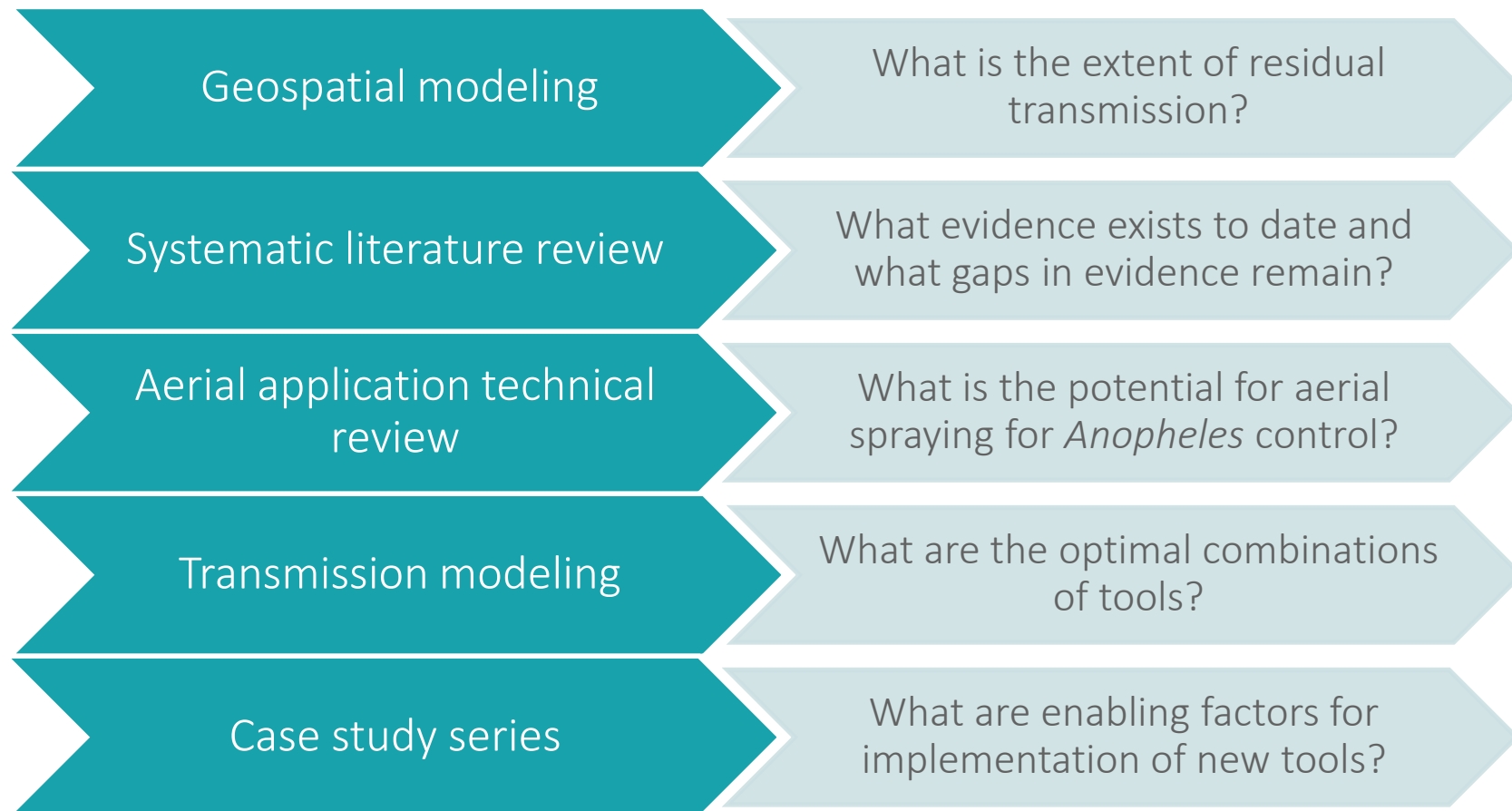




EXPANDING THE VECTOR CONTROL TOOLBOX: GAPS AND OPPORTUNITIES

Allison Tatarsky & Yasmin Williams
University of California, San Francisco
Global Health Group Malaria Elimination Initiative

We set out to understand the gaps in the vector control landscape beyond ITNs and IRS and identify potential solutions to accelerate progress to elimination

