

# **CDC and HaMEC Update**

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# Background: Malaria on Hispaniola

- ❑ **Hispaniola is the only Caribbean island where malaria remains a significant public health problem; Haiti bears the burden with >95% of the cases on the island**
  - Haiti reported 25,423 confirmed cases, estimated 130,000 cases (PAHO, 2012\*)
  - Dominican Republic reported 952 confirmed cases, estimated 1,300 cases (PAHO, 2012\*)
- ❑ **In 2009 Haiti and the Dominican Republic proposed a binational plan for malaria elimination from Hispaniola**
  - Estimated cost of \$194M over 10 years to reach malaria elimination by 2020
  - Binational coordination of malaria program plans, technical protocols, research activities, and surveillance system

# Background: Malaria Funding for Hispaniola

## ❑ Global Fund malaria grants

### ▪ Haiti

- Round 8: \$36.8M for 2011-15;
  - Phase 1 emphasis on LLINs and vector control
  - Phase 2 emphasis on RDTs
- New Funding Model (NFM) for 2014 -16: \$25.6M
  - \$15.6M is new for this period, \$10M remains from Phase 2
  - NFM emphasis on program orientation towards pre-elimination

### ▪ DR

- Round 8: \$7.4M for 2009-13 for targeted active surveillance, dx/tx, and targeted vector control
- No longer eligible for single-country grants

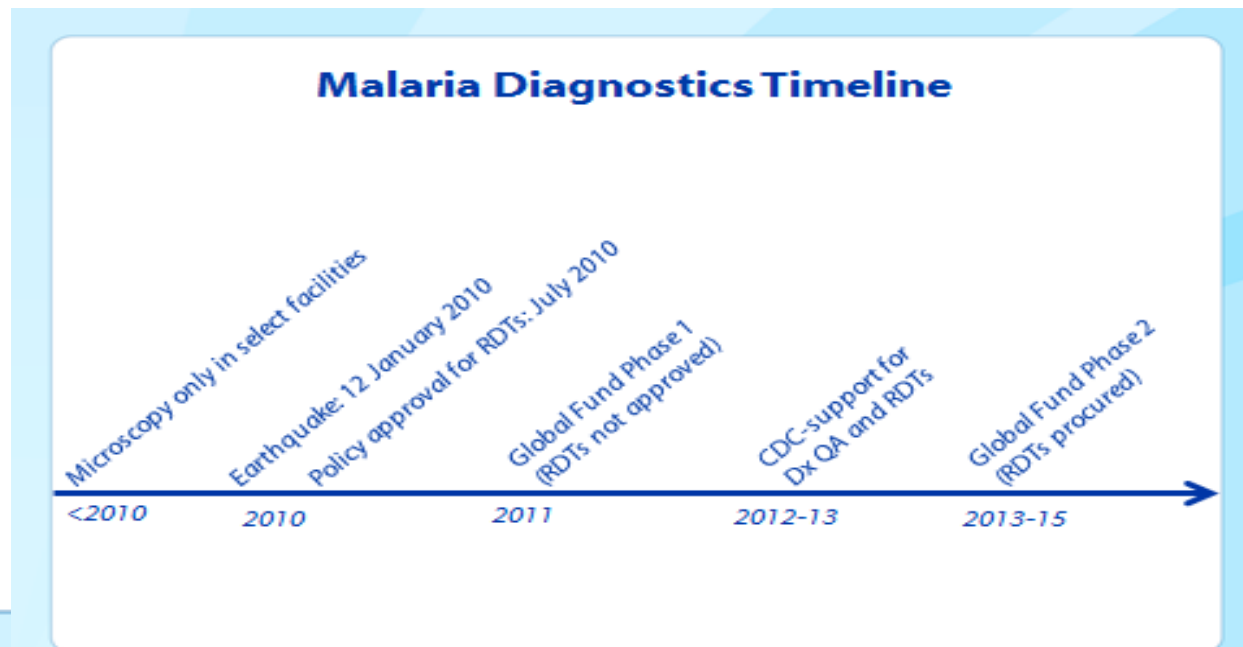
- ## ❑ Other donor malaria funding: CDC \$5.5M for 2011-15 for Haiti; **Global Fund** regional malaria elimination initiative (EMMIE) provide \$200K starter funds for each country and additional funds TBD until 2016; **CHAI/BMGF** grant for TA to Haiti ~\$337K for 2014-15

# CDC Malaria Support – Hispaniola (1)

Provide technical assistance to the MSPP and for GF activities to establish platform for malaria elimination:

## 1. Diagnostics

- Introduction and scale-up of RDTs
- QA for microscopy



# **CDC Malaria Support – Hispaniola (2)**

## **2. Surveillance**

- Pilot community surveillance/active case detection
- National Sentinel Site System (NSSS)

