	.03	.02	.01	.01

Suggest that IIBs would be very useful in eliminating malaria



IIB’s : only 20% of distance (distance = encounter rate) coverage required (modeling suggests 7.5% but we are going more than double)

Trial in Solomon Islands

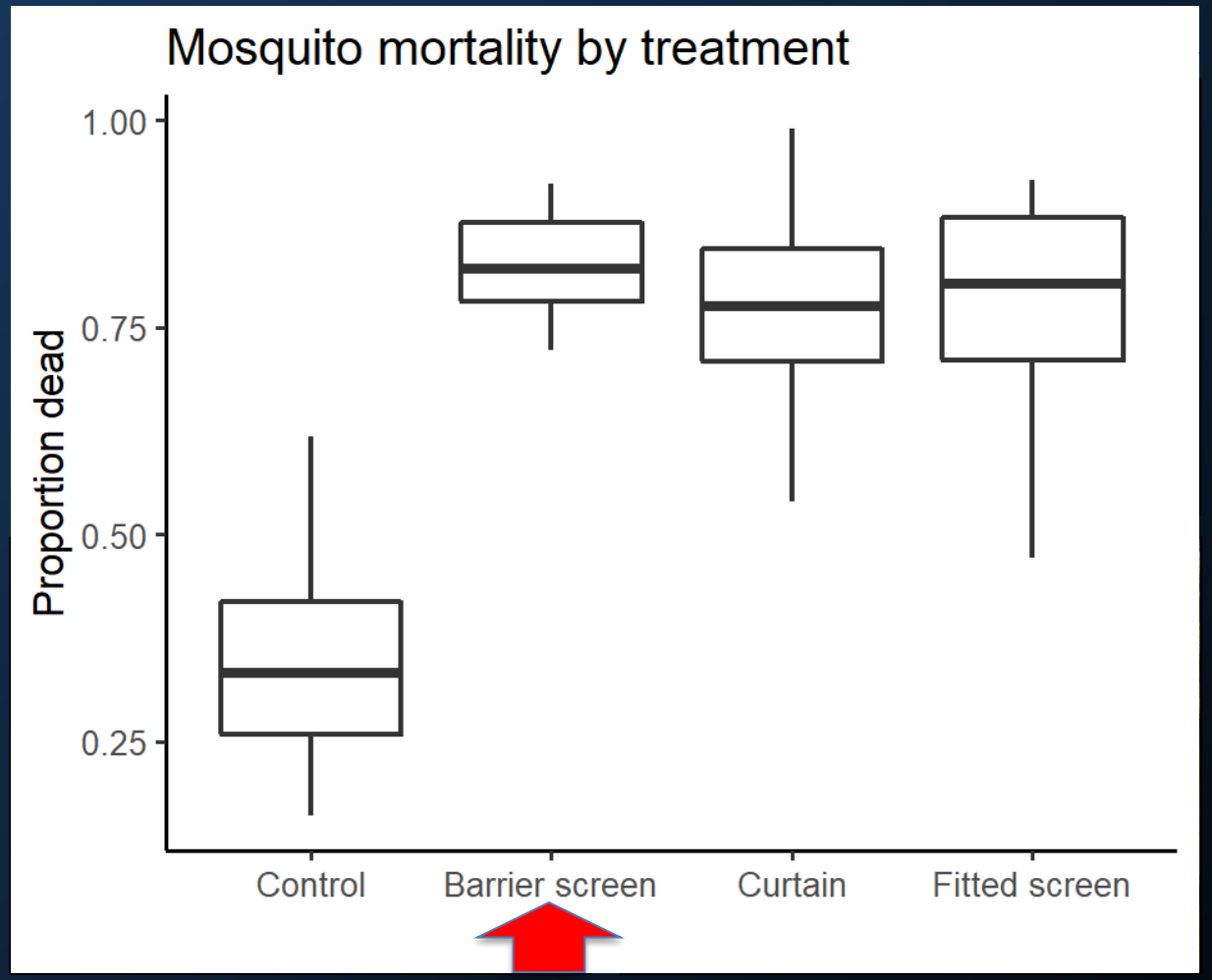
El Niño year (2014) – less rain, no malaria -> Study halted



SFS study in Zambia

Evaluated
- Fitted Screens
- Curtains
- Barriers

Impact on
- Landing
- Mortality



Summary

- We need new paradigms for outdoor malaria transmission (actually all malaria transmission)
- IIBs (or ITOPS – Insecticide Treated Outdoor Portable Screens) represent potential
- Require entomological and epidemiological evidence