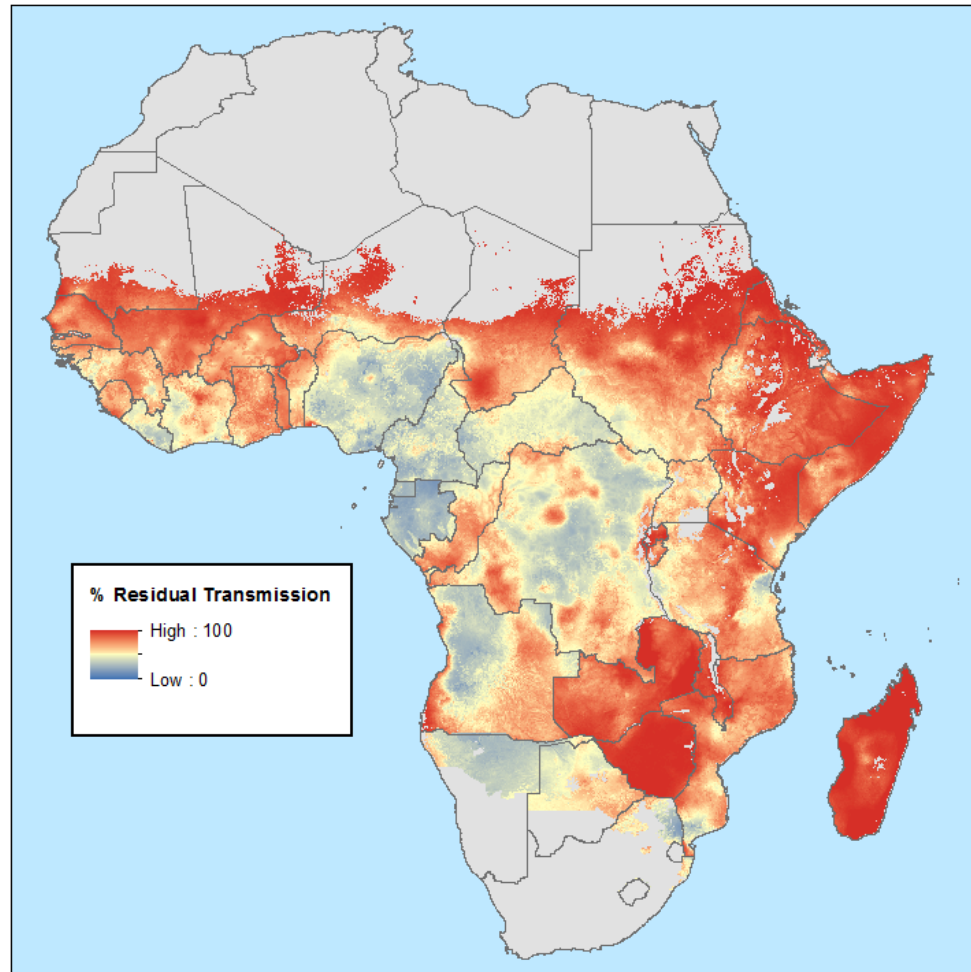


Collaborative effort

THE PARKER FOUNDATION

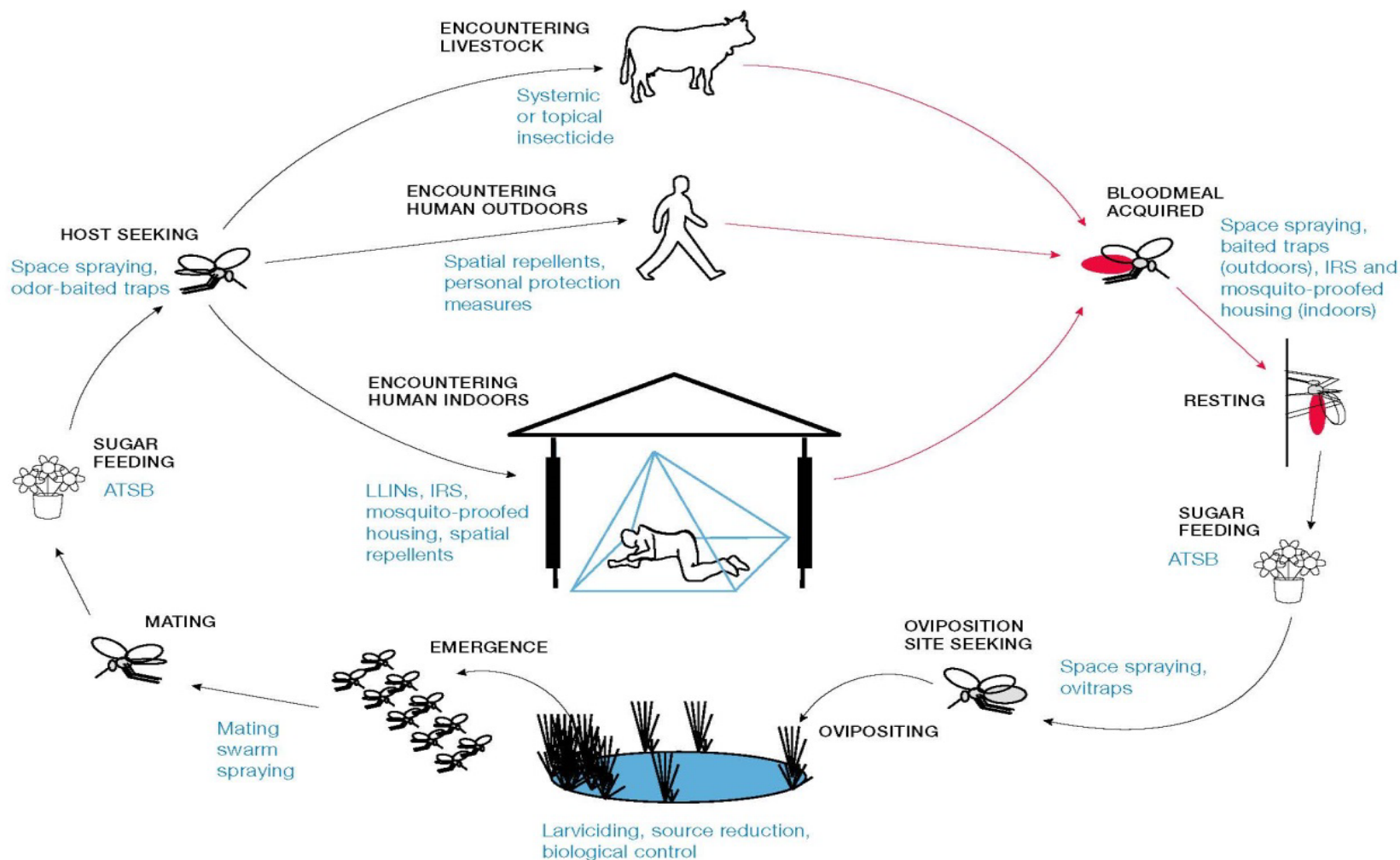


Transmission is estimated to persist even in areas with high bednet coverage in Sub-Saharan Africa