## **3. Evaluations to develop evidence base for interventions**

- LLINs
- Vector control interventions

## **4. Capacity building**

- Laboratory (molecular testing capacity)
- Entomology

## **5. GF activities**

- TRaC surveys (molecular testing; sampling)
- Health facility surveys (methods/protocol; analysis)

# Haiti Malaria Elimination Consortium (HaMEC) Project

- ❑ **Proposal developed and submitted to BMGF last week**
- ❑ **Partners**
  - CDC/CDC Foundation – principal partner and grant administrator
  - PNCM/MSPP
  - CENCET/ DR MoH
  - PAHO
  - The Carter Center
  - Clinton Health Access Initiative
  - Tulane University
  - London School of Hygiene and Tropical Medicine
  - BMGF (*ex officio*)

# Rationale for HaMEC project

## ❑ **Malaria elimination is feasible in Haiti**

- Haiti's national malaria parasite prevalence estimate from GF/PNCM /PSI surveys showed <1% parasite prevalence (2011; 2012 preliminary)
- CHAI feasibility assessment: malaria elimination technically feasible by 2020 costing an estimated \$102-146 million

## ❑ **Increasing understanding of malaria transmission and new methods to target interventions**

- Asymptomatic parasitemia is important reservoir sustaining malaria transmission (~20-50% of transmission in low endemic settings)
- Identifying malaria infection foci using more novel methods (active case detection, serology) needed for low transmission settings

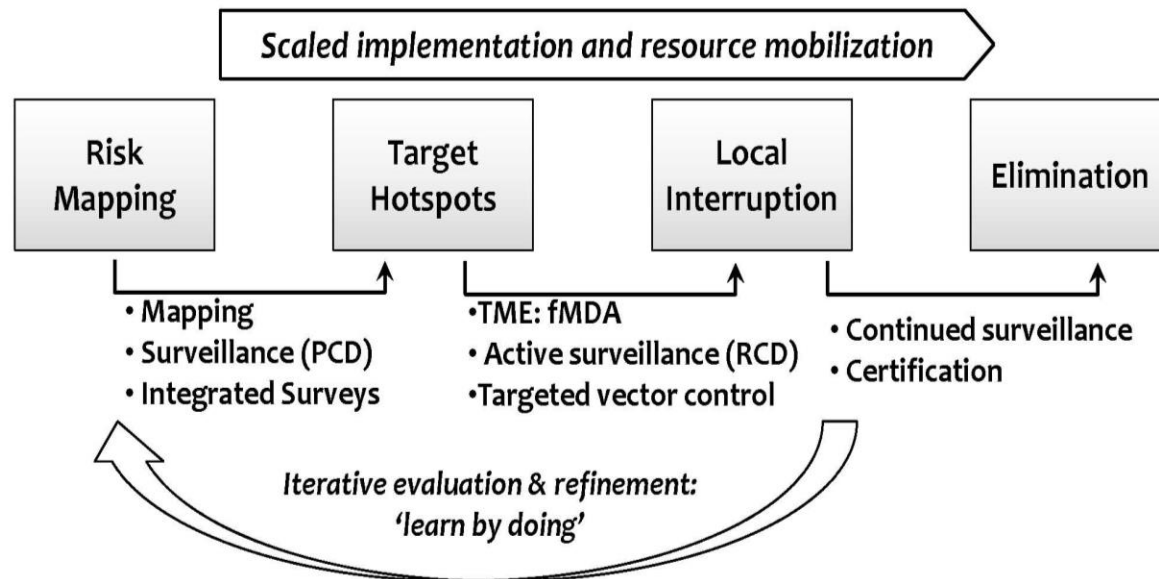
## ❑ **We now have an interested donor for malaria elimination**

- BMGF strategy is focused on elimination and long term->eradication
- Haiti identified by BMGF as an elimination investment priority along with southern Africa and the Mekong Region
- This is a rare opportunity as donor resources are shrinking globally

# Proposal Summary (1)

- ❑ Overall objective of the proposal is to eliminate malaria by 2020
- ❑ The approach is to iteratively improve the strategy for implementation