RBM Partnership To End Malaria

Vector Control Working Group

Permethrin-treated baby wraps for the prevention of malaria

Ross Boyce
University of North Carolina at Chapel Hill

30th October 2025

Permethrin-treated baby wraps for the prevention of malaria



Ross M. Boyce, MD, MSc
Associate Professor of Medicine
Institute of Global Health and Infectious Diseases
University of North Carolina at Chapel Hill

Declarations

- **Grant Support**
  - Doris Duke Foundation*
  - National Institutes of Health
  - Centers for Disease Control and Prevention
- **Conflicts of Interest**
  - No relevant





Agenda

- Background
- Trial Design
- Results
- Future Directions



The Concept

Baby Wraps

- Widespread across Africa
- Used from ~2 months of age
- Used until ~ 2 years of age
- Also serves as blanket or swaddle



Hypothesis

Treatment of wraps used to carry children with permethrin will provide an additional layer of protection against malaria, especially when the child is outside the home (i.e., not under a net)

Advantages

- Protects against outdoor biting
- Aligns with cultural practices
- Existing market demand
- Targets key age group (6-24 mo)
- Reduced skin absorption
- Complements existing interventions (i.e., nets)



Trial Design

- **Randomized**
  - Randomized 1:1 using REDCap
  - Stratified by age category at enrollment (6-11 vs. 12-18 months) and site
  - Block design

- **Placebo-controlled**
  - All wraps purchased from local vendors
  - No differences in materials or patterns by arm
  - Treatment and re-treatment by soaking in water

- **Blinded**
  - Clinicians and laboratory technicians were not aware of randomization

Boyce et al., *PLOS One,* 2023

Eligibility

- Adult (age ≥18) with *singleton* child between 6-18 months of age
- Current resident of Bugoye, Maliba, or Mubuku sub-counties
- Known HIV or sickle-cell disease
  - Malaria prophylaxis recommended in these population
- Known allergies to pyrethroids

Boyce et al., *PLOS One,* 2023



Intervention

- 2 x 1 m cotton cloth (2)
- Initial treatment prior to randomization
- Re-treatment or sham treatment every 4 weeks
- New net (pyrethroid only)

Outcome Measures

- **Primary Outcome**
  - Clinical malaria defined as:
    - Temperature ≥38° Celsius or history of fever in past 24 hours
      AND
    - Positive malaria rapid diagnostic test (RDT)
  - Clinical malaria cases censored from analysis for 28-days
- **Secondary Outcomes**
  - Malaria-related hospitalizations
  - Change in hemoglobin levels
  - Prevalence of asymptomatic parasitemia
  - Clinical malaria in mother
  - Change maternal hemoglobin level
- **Safety Measures**
  - Adverse event
  - Change growth measures

Boyce et al., *PLOS One,* 2023

Results

Participation

- 400 of 419 mother-infant pairs
  - 4 sets of twins
  - 2 with known sickle cell
  - 13 HIV positive
- Attended 5,194 of 5,200 visits
- No loss to follow up
- LLIN use reported 99% of nights



Primary Outcome

	Sham-treated wrap (n=200)	Permethrin-treated wrap (n=200)	IRD[a] (95% CI)	IRR[a] (95% CI)
Clinical malaria episodes	94 (73.4%)	34 (26.6%)	-	-
Time at risk (person-weeks)	4,395	4,641	-	-