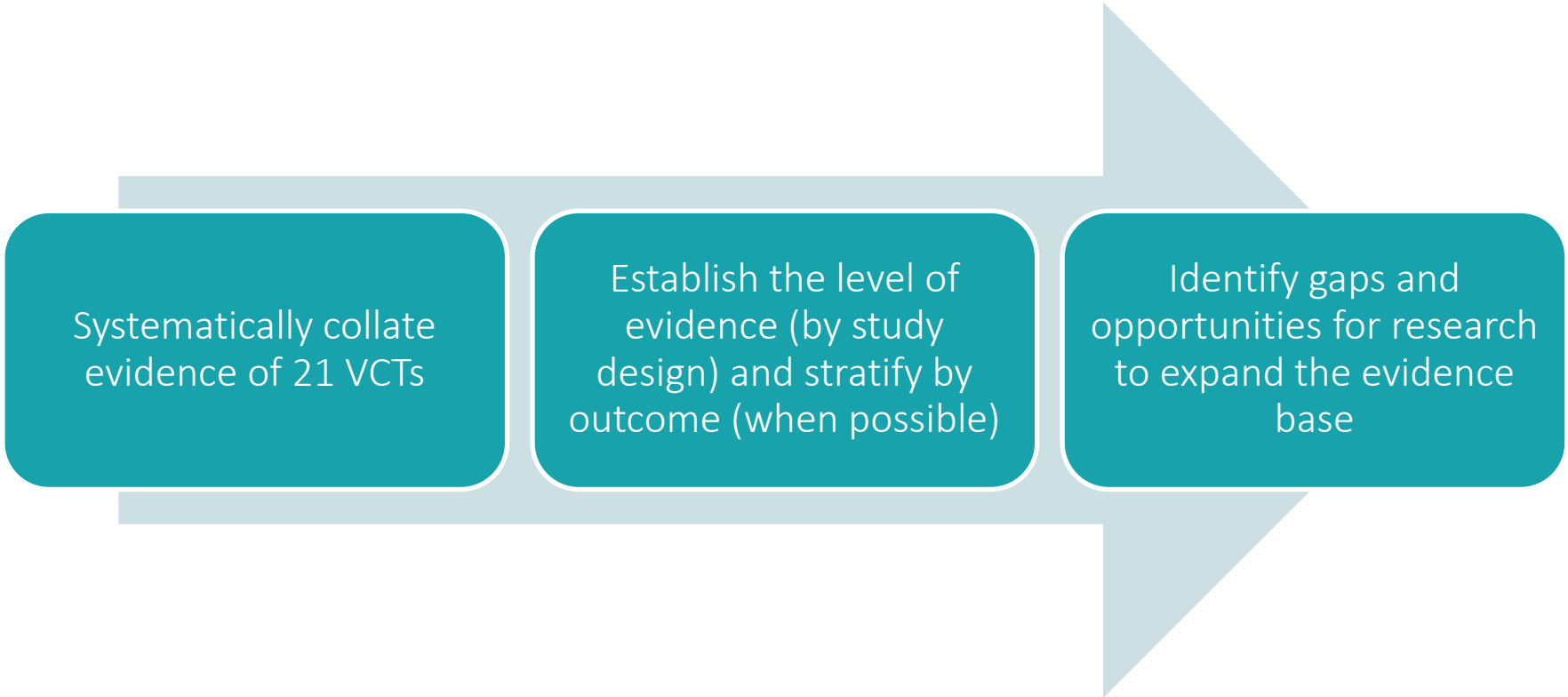
Gething P, et al (2017) In preparation

How can we better leverage the full toolbox of vector control tools and the mosquito lifecycle to address residual transmission?



Landscaping the literature

Objective: To identify options for expanding the malaria vector control toolbox to supplement ITNs and IRS, we conducted a systematic review of the availability and quality of the evidence for 21 malaria VCTs, excluding ITNs and IRS.

