

ATSB

The development pathway of a new product class

Mathias Mondy | VCWG | April 2021

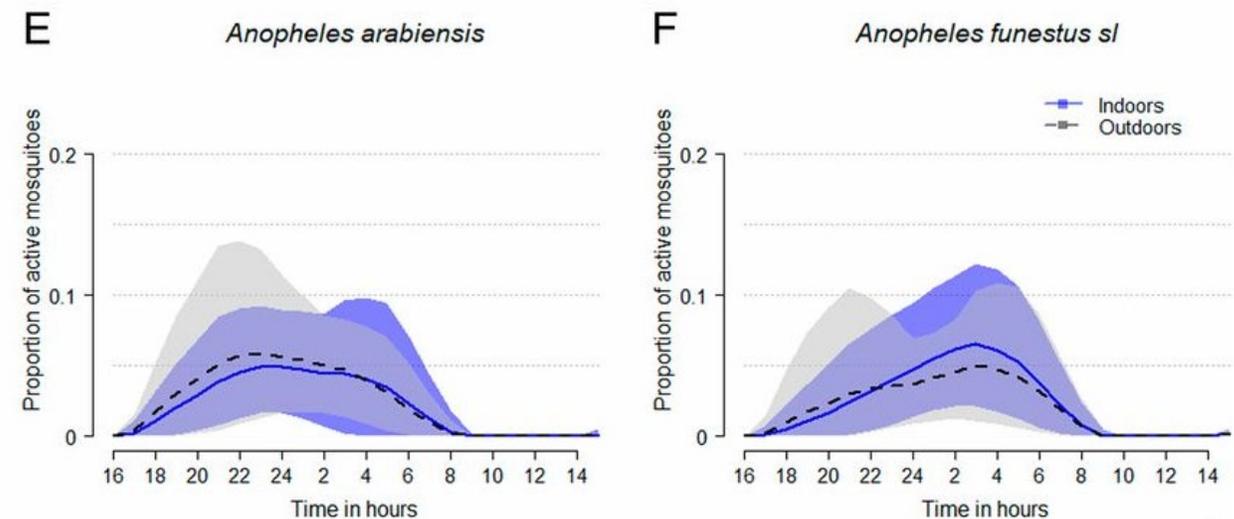
Mosquito feeding behavior and how it influences residual malaria transmission across Africa

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[+ See all authors and affiliations](#)

Abstract

The antimalarial efficacy of the most important vector control interventions—long-lasting insecticidal nets (LLINs) and indoor residual spraying (IRS)—primarily protect against mosquitoes' biting people when they are in bed and indoors. Mosquito bites taken outside of these times contribute to residual transmission which determines the maximum effectiveness of current malaria prevention. The likelihood mosquitoes feed outside the time of day when LLINs and IRS can protect people is poorly understood, and the proportion of bites received outdoors may be higher after prolonged vector control. A systematic review of mosquito and human behavior is used to quantify and estimate the public health impact of outdoor biting across Africa. On average 79% of bites by the major malaria vectors occur during the time when people are in bed. This estimate is substantially lower than previous predictions, with results suggesting a nearly 10% lower proportion of bites taken at the time when people are beneath LLINs since the year 2000. Across Africa, this higher outdoor transmission is predicted to result in an estimated 10.6 million additional malaria cases annually if universal LLIN and IRS coverage was achieved. Higher outdoor biting diminishes the cases of malaria averted by vector control. This reduction in LLIN effectiveness appears to be exacerbated in areas where mosquito populations are resistant to insecticides used in bed nets, but no association was found between physiological resistance and outdoor biting. Substantial spatial heterogeneity in mosquito biting behavior between communities could contribute to differences in effectiveness of malaria control across Africa.



What is ATSB?



How will it be deployed?



2-3 bait stations per eligible structure, at 1.8m high, in protected location for 6 months

