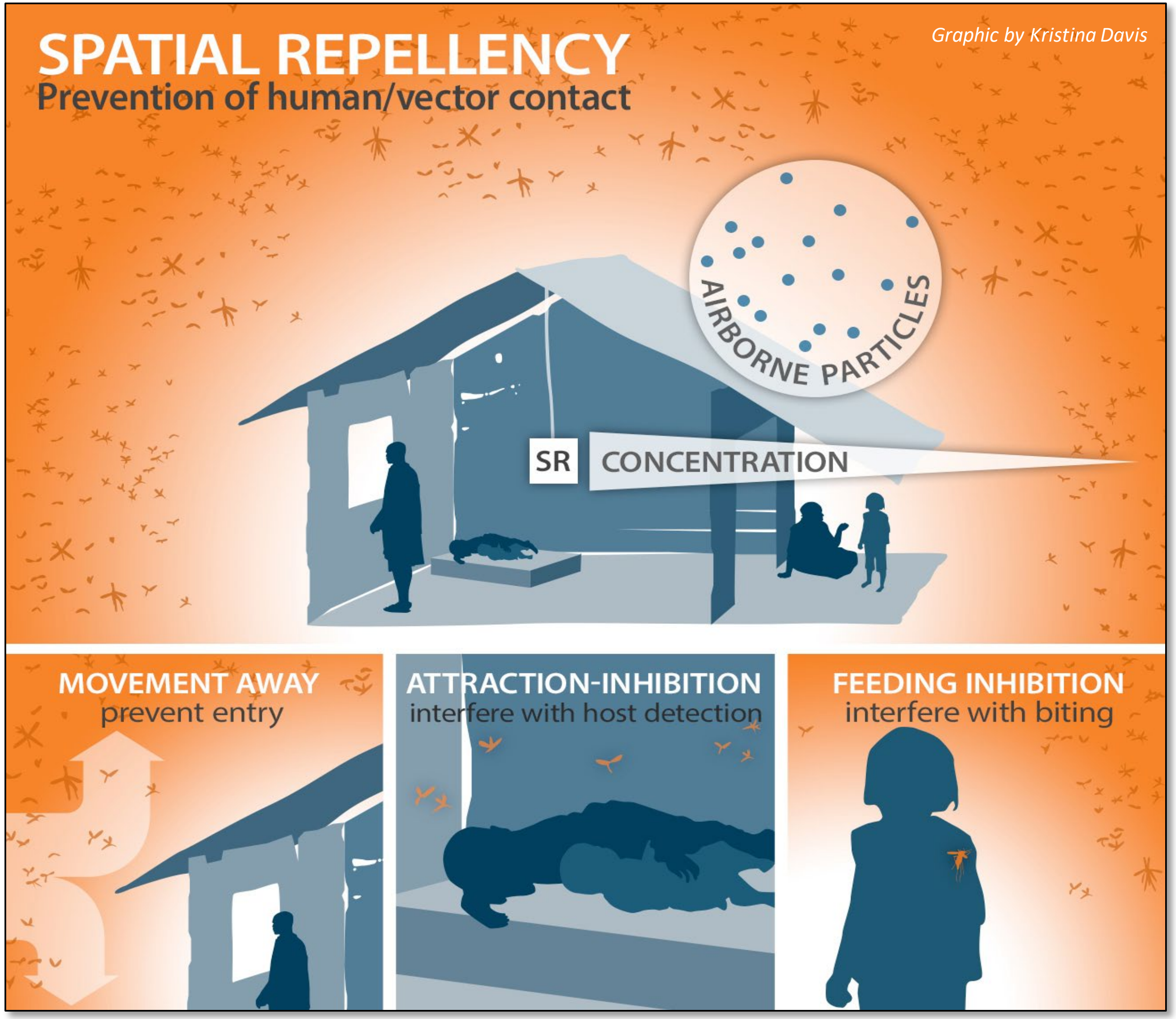
SPATIAL REPELLENTS FOR THE CONTROL OF VECTOR BORNE DISEASES

Eric Ochomo, MSc, PhD

Kenya Medical Research Institute

VCWG Meeting 29 April 2021



Continuous release of active ingredient over time and space