## Pathway to Malaria Elimination in Hispaniola



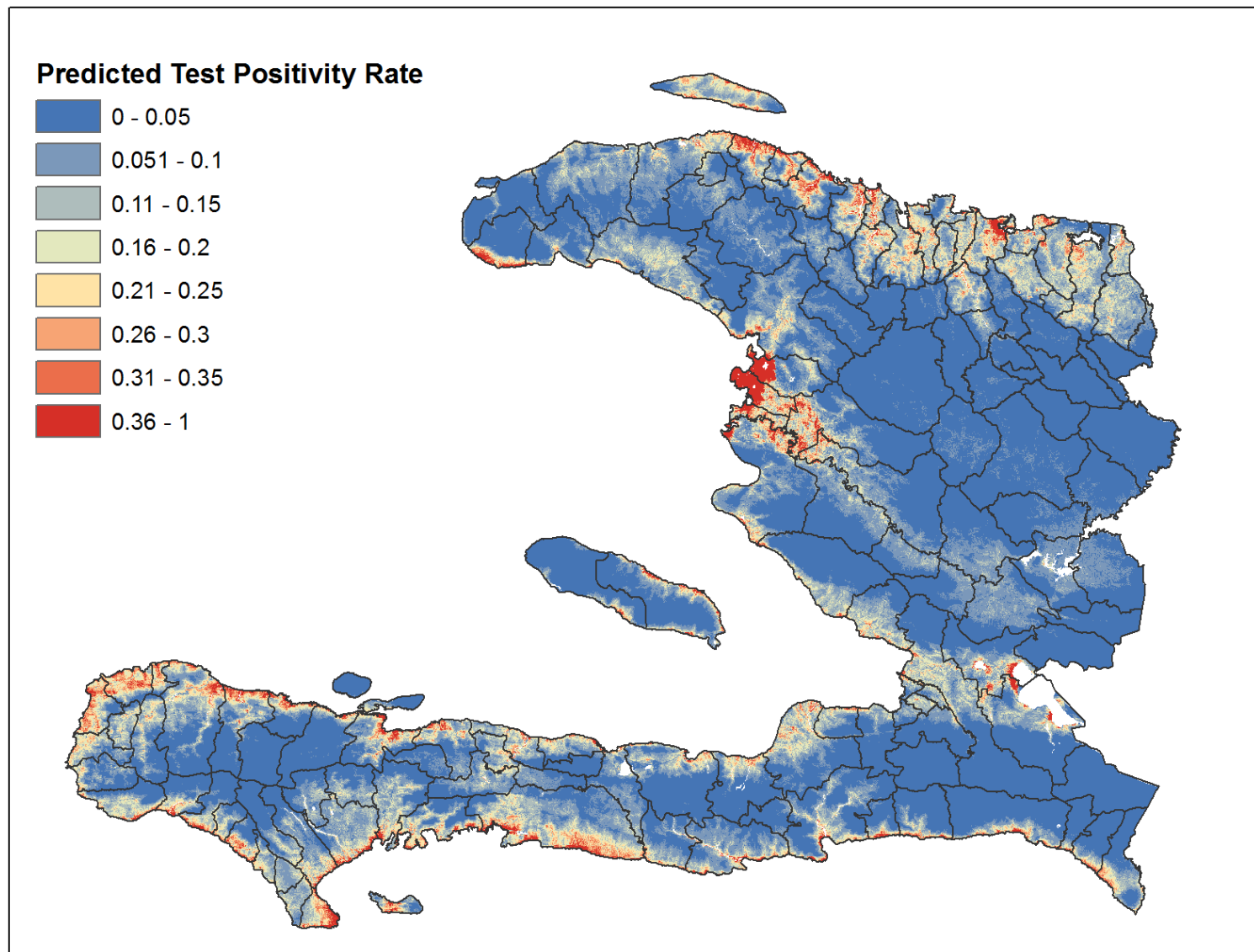


## Proposal Summary (2)

### ❑ **Four main components of the proposal:**

1. Evidenced-based strategy and operational plan developed with the MSPP and adopted
  - Develop updated malaria risk maps to identify foci of transmission (asymptomatic reservoirs) and target interventions
  - Conduct selected operations research studies to improve implementation of the strategy (e.g., improve adherence to treatment; improve efficiency of monitoring parasite reservoirs)
2. Advocacy and fundraising for additional resources to achieve malaria elimination by 2020
  - Current proposal investment is \$25M over 5 years
  - An additional ~\$80M will be raised for the project