The Product Development Challenges



Proof of Concept

Product
Development

Public Health Value
Demonstration

PQ listing and
country registration

Market Uptake

The Product Development Challenges



Proof of Concept

Product Development

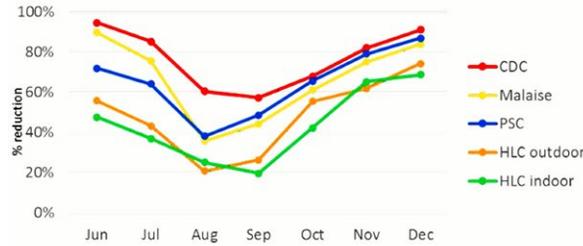
Public Health Value Demonstration

PQ listing and country registration

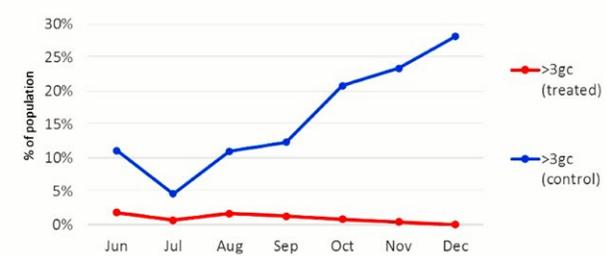
Market Uptake



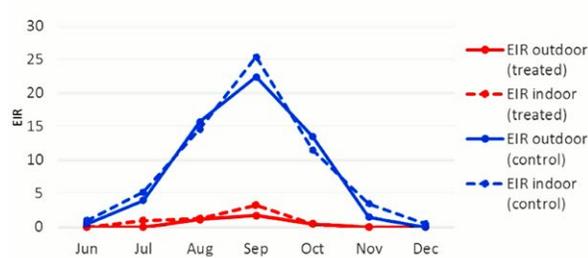
Female anophelines population reduction



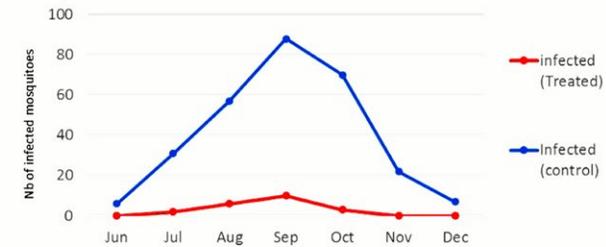
Old anopheline females



EIRs



Sporozoite rates



Traore et al. Malaria Journal 2020

The Product Development Challenges

Proof of Concept

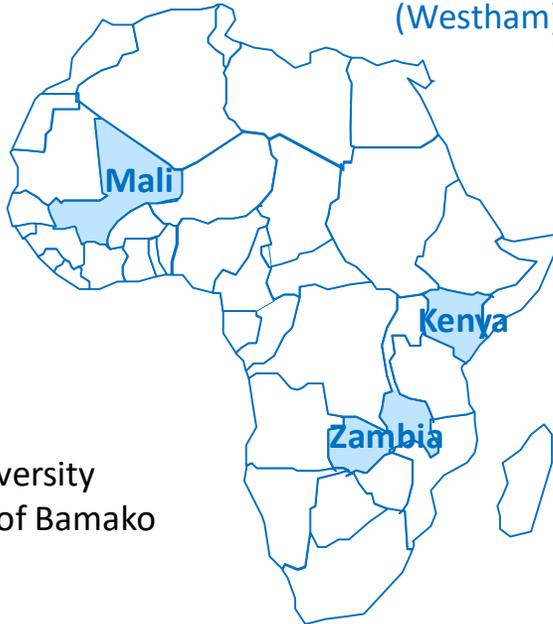
Product Development

Public Health Value Demonstration

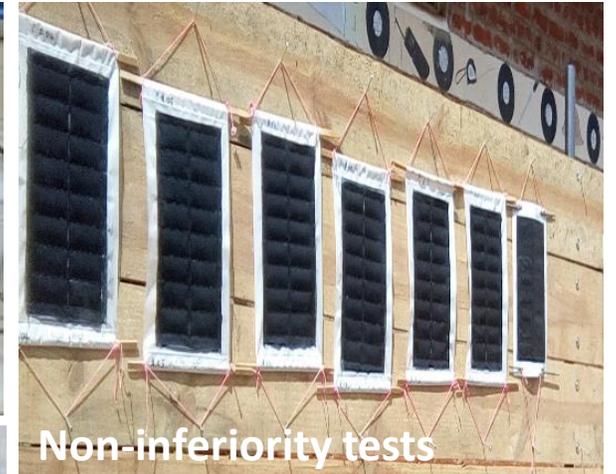
PQ listing and country registration

Market Uptake

UK (LITE) Israel (Westham)



IVCC/LSTM
PATH
LSHTM
Tulane University
University of Bamako
US CDC
KEMRI
Macha Research Trust
Johns Hopkins University
Institute of Molecular Biology and Biotechnology
University of Miami

