

Supporting *Accelerate to Zero*: The BMGF Malaria Vector Control Research Agenda

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A 25+ year arc to achieve our ambitious eradication goal

A world free of malaria

...in 5 yrs

Stage set for adoption of global eradication agenda:

- New drug and vector interventions needed to accomplish Pf and Pv elimination available and approved for use
- Foundation Accelerate to Zero strategies are proven to achieve elimination
- Global community mobilized around a common eradication goal
- Delivery of current interventions with new strategies optimized

...in 6-15 yrs

Eradication effort gathering momentum:

- New vaccine and vector suppression interventions to complete elimination available and approved for use in some settings
- Global leadership, financing, and policies needed to advance eradication galvanized
- Evidence from technical and operational feasibility studies of delivery models incorporated into or used to inform approved delivery policies

...in 15-25 yrs

Eradication efforts rolled out everywhere:

- Proven tools & delivery models deployed at scale in all endemic countries
- Financing and policy in place for sustained deployment of eradication effort
- Any additional interventions needed in global last mile settings developed and deployed

...in 25+ yrs

Eradication achieved:

- Global Pf and Pv prevalence reduced to 0

A High Level Strategy to Eradicate Malaria

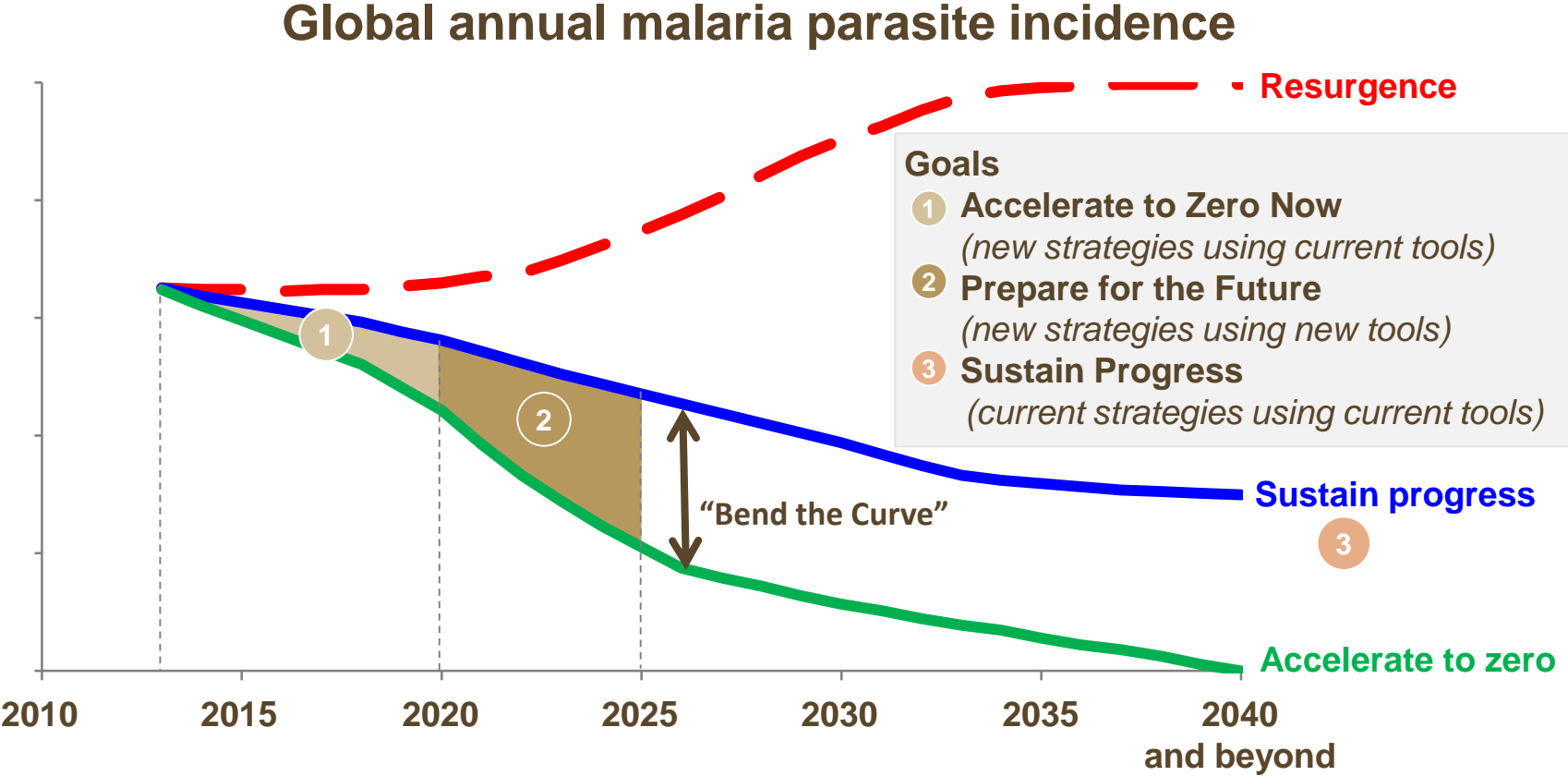
- 1) Detect the parasite
- 2) Eliminate the parasite from its reservoir
- 3) Prevent transmission of the parasite

