



#LB2111 Entomological monitoring and evaluation for operational malaria control in Rwanda



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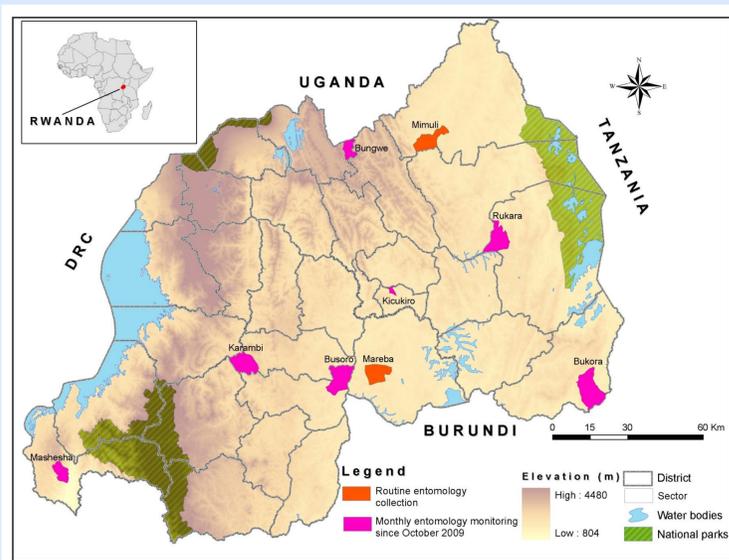
BACKGROUND

- The Rwanda National Malaria Control Program has made significant progress in scaling up malaria prevention activities including provision of long lasting insecticide treated nets (LLINs), indoor residual spraying (IRS), increased use of diagnostics and ACTs.
- Despite significant reduction in the burden of malaria since 2006, malaria remains a major public health problem in Rwanda with 1.2 million cases reported in 2009
- Universal coverage with LLINs will be achieved by 2010 and IRS currently targets high transmission foci of malaria in both peri-urban and rural settings in seven districts
- An insectary and entomological laboratory have been established and entomological monitoring is used to guide program decisions related to targeting and efficacy of vector control interventions.

METHODS

- Seven entomology posts employ standardized mosquito collection methods to monitor key entomological indicators including:
 - ✓ Human landing collection (HLC) for estimation of vector species composition, density and behaviour
 - ✓ Pyrethrum spray collections (PSC) for indoor resting density
 - ✓ Circumsporozoite protein (CS) - ELISA to estimate infection rates of *Plasmodium falciparum*
 - ✓ Calculation of Entomological inoculation rates (EIRs) using density and infection rate from HLC and CS-ELISA data
 - ✓ CDC bottle bioassays for insecticide susceptibility,
 - ✓ WHO cone bioassay with insectary-reared susceptible *Anopheles gambiae s.s.* to evaluate residual efficacy of IRS

Location of Entomological surveillance sites

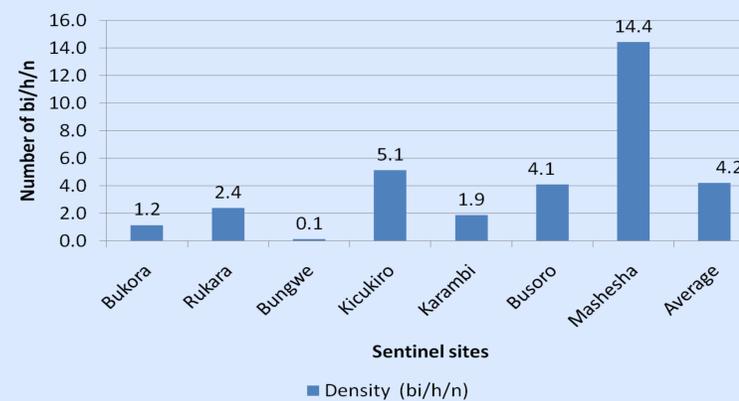


RESULTS

- Monthly HLC conducted in the seven sites from October 2009 to September 2010
- 15499 *Anopheles gambiae s.l.* were collected for determination of density and behaviour
- 4022 of these were tested with CS-ELISA and for EIR calculations
- Insecticide resistance testing conducted in August 2010 in 9 sites