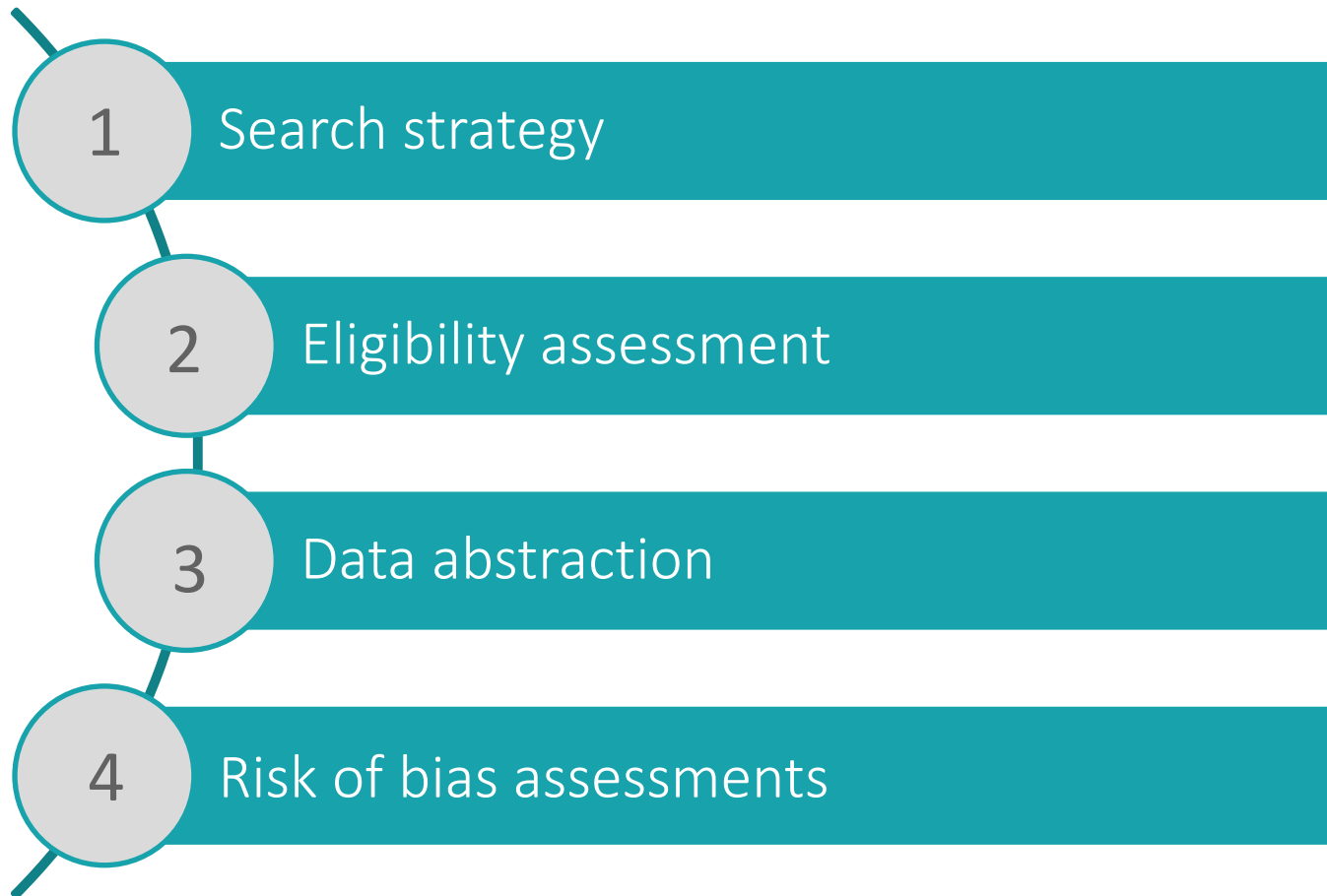


Systematically collate
evidence of 21 VCTs

Establish the level of
evidence (by study
design) and stratify by
outcome (when possible)

Identify gaps and
opportunities for research
to expand the evidence
base

Systematic literature review methods



Inclusion criteria

Study designs

- **Systematic reviews**
- **Experimental studies:** Phase III (RCTs, CBA, COS, ITS), Phase II (small-scale, semi-field, experimental hut), and Phase I laboratory
- **Observational studies:** case-control, cohort, and cross-sectional studies

Outcomes

- **Primary:**
 - Incidence of confirmed clinical malaria
 - Parasite prevalence
 - Entomological inoculation rate (EIR)
 - Human biting rate (HBR)
 - Density measures other than the HBR
- **Secondary:**
 - Adult mosquito fecundity or fitness, adult emergence rates, knockdown post-exposure, and blood-feeding inhibition