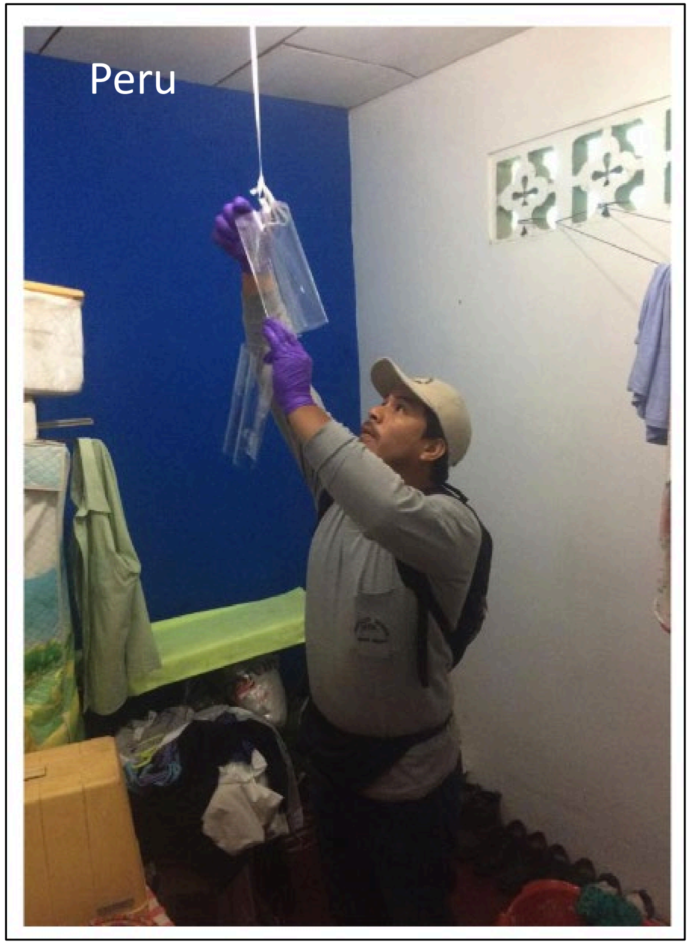
Added Value –
Addresses daytime, early-evening and indoor/outdoor vector biting

Varied modes of action

Innovation–
New actives, alternate target sites, exploitation of post-exposure effects