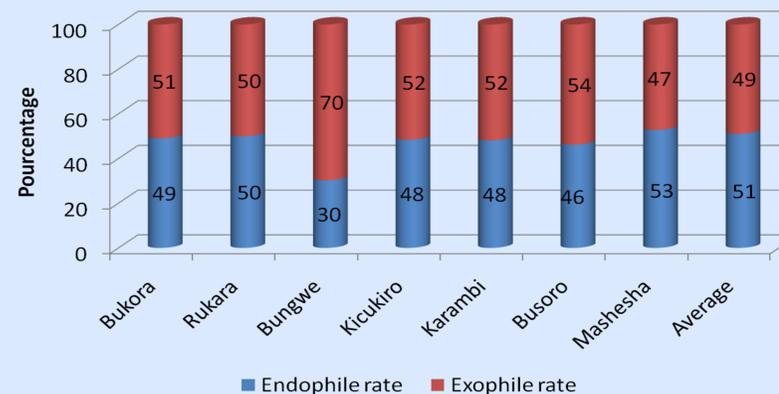
RESULTS

Average density (bites/human/night) by sentinel site of *A. gambiae s.l.*



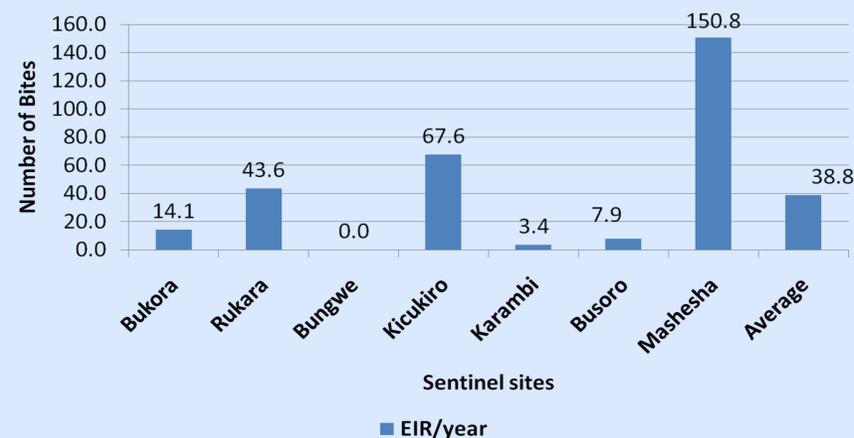
Higher density observed in cultivated marshland and peri-urban areas. The highest occurring in Masheshsha, lowest point in Rwanda with 900 m of altitude.

Endophilic and exophilic biting rates of *An. gambiae s.l.* by sentinel site



Approximately 50% of bites occurred outdoors indicating need to consider potential transmission gap not addressed by LLINs and IRS

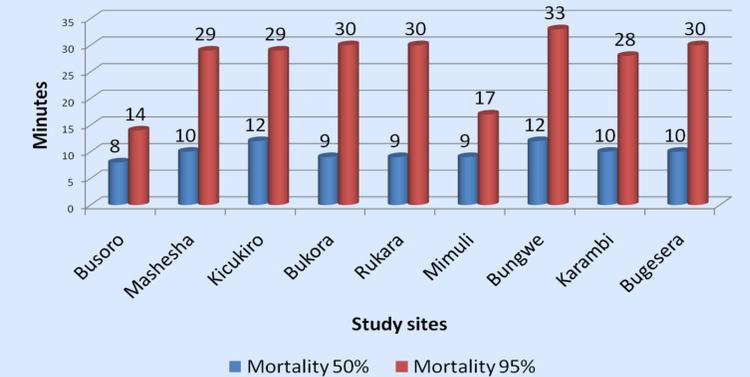
Annual EIR estimation of *An. gambiae s.l.* by sentinel site



High EIRs correlated with higher density found at low elevation site (Mashesha) and peri-urban locations in Kigali city.

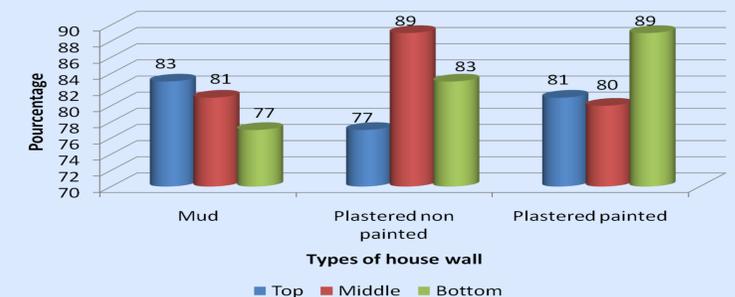
RESULTS

KD₅₀ and KD₉₅ of *An. gambiae s.l.* exposed to Deltamethrin 25ug/L



Cut off time for susceptibility to insecticide is 60 minutes. All tests showed vector susceptibility to Deltamethrin

Bioassays with *An. gambiae s.l.* for IRS quality control April 2010 (one month post-spraying)



Insecticide effectiveness varied by wall surface and location on the wall one month after spraying. Results used to guide training and supervision of spray operators.

MAIN CHALLENGES

- Consolidating a productive susceptible colony of *Anopheles gambiae s.s.*
- Determination of the species of *Anopheles gambiae* complex
- Strengthening entomology competencies with expanded entomologic staff

CONCLUSIONS

- Entomological assessments provide critical baseline information for ongoing monitoring of vector control interventions
- IRS with Deltamethrin remains an effective intervention as the local vectors are fully susceptible to the insecticide
- The finding of over 50% exophile prompts the need to monitor species and behaviour dynamics of *An. gambiae* complex
- High EIR in peri-urban areas affirms the need for continued IRS intervention in those areas
- Enhanced entomologic monitoring in conjunction with case surveillance are essential in guiding the operations and ongoing refinement of malaria vector control activities

ACKNOWLEDGMENTS

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DISCLAIMER

The findings and conclusions in this poster have not been formally disseminated by the CDC and should not be construed to represent any agency determination or policy.