Search results

17,912 abstracts identified through electronic database and hand searches

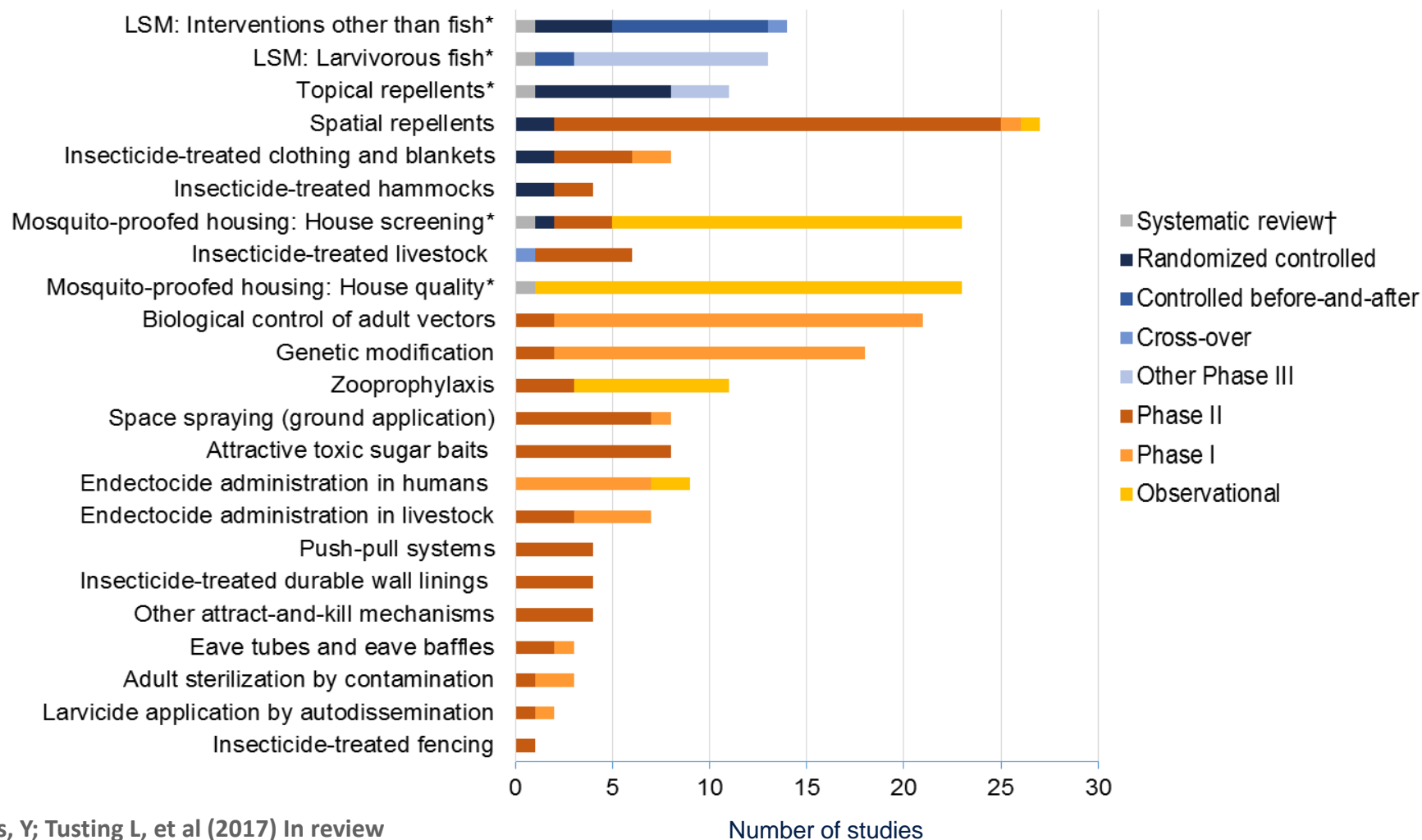


847 full-texts assessed for eligibility



155 studies eligible for inclusion in the qualitative synthesis

Across 21 vector control tools, only 7 have gone through a Phase III evaluation



Williams, Y; Tusting L, et al (2017) In review

Number of studies