Spatial Repellent Products currently under evaluation

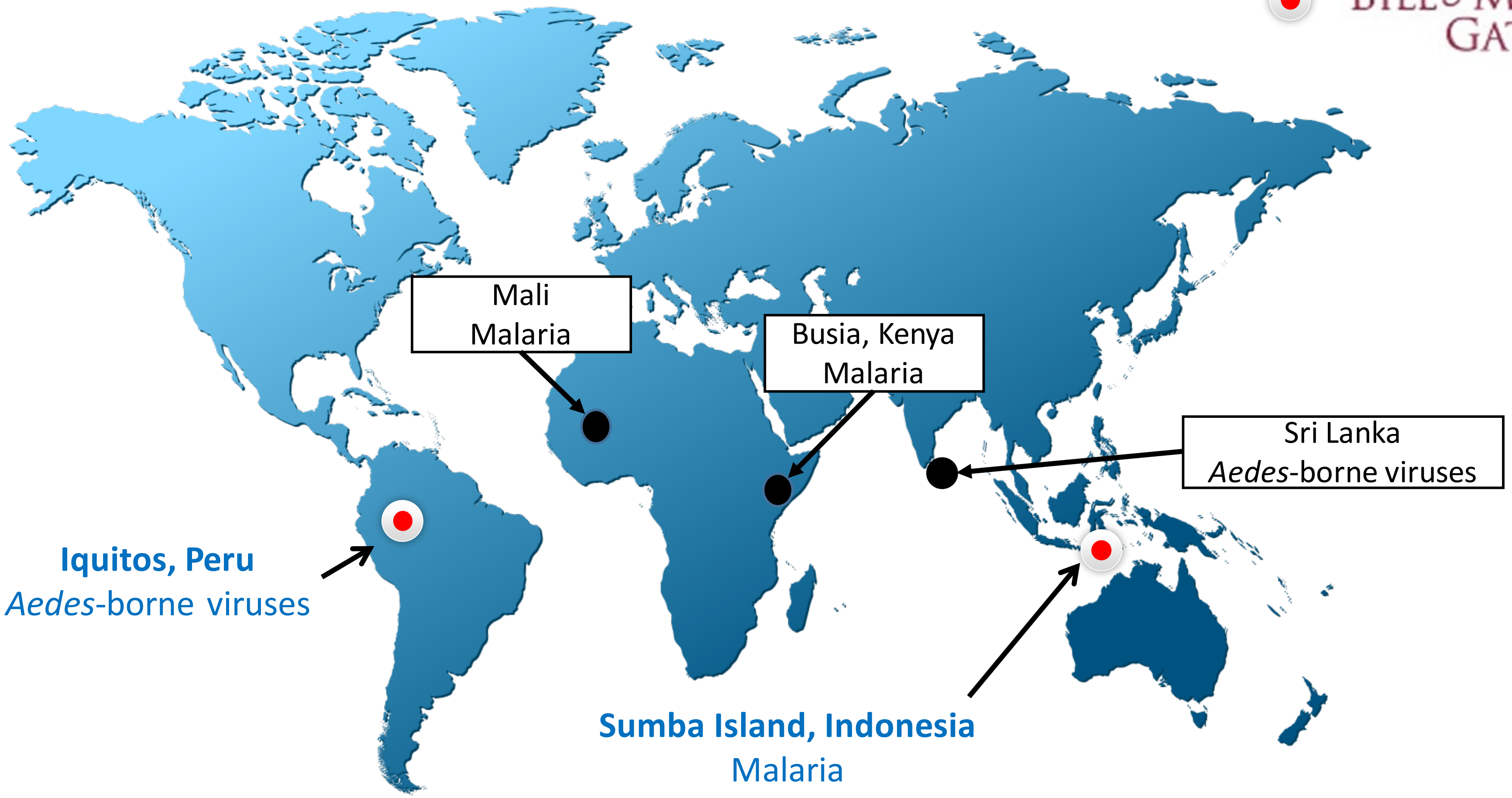
- Shield® - Transfluthrin (volatile pyrethroid) 2 week duration
- Mosquito Shield® - Transfluthrin 4 week duration



Current Trials on spatial repellents

Unitaid
Innovation in Global Health

BILL & MELINDA GATES foundation



Outcome of the PERU ABV Study

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Efficacy of a Spatial Repellent for Control of *Aedes*-Borne Virus Transmission: A Cluster Randomized Trial in Iquitos, Peru

Amy C. Morrison, Robert C. Reiner Jr., William H. Elson, Helvio Astete, Carolina Guevara, Clara del Aguila, Isabel Bazan, Crystyan Siles, Patricia Barrera, Anna B. Kawiecki, Christopher M. Barker, Gissella M. Vasquez, Karin Escobedo-Vargas, Carmen Flores-Mendoza, Alfredo A. Huaman, Mariana Leguia, Maria E. Silva, Sarah A. Jenkins, Wesley R. Campbell, Eugenio J. Abente, Robert D. Hontz, Valerie A. Paz-Soldan, John P. Grieco, Neil F. Lobo, Thomas W. Scott, Nicole L. Achee

doi: https://doi.org/10.1101/2021.03.03.21252148

This article is a preprint and has not been peer-reviewed [what does this mean?]. It reports new medical research that has yet to be evaluated and so should *not* be used to guide clinical practice.

- The spatial repellent significantly reduced ABV infection by 34.1% (95% CI 6.9%, ∞); p = 0.0236, z=1.98).
- *Aedes aegypti* abundance and blood-fed capture rates were significantly reduced by 28.6% (95% CI 24.1%, ∞); z=-9.11) and 12.4% (95% CI 4.2%, ∞); z=-2.43), respectively.