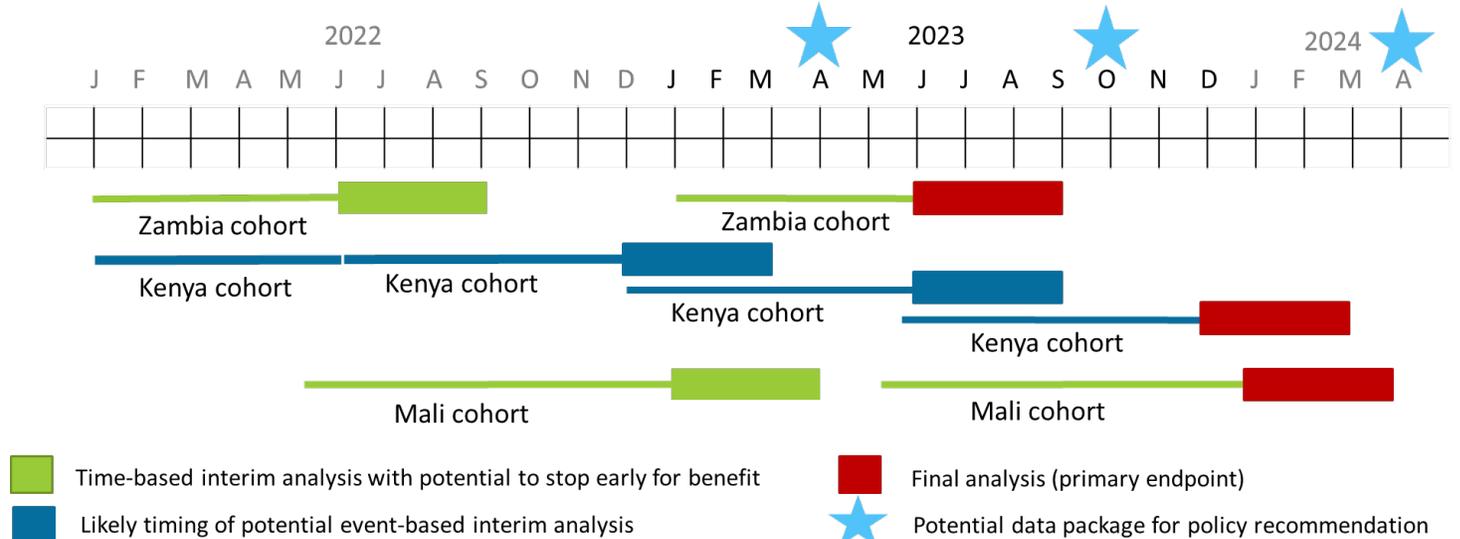
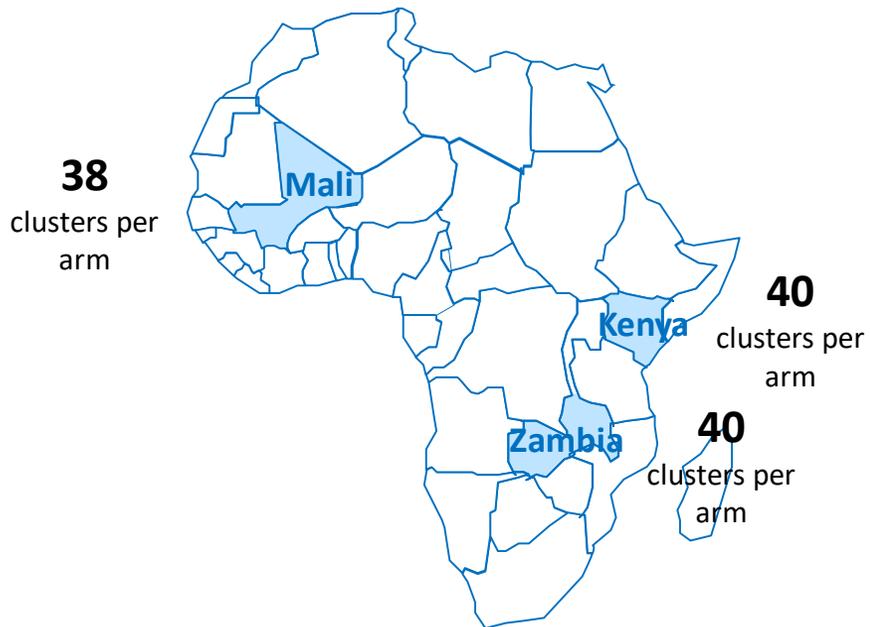


The Product Development Challenges



Open-label two-arm cluster randomized controlled (CRCT) trial design

[ATSB + high vector control coverage (ITN/IRS) versus high vector control coverage (ITN/IRS)]