Assumptions:

- New tools (Dx, Rx, Vx, Ix) and operational guidance are needed
- No single tool or activity by itself is the solution- **history tells us this!**
- Effective coordination/integration of these activities will be required to eradicate malaria
- Elimination of malaria will proceed in a geographic progression; management of re-infestation crucial if eradication is to be achieved

The world has three potential future trajectories for malaria...

...in our strategy, we have chosen to '*Accelerate to Zero*', which leads to three overarching goals for the period (2015-2020)



ROLE OF VECTOR CONTROL IN MALARIA ERADICATION

Vector control plays a critical role as part of the Prevent Transmission initiative and in the overall *Accelerate to Zero* strategy for malaria eradication

	Critical Role of Vector Control in Accelerate to Zero	Key Prevent Transmission Questions to Address
Accelerate to Zero Now	<ul style="list-style-type: none">▪ Provide direct support to malaria elimination in 2020 goals countries▪ Identify other prevent transmission scenarios where elimination is feasible based on current tools and approaches	<ul style="list-style-type: none">▪ What new tools, information, and organization are required to achieve elimination in 2020 priority countries?
Prepare for the Future	<ul style="list-style-type: none">▪ Develop tools, information, and organization that enable the ability to prevent transmission throughout the range of malaria	<ul style="list-style-type: none">▪ What tools, information, and organization are required to prevent transmission throughout the range of malaria parasites?
Sustain Gains	<ul style="list-style-type: none">▪ Reduce the environmental transmission potential to prevent reintroduction and be prepared to respond to outbreaks	<ul style="list-style-type: none">▪ What are best practices that limit vector production area wide and how can communities sustain targeted response to outbreaks