Outcome of the Indonesia Malaria Study

Am. J. Trop. Med. Hyg., 103(1), 2020, pp. 344–358
doi:10.4269/ajtmh.19-0554

Efficacy of a Spatial Repellent for Control of Malaria in Indonesia: A Cluster-Randomized Controlled Trial

Din Syafruddin,[1,2] Puji B. S. Asih,[1] Ismail Ekoprayitno Rozi,[1] Dendi Hadi Permana,[1] Anggi Puspa Nur Hidayati,[1] Lepa Syahrani,[1] Siti Zubaidah,[1] Dian Sidik,[3] Michael J. Bangs,[4] Claus Bøgh,[5] Fang Liu,[6] Evercita C. Eugenio,[6] Jared Hendrickson,[7] Timothy Burton,[8] J. Kevin Baird,[9,10] Frank Collins,[7] John P. Grieco,[8] Neil F. Lobo,[8]† and Nicole L. Achee[8]*†

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Abstract. A cluster-randomized, double-blinded, placebo-controlled trial was conducted to estimate the protective efficacy (PE) of a spatial repellent (SR) against malaria infection in Sumba, Indonesia. Following radical cure in 1,341 children aged ≥ 6 months to ≤ 5 years in 24 clusters, households were given transfluthrin or placebo passive emanators (devices designed to release vaporized chemical). Monthly blood screening and biweekly human-landing mosquito catches were performed during a 10-month baseline (June 2015–March 2016) and a 24-month intervention period (April 2016–April 2018). Screening detected 164 first-time infections and an accumulative total of 459 infections in 667 subjects in placebo-control households, and 134 first-time and 253 accumulative total infections among 665 subjects in active intervention households. The 24-cluster protective effect of 27.7% and 31.3%, for time to first-event and overall (total new) infections, respectively, was not statistically significant. Purportedly, this was due in part to zero to low incidence in some clusters, undermining the ability to detect a protective effect. Subgroup analysis of 19 clusters where at least one infection occurred during baseline showed 33.3% (*P*-value = 0.083) and 40.9% (*P*-value = 0.0236, statistically significant at the one-sided 5% significance level) protective effect to first infection and overall infections, respectively. Among 12 moderate- to high-risk clusters, a statistically significant decrease in infection by intervention was detected (60% PE). Primary entomological analysis of impact was inconclusive. Although this study suggests SRs prevent malaria, additional evidence is required to demonstrate the product class provides an operationally feasible and effective means of reducing malaria transmission.

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- Primary entomological analysis of impact was inconclusive.

Sumba Island, Indonesia- Primary Outcomes


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THE AMERICAN JOURNAL OF TROPICAL MEDICINE AND HYGIENE
official Journal of the American Society of Tropical Medicine and Hygiene