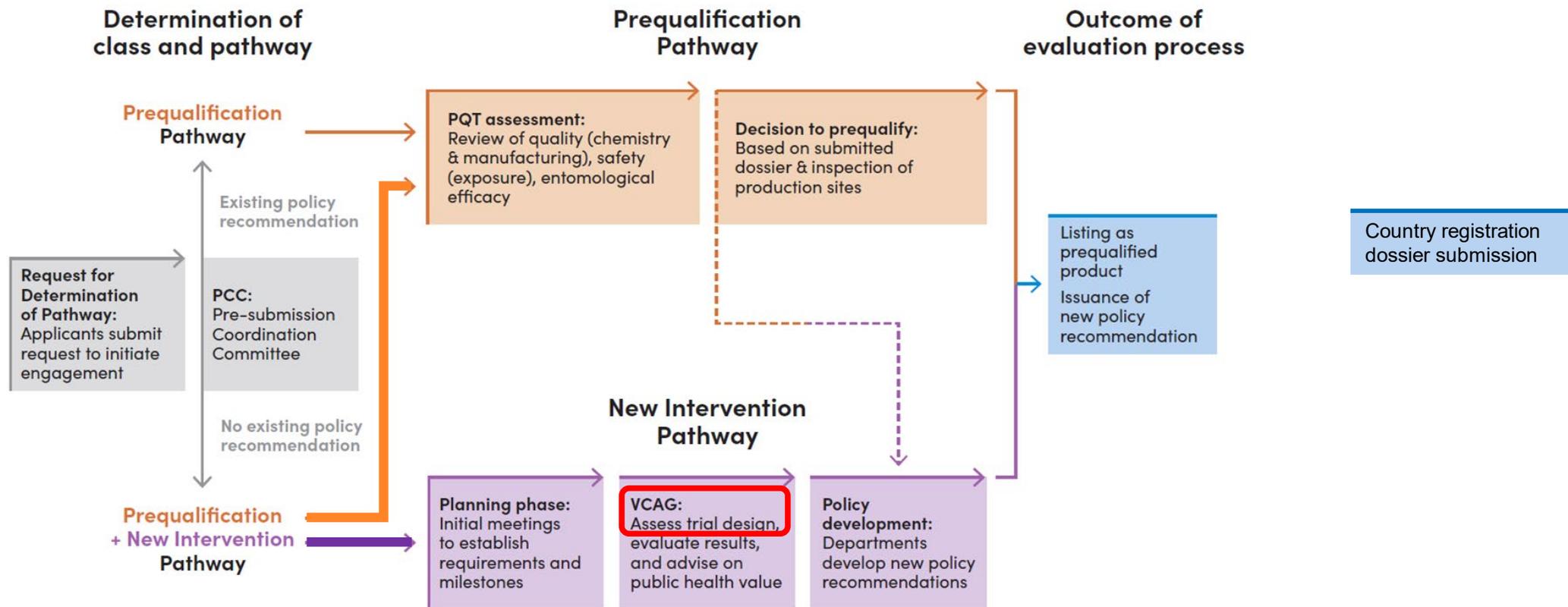


Primary outcome: incidence of malaria clinical cases (fever + positive rapid diagnostic test) measured within cohorts of children age 1-14 (5-14 in Mali). Target reduction: 30% over the time frame necessary to generate sufficient person-time (to achieve 90% power)