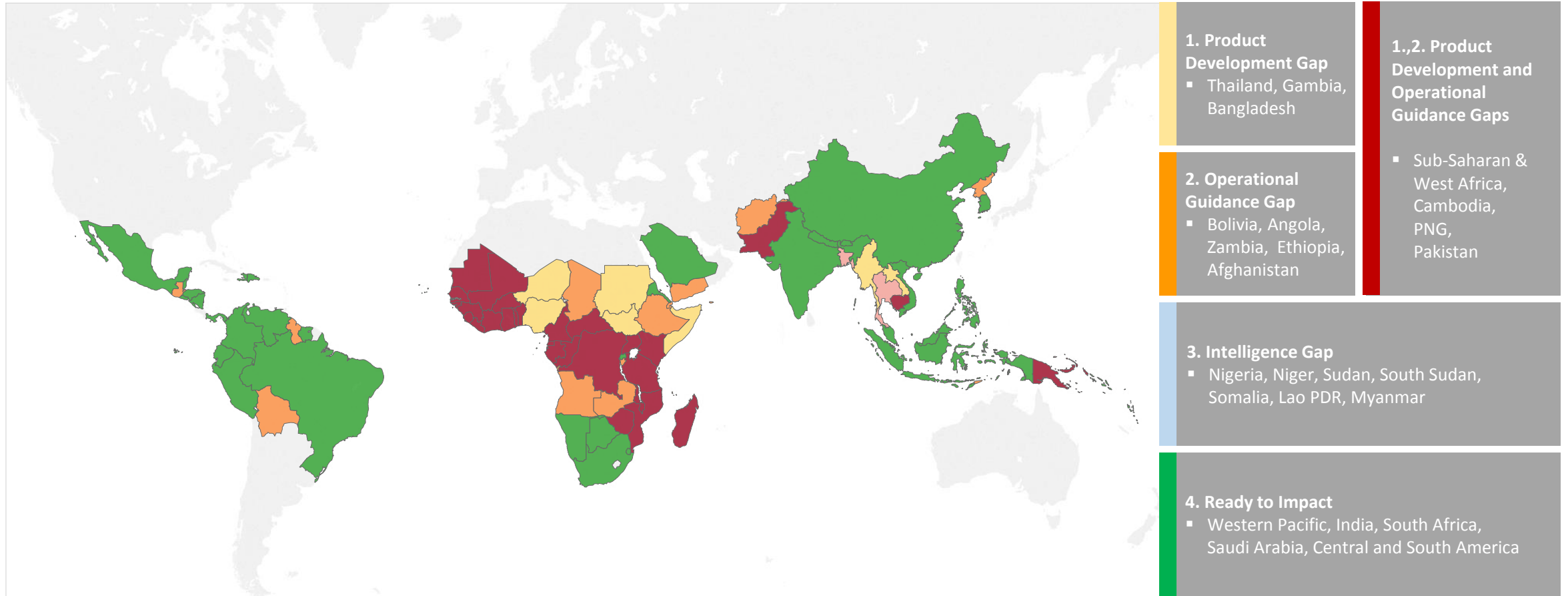
2015-2020 VECTOR CONTROL PRIORITIES

Four priorities for action based on adequacy of available interventions in different prevent transmission scenarios, adequacy of vector control management for elimination, and known knowledge gaps

		Accelerate to Zero Now	Prepare for the Future	Sustain Gains
1. Product Development and Supply	<ul style="list-style-type: none"> Prevent Transmission situation requires an intervention that we do not currently have Vector Control team will develop, help license and help commercialize a new product meeting the Prevent Transmission situation TPP 	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
2. Operational Guidance	<ul style="list-style-type: none"> Operational practice for a Prevent Transmission situation is not fit-for-purpose Vector Control team will identify best practice and work with Eliminate and Mobilize to enable adoption by WHO and other partners of needed operational guidance 	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
3. Intelligence Gaps	<ul style="list-style-type: none"> Intervention and operational practices needs for Prevent Transmission situation are unknown or uncertain Vector Control team will fill intelligence gaps through funding of targeted research work 	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
4. Ready to Impact	<ul style="list-style-type: none"> Needed interventions and fit-for-purpose operational practices are available for Prevent Transmission situation Vector Control team will work with Eliminate Initiative team to implement now in target geographies 	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

CURRENT SITUATION ASSESSMENT VS. PRIORITIES

A significant number of countries are at Ready to Impact. However, many 2020 goal countries have product development, operational guidance or intelligence gaps