# Malaria risk map - large parts carry no or very low risk



*Method: multivariate spatial logistic regression (source: CHAI and NSSS)*

## Proposal Summary (3)

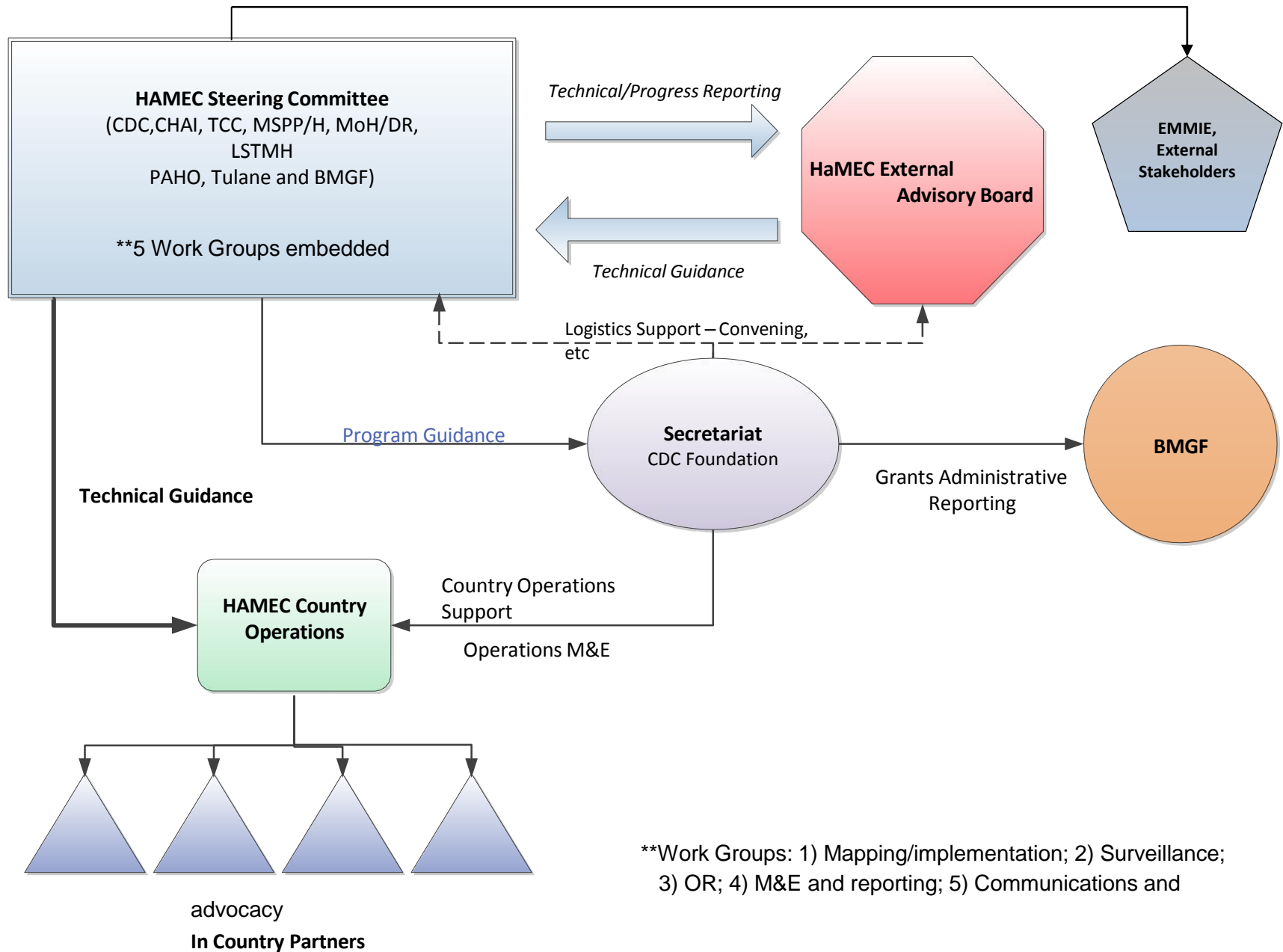
### ❑ Four main components of the proposal:

3. Improved malaria surveillance systems for decision making and action
  - Ensure diagnostic testing and case reporting across health facilities
  - Establish active surveillance systems in areas of high transmission to further identify and treat parasite reservoirs
  - Coordinate efforts with ongoing surveillance strengthening by other programs and donors
  - Strengthened surveillance will provide a robust platform to address other issues after elimination (Chikungunya, dengue, etc.)
4. Reductions in malaria transmission leading to elimination by 2020
  - Refine and implement strategy to reduce parasite reservoir/transmission
  - Limited sensitivity of malaria diagnostics in context of asymptomatic (silent) parasite reservoir means aggressive elimination strategy will benefit from selective, targeted community treatment (focal mass drug administration) in the transmission “hotspots”

# Structure of Consortium

- ❑ **Technical oversight and governance of the project**
  - **Steering Committee** to oversee the overall performance of activities and provide technical direction and monitoring of progress towards elimination
  - **Workgroups** to assist in operationalizing activities
  - **Secretariat** to support operational and financial tracking needs
  - **External Advisory Board** comprised of external experts to provide outside oversight, direction, and participate in the annual evaluation of project progress