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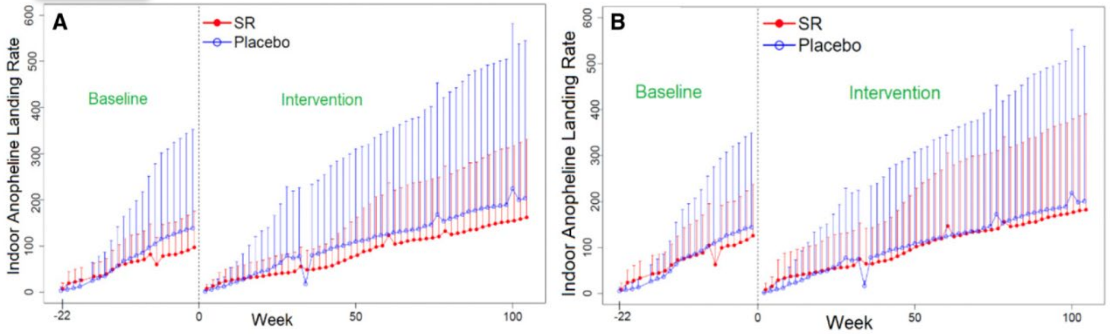
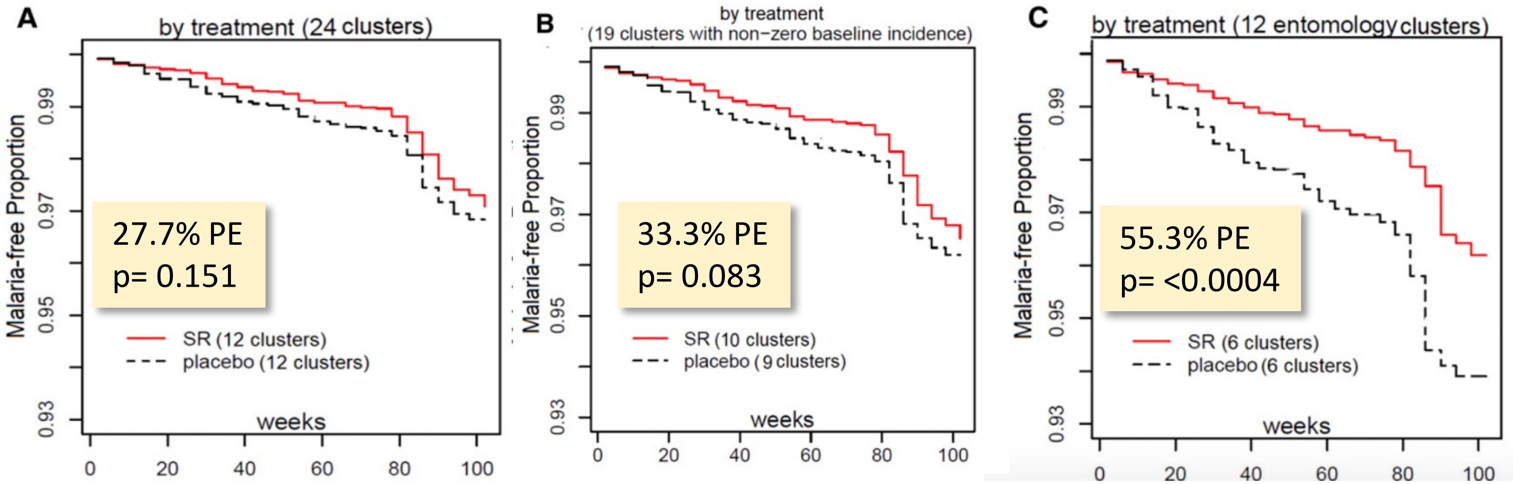
16.4% and 11.3% reduction in anopheline attack rate indoors and outdoors, respectively.



Incidence (Time to First Infection)



Up to 65.6% PE (p <0.001) in <u>overall infection</u> (first and all subsequent) in clusters with entomology collections

The Kenya Trial

A cluster randomized trial of the efficacy of a spatial repellent (the Mosquito Shield) on *Plasmodium falciparum* malaria incidence as measured by time to first infection in western Kenya