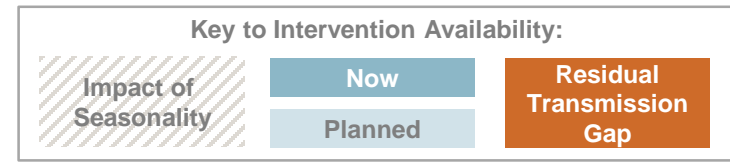
● Not Malaria endemic

PROPOSED APPROACH TO VECTOR SUPPRESSION

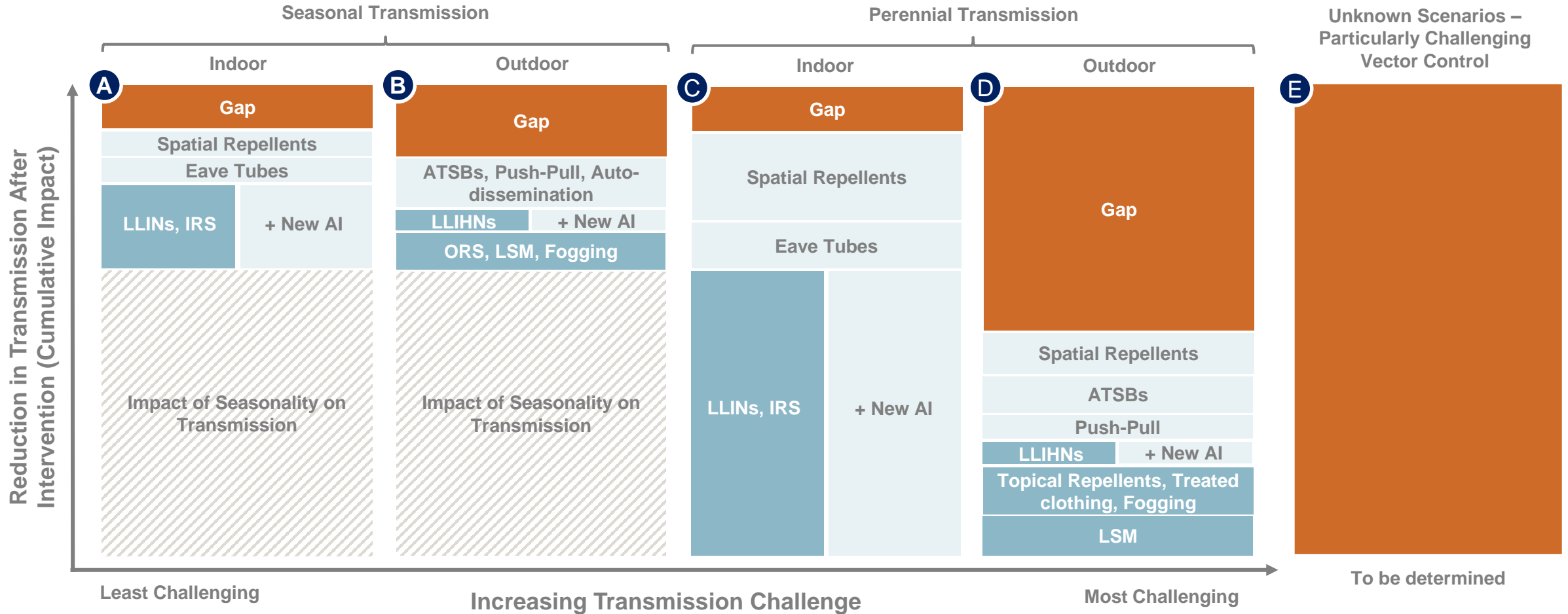
Interventions can prevent vector contact, suppress vector populations and reduce vector transmission capacity to improve the technical and operational feasibility of elimination efforts and sustain gains through eradication

		A. Improve Technical Feasibility	B. Improve Operational Feasibility	C. Sustain Donor/ Country Affordability	
1	Prevent Contact Between Humans and Malaria Vectors	e.g. spatial repellents that protect all the occupants of a home	e.g. apply user-centric design to empower the individual	e.g. develop evidence base to make policy that allows donor support	
2	Suppress Vector Populations	e.g. new insecticide active ingredients to combat insecticide resistance	e.g. manage use of new insecticides to avoid creation of resistance	e.g. make integrated vector management part of intervention package to target more expensive products	
3	Reduce the Capacity of Vectors to Transmit Malaria Parasites to Humans	e.g. reduce vector populations through environmental management	e.g. apply best practices to construction and road building	e.g. include best practices in integrated vector management plans	

REQUIREMENT ANALYSIS



We will bring to market vector control tools and invest in product development for new interventions to meet remaining gaps in the most challenging epidemiological situations



PRODUCT DEVELOPMENT NEEDS ANALYSIS *(in progress)*

Status	Intervention	Estimated Time to Market (TTM) (years)	Probability of Regulatory and Technical Success (PRTS)	Total BMGF Development Cost	Delivery Costs (per person per year of protection)	Scenario			
						A	B	C	D
Available	LLINs	-	-	-	\$1.00	●	●	●	●
	LLIHNs	-	-	-	\$2.00	●	●	●	●
	LSM	-	-	-	\$4.00	●	●	●	●
	Outdoor Barrier Sprays	-	-	-	\$4.00	●	●	●	●
	Targeted IRS	-	-	-	\$4.00	●	●	●	●
	Outdoor Spraying	-	-	-	\$8.55	●	●	●	●
	Indoor Aerosols	-	-	-	\$23.00	●	●	●	●
	Insecticide-Treated Clothing	-	-	-	\$25.00	●	●	●	●
	Topical Repellents	-	-	-	\$90.00	●	●	●	●
	Indoor Coils	-	-	-	\$150.00	●	●	●	●
In development	Auto-dissemination	3	50%	\$10M	\$5.00	●	●	●	●
	Push-Pull	5	90%	\$2M	\$2.00	●	●	●	●
	Spatial Repellents	5	90%	\$36M	\$1.30	●	●	●	●
	ATSBs	5	80%	\$14M	\$0.50	●	●	●	●
	Eave Tubes	5	80%	\$10M	\$2.00	●	●	●	●
	New AIs	10	85%	\$280M	\$4.00	●	●	●	●
	HEGs/gene drive	10	25%	\$120M	\$0.10	●	●	●	●