## HaMEC Governance Structure

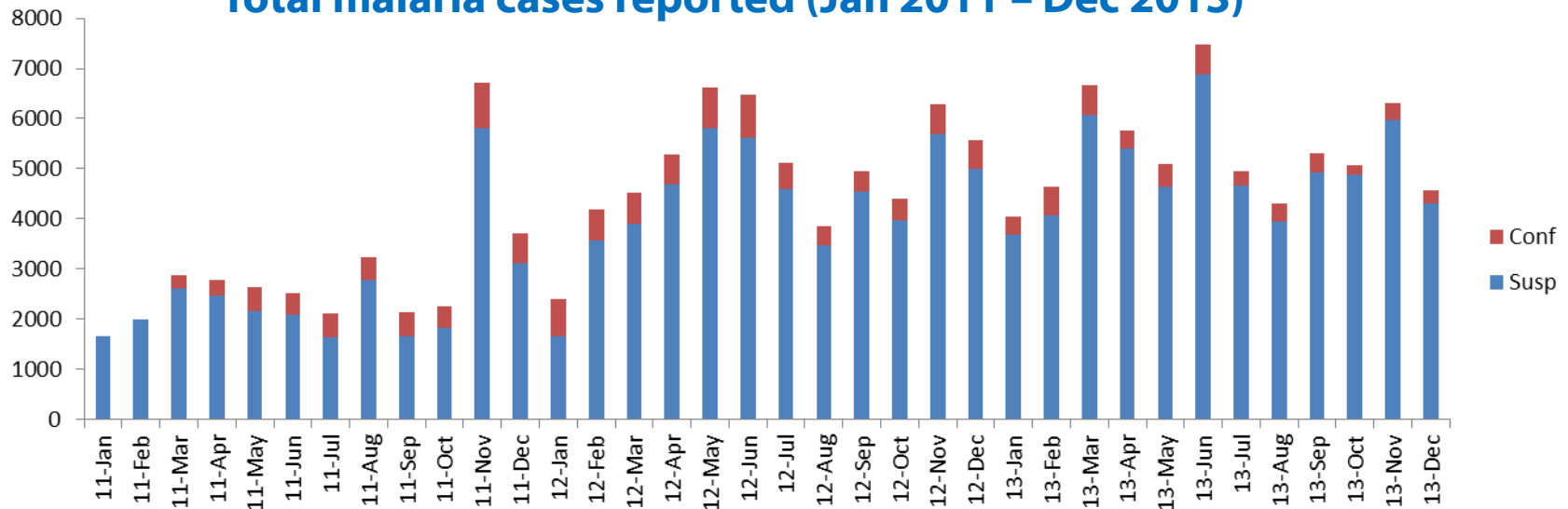


## **Extra slides**

# National Sentinel Site Surveillance (NSSS)

- ❑ Syndromic surveillance at health facilities based at PEPFAR sites (public and NGO sites)
- ❑ Established after 2010 earthquake to monitor trends, detect disease outbreaks, and target relief efforts
- ❑ Weekly reporting

**Total malaria cases reported (Jan 2011 – Dec 2013)**



# **CDC/LNSP supported Malaria Diagnostic Quality Assurance (QA)**

- ❑ **Integrated QA program : pilot in planning for June 2014**
  - Objectives
    - Assess a greater number of routine microscopy tests
    - Expand the number of sites the program serves
    - Find a sustainable approach by integrating with other programs (tuberculosis, cholera, HIV, other), minimize logistical challenges
  - Methods
    - Collect all routine malaria blood slides; use the specimen transport system (when possible) established for HIV. Re-read 100% positives, 10% of negatives
    - Field technicians will conduct integrated site visits 1 x /quarter
    - Identify low performing sites and send malaria specialists to supervise these
  - Pilot planned for Sud and Grand Anse in June/July 2014
    - ~26 facilities
    - Staggered expansion to all 10 Departments in 2014 – 2015



# 2011 result details

Department	RDT	PCR	Micr 1	Micr 2	Gamet <sup>a</sup>	≥2 pos tests	Age	Fever	Fever medicine <sup>b</sup>
Ouest, Met	Pos	ND	ND	ND	–	No	3	Yes	CQ
Ouest, Met	Neg	Neg	Pos	Neg	No	No	6	No	–
Ouest, Met	Neg	Pos	Neg	Neg	–	No	18	No	–
Ouest, Perif	Neg	Pos	Pos	Pos	Yes	Yes	33	Yes	CQ
Ouest, Perif	Pos	Neg	Neg	Neg	–	No	51	Yes	CQ
Ouest, Perif	Pos	Pos	Pos	ND	Yes	Yes	31	Yes	CQ
Ouest, Perif	Pos	Pos	Pos	Pos	No	Yes	22	Yes	CQ
Ouest, Perif	Pos	Neg	Neg	Neg	–	No	18	Yes	<sup>c</sup>
Sud	Neg	Pos	Pos	ND	–	Yes	29	Yes	Nothing
Sud	Pos	Neg	ND	ND	–	No	3	Yes	Nothing
Grand Anse	Pos	ND	ND	ND	–	No	22	No	–
Nord	Pos	ND	ND	ND	–	No	3	No	–
Nord	Neg	Neg	Pos	Pos	No	Yes	1	Yes	Nothing
Nord	Neg	Pos	Neg	Pos	No	Yes	32	Yes	CQ
Artibonite	Pos	Pos	Pos	Pos	Yes	Yes	43	Yes	Nothing
Artibonite	Neg	Pos	Neg	Pos	No	Yes	40	Yes	Nothing
Artibonite	Pos	Neg	Neg	Neg	–	No	34	No	–
Artibonite	Pos	ND	ND	ND	–	No	3	No	–
Artibonite	Pos	Pos	Pos	Pos	Yes	Yes	2	No	–
Artibonite	Neg	Pos	Pos	Pos	Yes	Yes	4	Yes	CQ
Artibonite	Pos	Neg	Neg	Pos	No	Yes	2	Yes	Nothing
Artibonite	Pos	Neg	ND	ND	–	No	2	Yes	CQ
Artibonite	Neg	Pos	ND	ND	–	No	19	Yes	Nothing
Artibonite	Neg	Pos	ND	ND	–	No	4	No	–
Artibonite	Neg	Neg	Pos	Neg	–	No	3	No	–
Nord Ouest	Pos	Neg	Pos	Pos	Yes	Yes	2	Yes	CQ
Nord Ouest	Pos	Pos	Pos	Pos	No	Yes	4	Yes	CQ
<b>Total = 27</b>	<b>17</b>	<b>13</b>	<b>12</b>	<b>11</b>	<b>6</b>	<b>13 ≥2</b>	<b>16.1</b>	<b>18 had</b>	<b>10</b>
	<b>RDT</b>	<b>PCR</b>	<b>Micr1</b>	<b>Micr2</b>	<b>Gamet</b>	<b>pos test</b>	<b>mean age</b>	<b>fever</b>	<b>took CQ</b>

