Revolutionizing vector control for malaria elimination

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The context

Ambitious elimination targets

Important lessons from history

Calls for new tools for an eradication agenda
The problem

- Growing threats to current vector control interventions
- Gaps in the Anopheles control approach
- Dearth of evidence on vector control for malaria program decision-making

Before DDT, malariologists were trained to be problem solvers; after DDT malariologists were trained to be solution implementers

-José Najera, former WHO epidemiologist
Estimating residual transmission

Source: Gething P (2016) Unpublished work
The opportunity

Accelerate progress toward malaria elimination and eradication with innovative and aggressive vector control

The Parker Foundation

- Develop partnerships
- Contribute to a paradigm shift
- Elevate evidence
- Inform decision making
- Demonstrate impact
Research program activities – Phase 1
(June 2015-December 2016)

1. **Systematic review** of the vector control toolbox

2. **Technical analysis** of aerial programs and technologies

3. **Cross-country case study** on mosquito control programs, including delivery systems and tools

4. **Modeling** to improve understanding of factors and interventions that influence malaria transmission

5. **Proposal for a Phase 2** - large-scale demonstration project (2017 and beyond)
1. Systematic literature review

17,963 records identified through database searching, other sources, and reference lists

17,914 total records after removing duplicates

875 records remaining following title and abstract screening

~127 records remaining following full-text eligibility screening

Current step: Data extraction of ~127 records

Next step: Consultation with experts and malaria program managers for "readiness" assessments and to fill evidence gaps

Consolidated evidence base for the vector control toolbox and identified areas for further research
2. Aerial technical analysis

- Ecological parameters for aerial adulticiding and larviciding

- Cost and productivity of technology options

- Opportunities to leverage existing aerial infrastructure in low resource settings

- Opportunities to test the use of unmanned aerial systems (UAS) for aerial insecticide delivery and surveillance
3. Cross-country IVM case studies

Methods:
1. Literature reviews
2. Key informant interviews
3. Direct observation

Robust delivery systems are required to implement new tools and aggressive approaches for *Anopheles* control

- Four country examples of innovative mosquito control programs (Australia, Indonesia, Tanzania, United States)
- Focus on integration, governance, financing, program management, collaboration and coordination, human capital, and M&E
- Synthesize best practices, challenges, and lessons learned that may be transferable to malaria endemic countries targeting elimination
4a. Transmission modeling

Methods:
1. Elaborated feeding cycle model
2. MICRO individual-based simulation model
3. Models to validate individual tools
4b. Geo-spatial modeling

Objective 1. Define and explore patterns of relative decline in SSA

Objective 2.
Understand drivers of residual transmission across SSA
a) Climate-vector interactions
b) Livestock-vector interactions
c) Agriculture-vector interactions

Terrestrial Ecosystems, Livestock Density, and Rice Cultivation (harvested area) datasets

Objective 3. Understand non-intervention drivers of declining transmission at continental level across SSA
5. Develop a Phase 2 proposal
(January 2017 and beyond)

- Large-scale demonstration project
- Multi-site, multi country
- Focus on *approach* to vector control using integrated delivery and tools, rather than a demonstration of individual tools
- Conceptual framework:
  - Target all blood sources
  - Target sugar feeding
  - Target mating
  - Target all life stages
- Outcome is TBD, i.e. epi vs. ento endpoints, reduction in morbidity vs. elimination
- Assess the operational feasibility, including cost-effectiveness, acceptability
- Study design is TBD
The UCSF Global Health Group’s Malaria Elimination Initiative (MEI) accelerates progress towards malaria elimination in countries and regions that are paving the way for global malaria eradication.

www.shrinkingthemalariamap.org