Boyce et al., *NEJM,* 2025

Primary Outcome

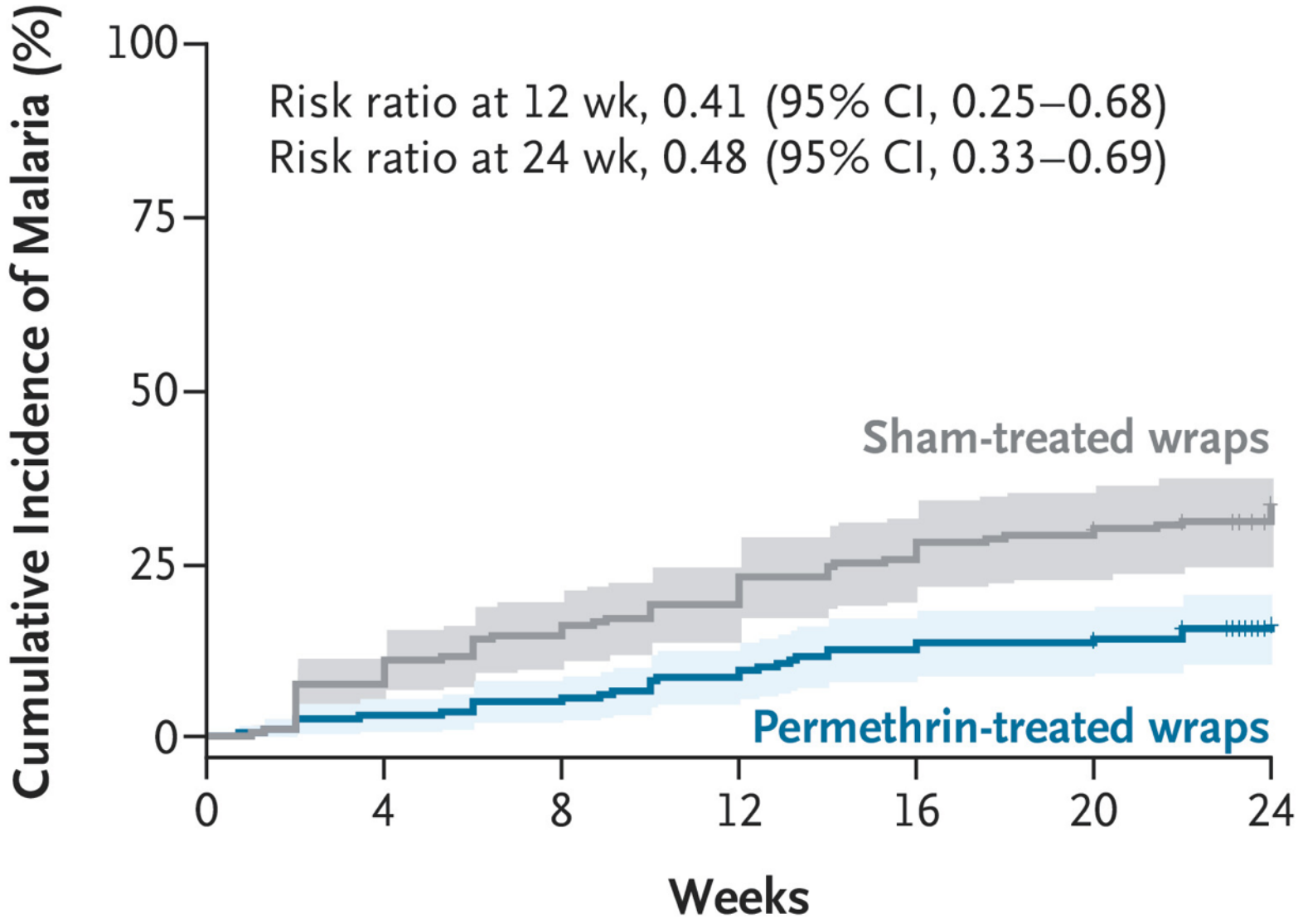
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Time at risk (person-weeks)	4,395	4,641	-	-
Clinical malaria incidence (per 100 person-weeks)	2.14 (1.73, 2.62)	0.73 (0.51, 1.02)	-1.41 (-2.03, -0.83)	0.34 (0.23, 0.51)[b]

Boyce et al., *NEJM,* 2025

Primary Outcome

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Age 6-11 months	2.07 (1.52, 2.76)	0.66 (0.37, 1.09)	-1.42 (-2.22, -0.70)	0.32 (0.18, 0.57)
Age 12-18 months	2.21 (1.62, 2.94)	0.80 (0.48, 1.26)	-1.41 (-2.39, -0.51)	0.36 (0.21, 0.62)

Boyce et al., *NEJM,* 2025



No. at Risk (no. of events)

Sham-treated wraps	200 (0)	185 (22)	171 (32)	162 (46)	149 (56)	142 (60)	132 (67)
Permethrin-treated wraps	200 (0)	194 (6)	190 (11)	183 (19)	175 (27)	173 (28)	153 (32)

Secondary Outcomes

- **Fewer malaria-related hospitalizations**
  - 17 (8.5%) vs 7 (3.5%), PD 5.0% (95% CI -10.3 to -0.2)

- No differences in:
  - Change in hemoglobin levels
  - Change in growth measures (MUAC, Z-scores for weight-for-age, etc.)

- AEs were infrequent, mild, and balanced between trial arms

Boyce et al., *NEJM,* 2025

Key Findings

- **Permethrin-treated wraps effectively reduced the incidence of clinical malaria among young children in western Uganda**

- Effects were observed even with provision of new LLIN and high (reported) use
  - *Suggests dawn/dusk and outdoor biting plays substantial role in transmission*

- Effects were observed in a region with >90% prevalence of pyrethroid resistance
  - *Suggests permethrin maintain repellency effect even when no longer insecticidal*

- Permethrin-treated wraps were safe for at least for 6 months of use



Important Questions

- What is the mechanism?
- Are wraps safe for the anticipated period of use?
- Do treated wraps complement new interventions?
- Different permethrin application strategies?

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DORIS DUKE FOUNDATION
Award 24971

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Questions?

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RBM Partnership To End Malaria

Vector Control Working Group

Wrap up

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Samantha M O'Loughlin