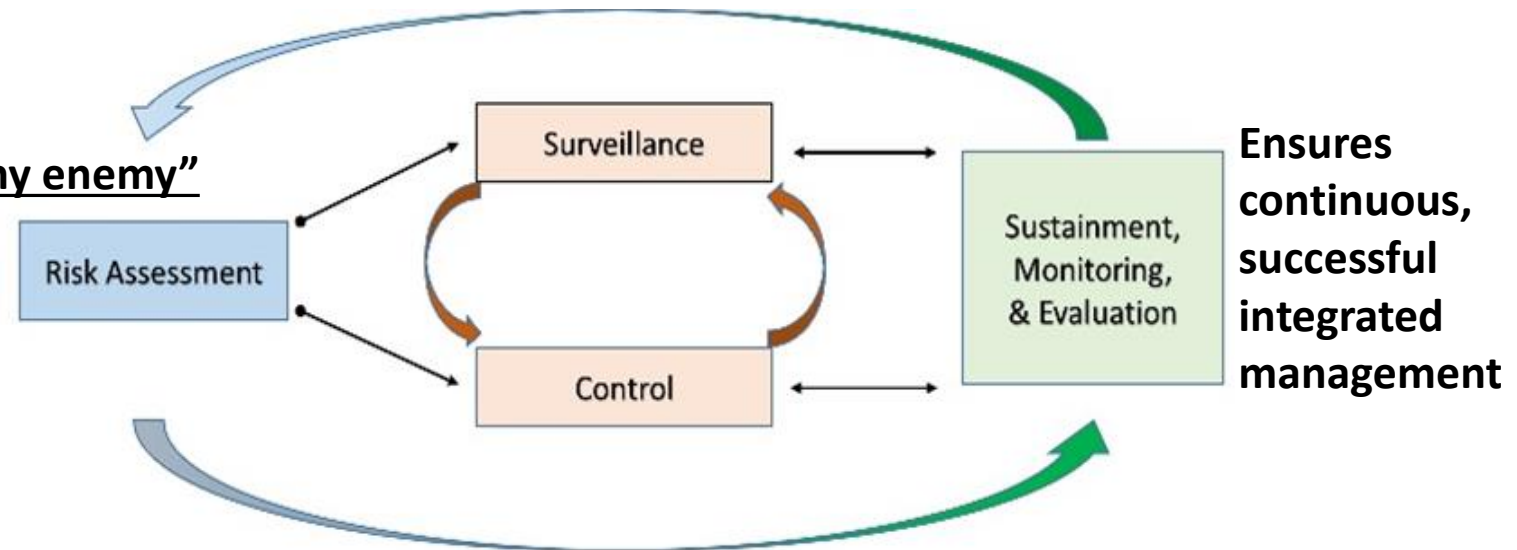
EVIDENCE-BASED VECTOR SUPPRESSION

Entomological and Environmental Monitoring Activities:

- Vector identification/abundance measures
- Pathogen and insecticide resistance detection
- Correlates: environmental variables; allows for ecological niche modelling
 - **Climate data**

First Step: "Know thy enemy"

- Identification
- Distribution
- Behavior
- Bionomics
- Epidemiology



Suppression measures taken to prevent pathogen transmission by a vector

- Source reduction (environmental management/engineering)
- Biological control (Bti, larvivorous fish, copepods)
- Chemical control (LLINs, IRS, ULV sprays, repellents)
- Genetic control (HEGs, RIDL, other GM approaches)

Grand Challenges in Global Health



TOPIC:

Surveillance Tools, Diagnostics and an Artificial Diet to Support New Approaches to Vector Control

TOPIC:

New Approaches for Addressing Outdoor/Residual Malaria Transmission

<http://gcgh.grandchallenges.org/>

THANK YOU!

- **Dr. Mary Hayden**
- **National Center for Atmospheric Research**
- **Fellow workshop participants**

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VECTOR CONTROL
SUB-INITIATIVE

PREVENT TRANSMISSION
INITIATIVE

ELIMINATE
INITIATIVE

MOBILIZE
INITIATIVE

SURVEILLANCE
SUB-INITIATIVE

BUSINESS
TEAM

THE MALARIA TEAM PREVENT TRANSMISSION VECTOR CONTROL SUB-INITIATIVE
PRESENTS

Vectorpocalypse Now

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