<sup>a</sup> Among positive microscopy results

<sup>b</sup> Among those with fever

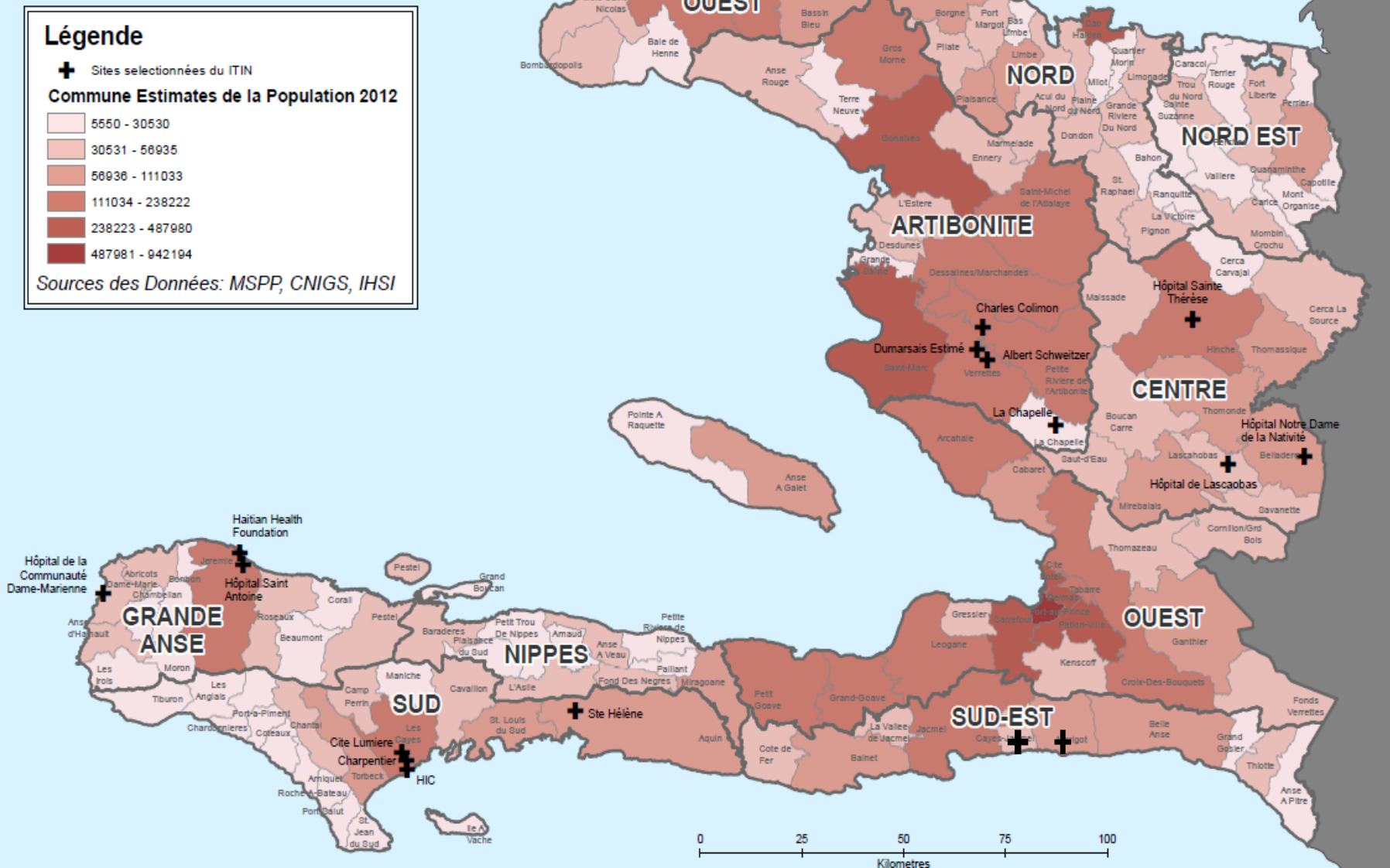
ND: not done because subject did not agree, or quality of specimen was too poor to analyze