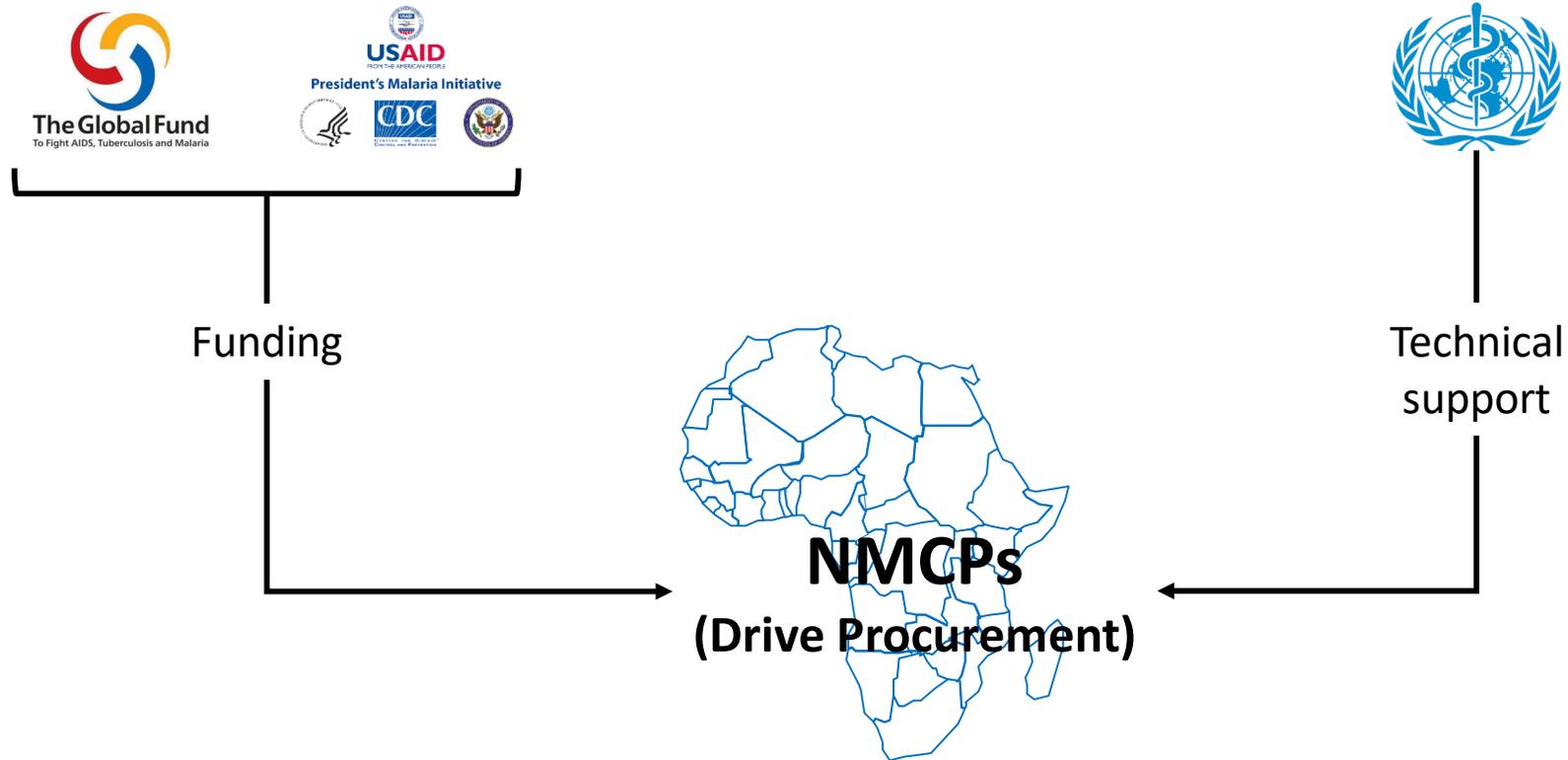
Secondary outcomes: time to first infection assessed among the cohort, prevalence of malaria infection among people age 12 months and older, incidence of passively reported confirmed cases among people of all ages from routine surveillance data, entomological outcomes (age structure, density, sporozoite rate, entomological inoculation rate).

Other measures: durability monitoring, insecticide resistance monitoring, social and behavioral studies (acceptability, barriers to coverage), and economic measures (cost and cost-effectiveness)

The Product Development Challenges



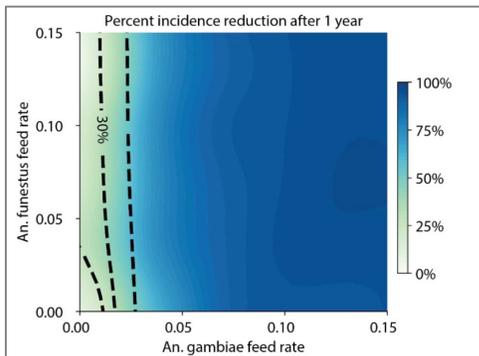
The Product Development Challenges



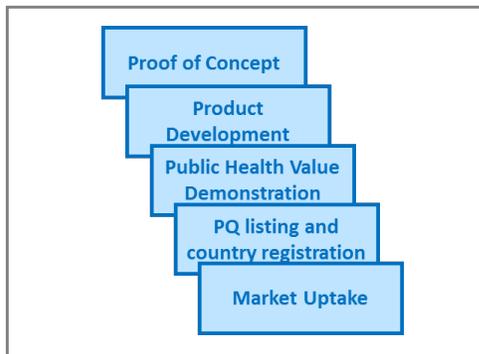
In place for IRS and LLIN... but need to be established for ATSB



This new product class is based on the fact that mosquitoes feed frequently on sugar
ATSBs offer a new and potentially widely applicable control method to reduce malaria transmission, including outdoors



Modelling suggests that even a modest daily feeding/kill rate of 2-3% would translate in a substantial decrease in transmission of malaria burden (at least a minimum of 30% reduction in malaria incidence)



The development pathway of a new product class requires the mobilization of significant resources and expertise to demonstrate Public Health Value, achieve PQ-listing, country registration and market uptake



Developing innovative solutions in vector control



Thank you for your attention