Efficacy & Diversion Trial: Ke a

CENTERS FOR DISEASE CONTROL AND PREVENTION

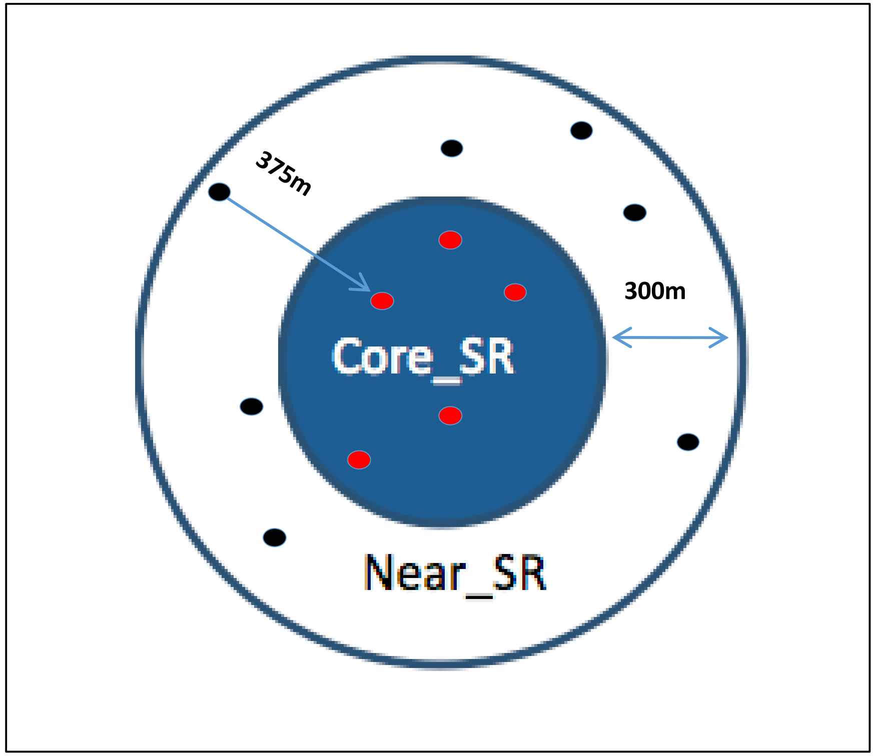
STUDY OVERVIEW

DESIGN:

- Cluster-randomized, placebo-controlled
- 1 baseline cohort (4mo)
- 2 intervention cohorts (≥6 mo - <10 yrs)

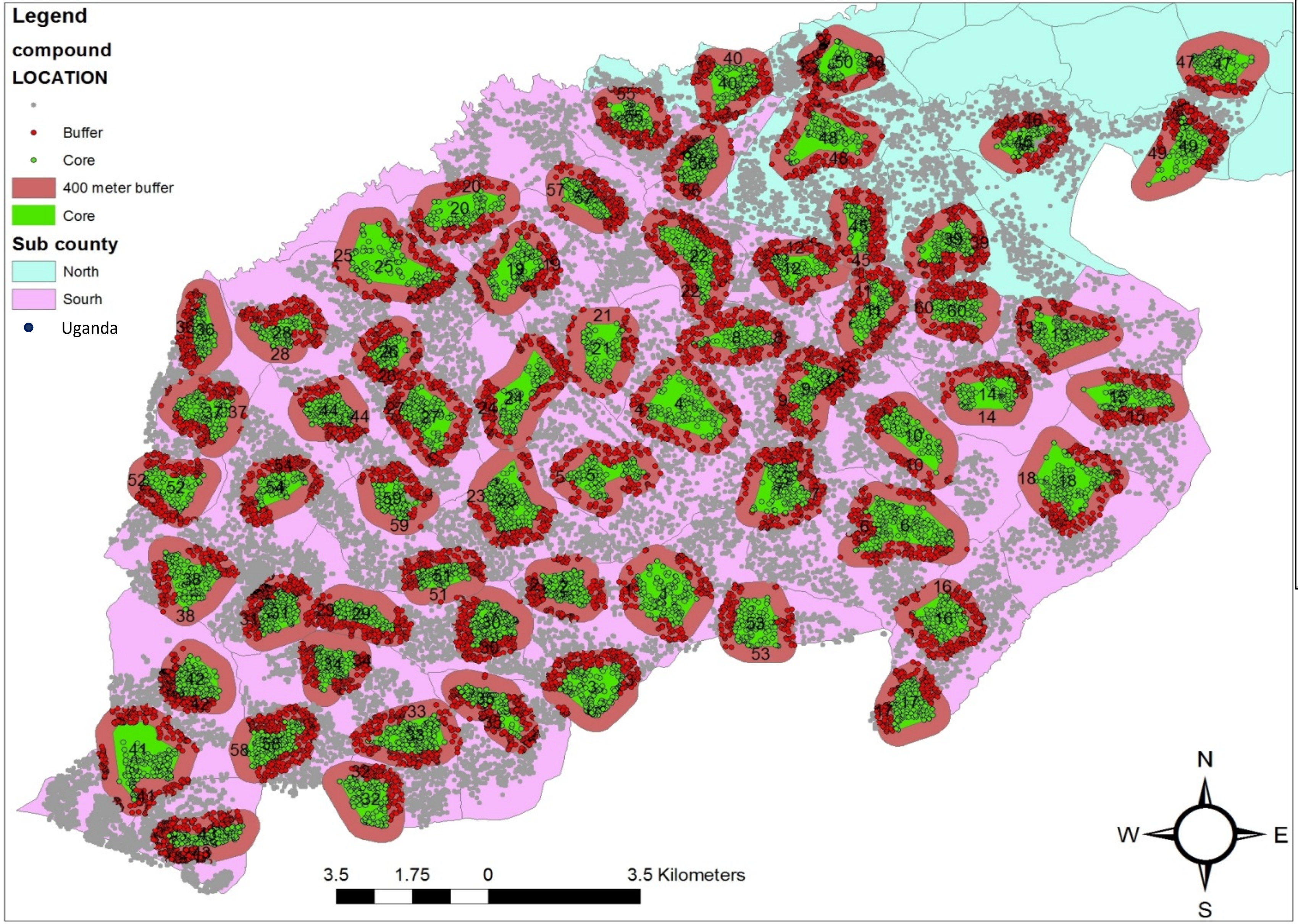
followed 12mo each:

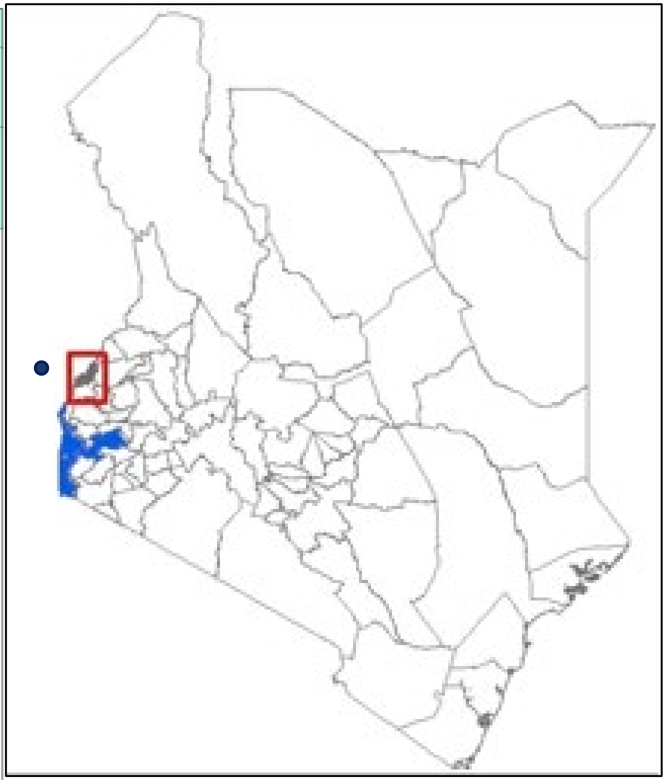
- Sample size of 6120 participants
- 30 Clusters (placebo arm) - + buffer
- 30 Clusters (SR arm) – + buffer



PE in Near_SR cohort in relation to distance to nearest SR home – Diversion / Community Effect