<sup>c</sup> No response

# **Evaluation of the Effectiveness of LLINs in Haiti: A Case Control Study (1)**

- ❑ The national distribution of LLINs was part of Haiti's malaria control strategy and the major component of the Global Fund round 8 grant**
- ❑ To assist in determining the future role of LLINs in Haiti, a case-control study design was used to evaluate the effectiveness of recently distributed LLINs**
- ❑ Objective is to estimate the protective effect of using an LLIN by comparing proportions of LLIN usage among cases and controls**
- ❑ We recruited participants from 16 HFs across 5 Departments in Haiti from Sept 2012 – Feb 2014**

# Study sites for the evaluation of effectiveness of LLINs in Haiti



# Evaluation of the Effectiveness of LLINs in Haiti: A Case Control Study (2)

## ❑ **Methodology:**

- Cases - febrile persons with parasitemia
- Controls - febrile persons without parasitemia
- Diagnosis based on RDTs and PCR results
- Analysis matches on age group, sex, area of residence, and date of enrollment

## ❑ **Additional data collection:**

- Insecticide resistance
- Condition of LLINs (durability and insecticidal content) distributed during the campaign after 12 and 18 months of use from study participants
- Pyrethrum spray catches in homes with and without LLINs

# Evaluation of the Effectiveness of LLINs in Haiti: A Case Control Study (3)

## ❑ Preliminary analysis based on RDT status

- 379 positives of 9,318 tested by RDTs (4.1%)
- Post hoc matching yielded 365 cases and 1,204 controls for analysis
- No difference in ownership or usage among cases and controls

	<b>Cases</b>	<b>Controls</b>	<b>p</b>
Using any bednet previous night	34.5%	32.9%	0.56
Using campaign LLIN previous night	21.9%	19.5%	0.32
Always used campaign LLIN during 2 weeks before illness	18.4%	18.5%	0.94

# **Evaluation of the Effectiveness of LLINs in Haiti: A Case Control Study (4)**

- ❑ **Final results and analysis using PCR testing is underway; initial PCR results correlate well with RDT results**
- ❑ **Preliminary results do not provide evidence to support the distribution of LLINs in Haiti as a prevention strategy**
- ❑ **Limitations**
  - Identifying cases was very difficult despite intensive scale-up of recruitment sites
  - Usage of campaign LLINs was lower than initial assumptions



# GHESKIO CENTERS

## Malaria chloroquine resistance testing (1)

*Macarthur Charles, Glavdia Delva, Carole Anne Beauharnais, Sanchita Das, Rodney Destine, Laura Kirkman, Sarah K. Volkman, Jean W. Pape and Linnie M. Golightly (unpublished data)*

- Samples collected 2005-2009
- 9 health centers
  - Port-au-Prince, Jeremie, Jacmel, Cayes, Miragoane, Cap-Haitien, Deschappelles, Fort-Liberte,
  - Port-de-Paix
  - >90% from three sites
- 901 samples analyzed
  - 743 direct sequencing
  - 158 *pfprt* PCR analysis



<http://geology.com/world/haiti-satellite-image.shtml>

# Status of chloroquine resistant haplotypes in *P. falciparum* parasite populations collected in post-earthquake Haiti (2)

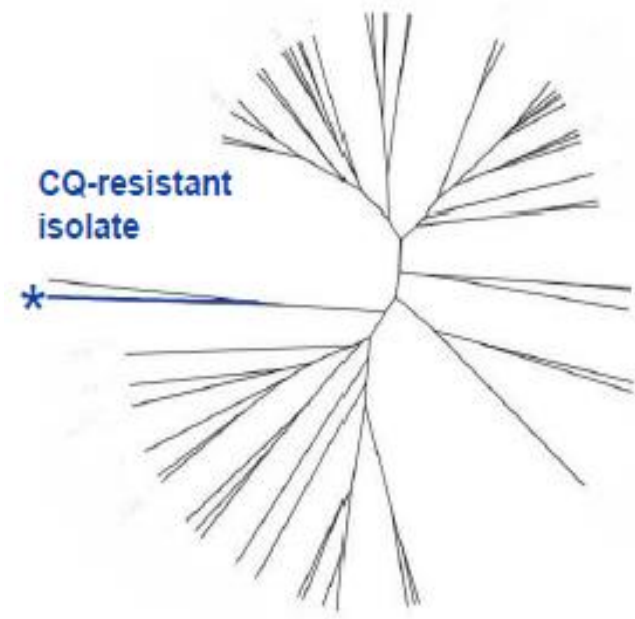
- Results: 1 isolate resistant to both CQ and SP
- Resistant isolate was genetically distinct from other parasites collected