We also explored alternative application methods including aerial spraying

	Number of spray aircraft available on continent
Africa	200
South America	3,800
Asia-Pacific / Australia	1,400



Fleet for Tsetse fly control (adulticiding) in Africa



Aerial larviciding by fixed-wing aircraft in Brazil

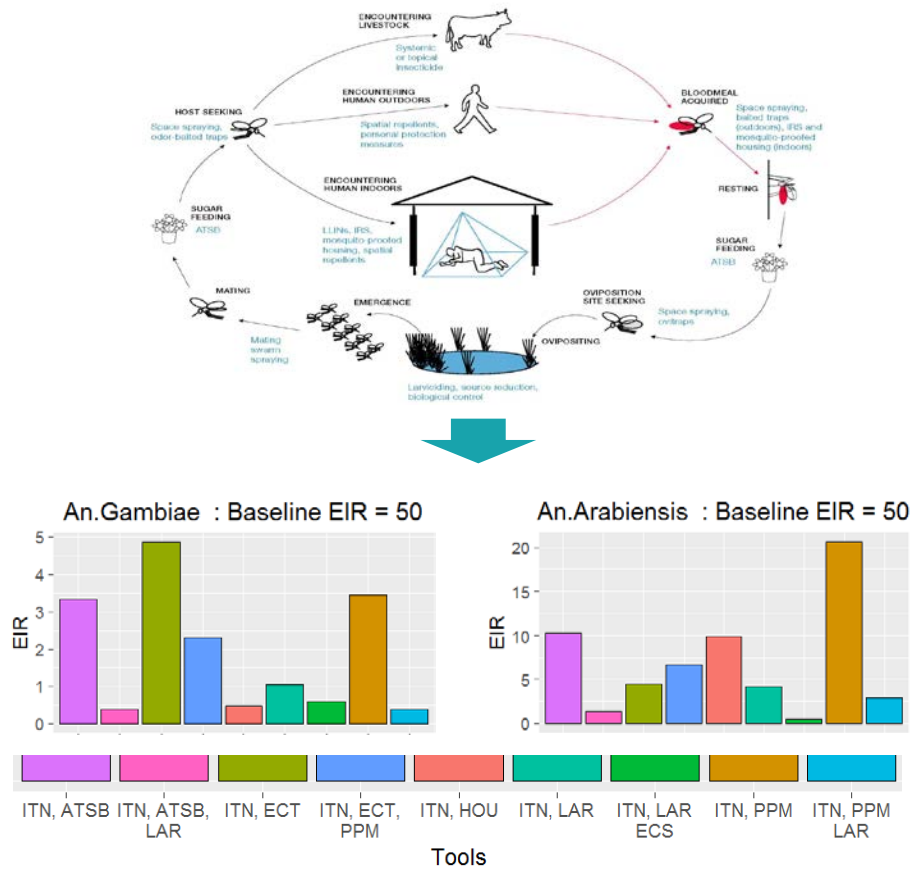


Aerial larviciding by helicopter in West Africa to control blackflies for onchocerciasis