The Study Site





Entomology Collection Techniques

Human Landing Catches

CDC Light trap

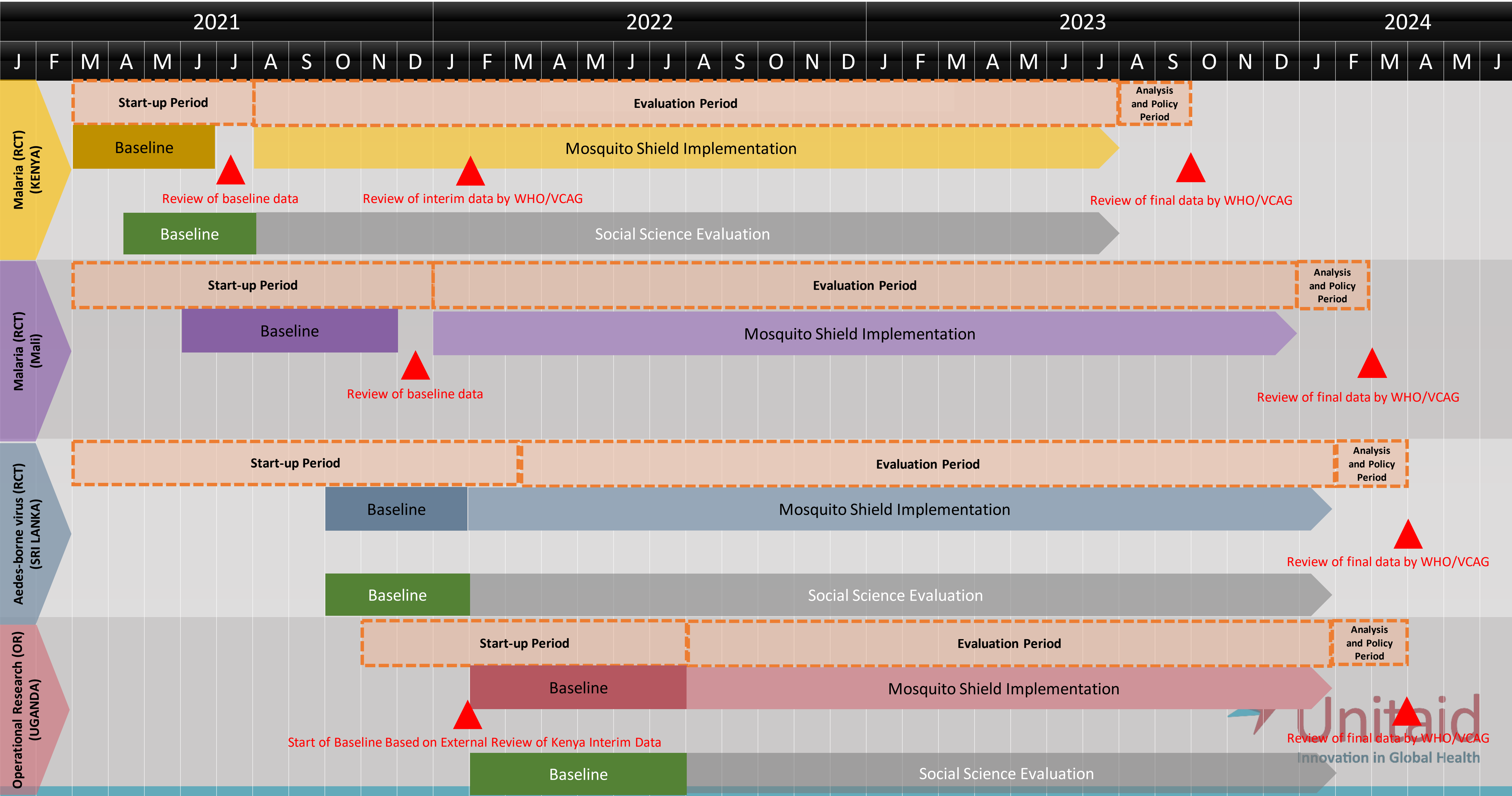
Social Science Studies around SR

- No strategy will be successful if the affected population does not *perceive benefit*, *believe in it* and *adopt it*
  - Retail audit to identify malaria prevention tools available in the local market
  - Free-listing and ranking of malaria prevention products
  - In-depth interviews
  - Observations of night time activities and sleeping patterns
  - Trials of improved practices (TIPs) to better understand participant experiences with and perceptions of SRs
  - key informant interviews (KIIs) with County and National-level stakeholders
- Collaboration with JHU Centre for Communication Programs

Progress so far

- Completed baseline enrolment on 7th April 2021; target was 2040; a total of 110 consented persons failed to show up at the clinic for screening, result is following 1930 participants;
- Conducted two weeks of ento monitoring (CDC LT) in 20 clusters in March 2021;
- Starting consenting of households and measurement of structure sizes on 5th April 2021 for deployment of SRs at start of intervention phase.

TIMELINE PROJECT PLANNING



AEGIS
Advancing Evidence for the Global Implementation of SPATIAL REPELLENTS

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