Table 1 Prevalence of drug resistant haplotypes

No. of Samples	<i>pfcr</i> haplotype					Freq.
	C72S	73	M74I	N75E	K75T	
107	C	V	M	N	K	0.99
* 1	C	V	I	E	T	0.01
108						1.00

No. of Samples	<i>pfldr</i> haplotype					Freq.
	C50R	N51I	C59R	S108N	I164L	
69	C	N	C	S	I	0.64
38	C	N	C	N	I	0.35
* 1	C	I	R	N	I	0.01
108						1.00

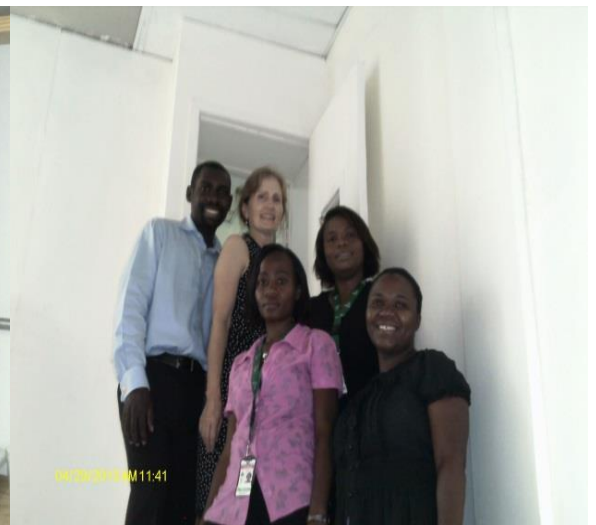
No. of Samples	<i>pfldps</i> haplotype					Freq.
	S436F	A437G	K540E	A581G	A613S/T	
107	S	A	K	A	A	0.99
* 1	F	G	K	A	A	0.01
108						1.00



*Hierarchical clustering phylogenetic tree*



# Insectary and the team

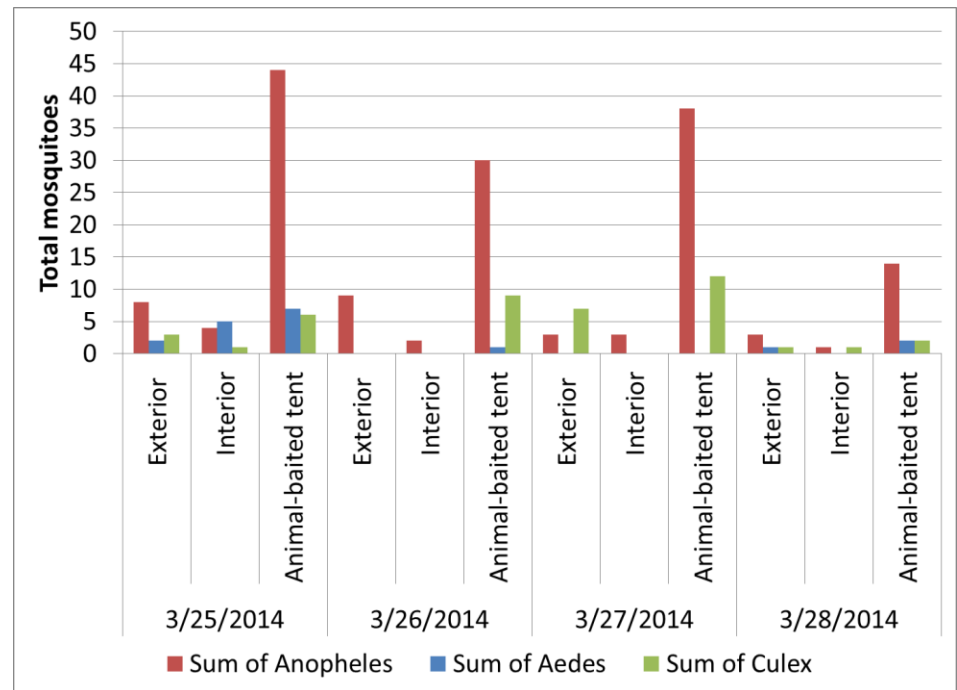


# Preparation for mosquito behavior pilot study in Haiti



# Results of mosquito behavior pilot study in Ouanaminthe

- Anopheles albimanus* was the dominant vector caught in all three methods: interior and exterior human landing catches and animal-baited tents.





# Results of mosquito behavior pilot study in Ouanaminthe

- Peak biting of *Anopheles* mosquitoes occurred early in the evening (8:00 PM) and steadily declined thereafter.
- However, biting lasted throughout most of the night particularly in animal-baited traps.
- Similar biting trends were observed indoors, outdoors and in animal-baited traps