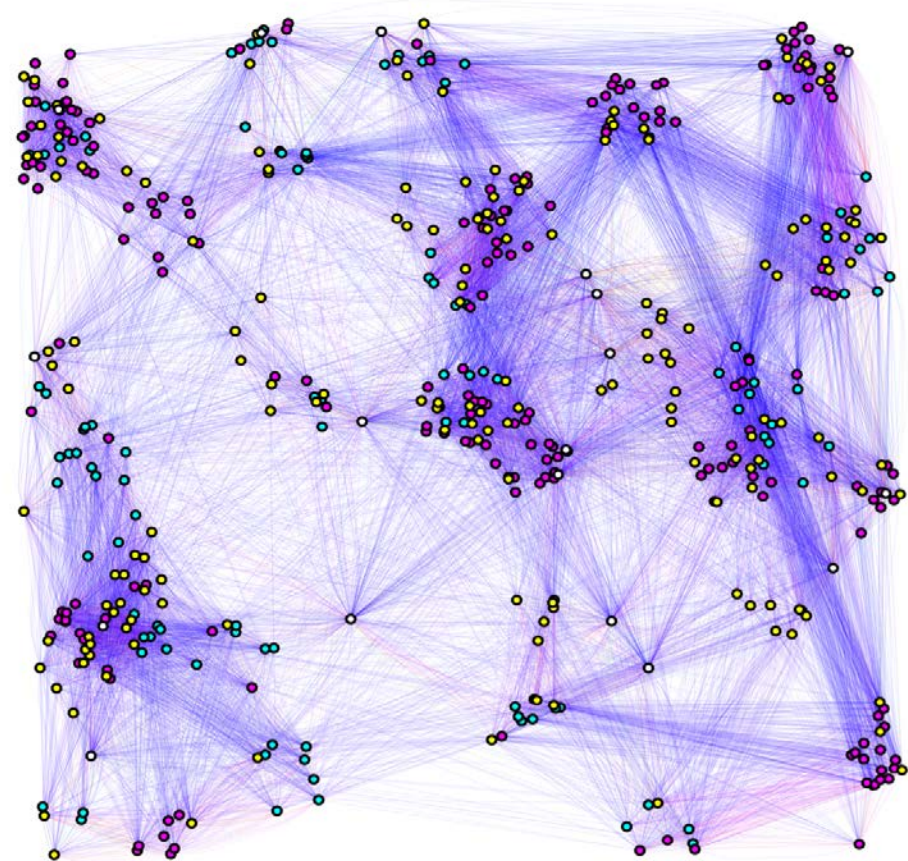


Yamaha R-Max, UAV for agricultural use

Transmission models are under development to estimate optimal intervention packages and design field tests



Vector Control Optimization Model (VCOM); Kiware, S. et al (2017)
In preparation



Modular Analysis and Simulation for human Health (MASH) model; Smith, D. et al (2017) In preparation

The right tools at the right time in the right place ultimately hinges on the readiness of the system

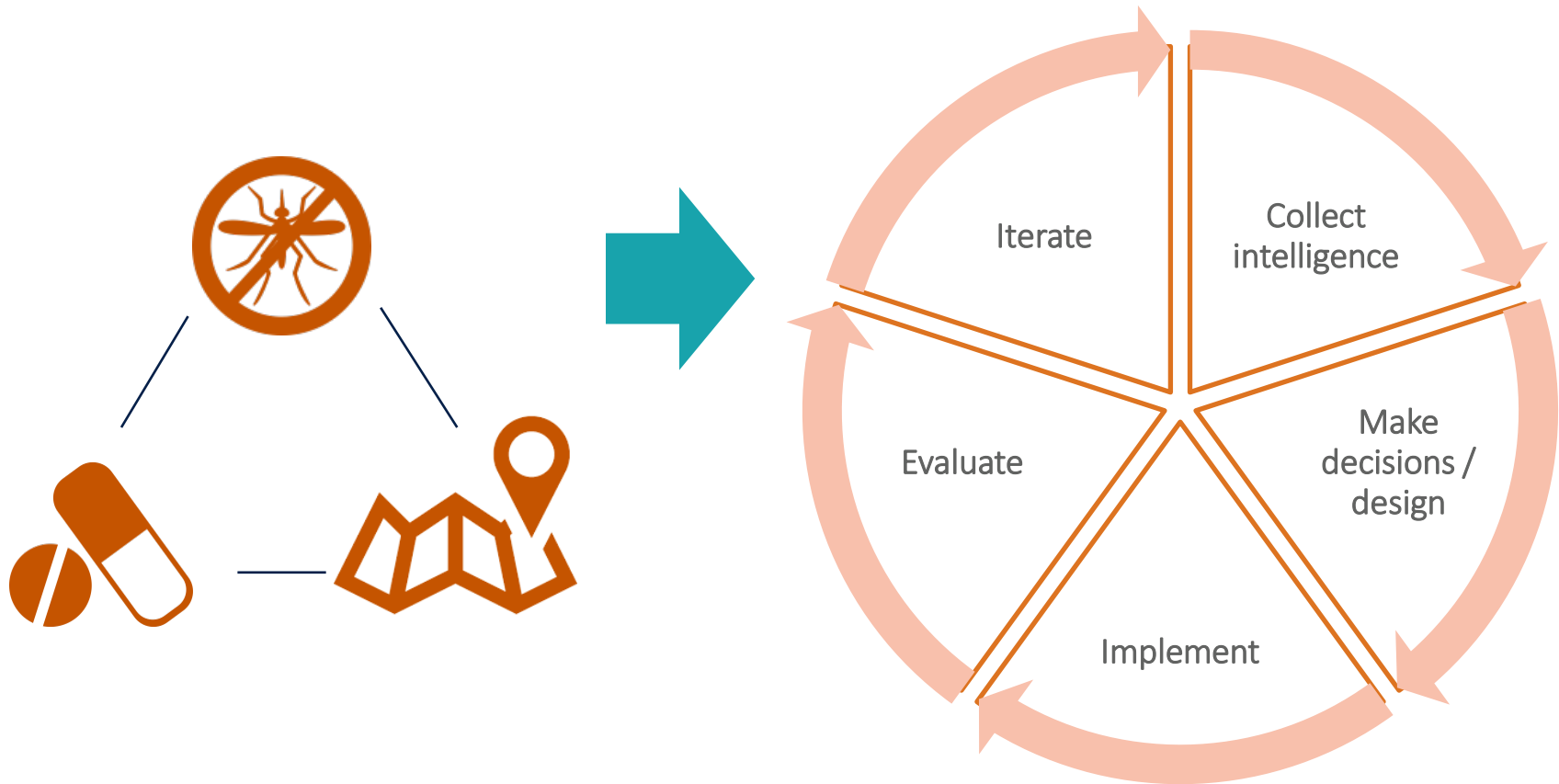
Best practices from case study series across the U.S., Australia, and malaria endemic countries:

- Entomological and operational capacity
- Entomological intelligence linked with spatial, epidemiological, and cost data
- Evidence-based and decentralized decision making
- Sustainable financing, often domestic
- Meaningful community engagement
- Strong leadership and management at all levels
- Link with research institutions

Ongoing development of shortlist of “ready” tools with potential for impact

VCT shortlist based on “readiness” and potential for impact	Readiness for learning-by-doing	Target mosquito life stage		Target blood feeding preference		Target biting and resting behavior		Interest by programs surveyed?	Long-lasting intervention?
	 = now  = 1-2 years	Immature	Adult	Human	Animal	Indoor	Outdoor	 = yes  = in use (small scale)	
Environmental management		✓		✓	✓	✓	✓	 	✓
Larviciding (manual and aerial application)		✓		✓	✓	✓	✓	 	
Mosquito-proofed housing			✓	✓		✓		 	✓
Attract-and-kill not based on sugar			✓	✓	✓	✓	✓		
Attractive toxic sugar baits			✓	✓	✓	✓	✓		
Insecticide treated hammocks			✓	✓			✓		
Livestock endectocides			✓		✓	✓	✓		
Space spray (ground-based and aerial)			✓	✓	✓	✓	✓		
Spatial repellents			✓	✓	✓	✓	✓		

How can we move beyond traditional research and explore a “learning-by-doing” approach



Opportunities for consideration by the RBM VCWG New Tools New Challenges workstream

- Develop a learning-by-doing research agenda on emerging novel vector control tools
 - Answer feasibility, scale, and cost-effectiveness questions
 - Test intervention packages, including drug-based strategies
 - Leverage new technology to strengthen vector surveillance for improved targeting, monitoring, and strategy iteration
 - Develop standardized indicators for evaluation of new tools
- Track studies on new tools

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A background image of a dirt road winding through a rural landscape with trees and vegetation. The road is light brown and curves to the right. The surrounding area is green with various plants and trees. The sky is a pale blue.

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.

<http://www.shrinkingthemalariamap.org/what-we-do/vector-control>