Building Out Vector-borne diseases in sub-Saharan Africa

Prof Steve Lindsay
Multi-sectoral working group
Roll Back Malaria, Geneva, 6th Feb 2020
Introduction

• What’s BOVA?
• The threat of vector-borne diseases in sub-Saharan Africa
• Importance of working with those in the built environment
What does BOVA do?
What is the BOVA Network?

- Interdisciplinary network of researchers and practitioners working on insect-borne diseases and the built environment
- Aims to establish a new research discipline
What BOVA has achieved

• Our Network of 461 members
• Eight pump-priming projects
• Seven grant writing workshops
• Continuing advocacy and contributions to high level reports and policy documents
• Publications
• Simple messages: what can be done now
Eight pump-priming projects

Basic science
1. Computer fluid dynamics, Denmark
2. Filming mosquitoes, Malawi
3. Up & down houses, The Gambia

Multi-sectoral & Scale up
3. Housing development programme, Ethiopia
4. Trash to treasure, Kenya

New tools
6. Floors for tungiasis control, Kenya
7. Mosquito repellent chairs, Tanzania
8. Screening entry points with spatial repellents, Mozambique
Seven grant writing workshops

**Basic science**

1. Knudsen: Rapid malaria mapping tool
2. Lobo: Modeling airflow

**New tools**

7. Wilson: Eave ribbons in combination with LLIN

**Multi-sectoral & Scale up**

3. Altamirano: Healthy housing bridging the evidence gap
4. Ruel-Bergeron: Health through housing coalition
5. Peeters: Developing policies to build resilience and adaptation
6. Maks Davis: Chagas disease
Publications

Continuing advocacy and contributions to high level reports and policy documents

- Lancet Commission on mosquitoes, viruses and cities
- International Guidelines on Urban and Territorial Planning
- WHO Health & housing?
- Working groups:
  - RBM work streams
  - Strategic Technical Advisory Group-NTDs
- International meetings:
  - Roll Back Malaria, Switzerland
  - BOVA Open Network Meeting, UN-Habitat, Kenya
  - Healthy City Design, London
  - International Conference on Urban Health, China
  - American Society of Tropical Medicine & Hygiene, USA
BOVA Conceptual Framework

Goal
Sustainable & resilient communities free of insect-borne diseases

Objectives
Develop and scale-up products & approaches in the built environment for preventing disease

Action
- Information exchange
- Basic and applied research
- Capacity building
- Advocacy and sustainability

Foundation
Management Board
Network of experts in insect-borne diseases and the built environment
The threat of vector-borne diseases in Africa
The basic split

Rural/Peri-urban = malaria

Urban/Peri-urban = dengue & worse
Malaria

• 213 million malaria cases and 380,000 deaths in Africa in 2018

• Africa accounted for 93% of global malaria cases and 94% of malaria deaths in 2018
Diseases carried by *Aedes* mosquitoes

- Dengue is world’s fastest growing infectious disease.
- 390 million dengue cases each year
- Global epidemic of Zika
- Yellow fever outbreaks in Africa

*Aedes aegypti*, the world’s most efficient vector of viral diseases
These are urban viral diseases

- dengue haemorrhagic fever
- Zika
- Aedes aegypti
- yellow fever
- chikungunya
Aedes aegypti: the enemy within the gates

1. It is the world’s most efficient vector of viruses
2. Is an invasive species
3. It breeds in human-made containers e.g. tyres, water storage jars etc.
Dengue cases reported to WHO

Data accessed 27.03.19
Dengue is endemic in 34 African countries in 2012.
Overlap between *Aedes* mosquito and human populations

- Cities >1M inhabitants
- Predicted *Aedes aegypti* distribution in 2015

Nick Golding, unpublished
And for something new....

Anopheles stephensi

Takken & Lindsay (2019) New & Emerging Diseases
How should we control these diseases?
What control methods do we currently have?

- Insecticide-treated bednets
- Fogging
- Indoor-residual spraying
- Larval source management
Control of *Aedes*-borne diseases

- No specific treatments for diseases
- No vaccines for Zika & chikungunya, dengue vaccine is partially protective & yellow fever vaccine is in short supply
- Vector control works – but we need to do better
Space spraying for emergency control of adult *Aedes aegypti*
Larval source reduction

Solid waste management to remove water containers – particularly tyres
Larval source reduction

Provision of reliable piped water to prevent water storage at home
Home improvements for households

- Doors
- Eaves
- Lifted
- Insecticide-treated
- Ventilation
- Environment
- Roofs
110 new healthy homes being built in Tanzania to **reduce indoor mosquito entry** (reduce respiratory & diarrhoeal diseases, & keep the house cool)

**Pilot testing**

**Designed by**
Jakob Knudsen
Or for urban areas.....

Designed by Jakob Knudsen
Dengue control in Singapore
Collaboration between Environment Agency & other sectoral stakeholders in Singapore
Global policy relevant to mosquito control
... above all, the spread of Zika, the resurgence of dengue, and the emerging threat of Chikungunya are the price being paid for a massive policy failure that dropped the ball on mosquito control in the 1970s.

Margaret Chan
Former Director-General, World Health Organization
Opening Address at World Health Assembly 69th session, May 2016
Housing improvements - policy

RBM / UNDP / UN-HABITAT
Consensus statement on housing and malaria

Housing and Malaria
Consensus Statement
Vector Control Working Group
Roll Back Malaria
November 2015

Introduction

New tools and approaches are required to achieve the ambitious targets outlined in the WHO Global Technical Strategy for Malaria 2016-2030 (GTS) and the complementary Roll Back Malaria (RBM) global framework for Action and Investment to Defeat Malaria 2016-2030 (AIM) of at least a 90% reduction in malaria mortality and case incidence, and elimination from 35 countries by 2030, while preventing re-introduction into malaria-free areas. Additional interventions are needed to compliment the current tools which rely heavily on effective insecticides for optimal protection. There is a need to look beyond long-lasting insecticidal nets (LLINs) and indoor residual spraying (IRS), particularly to address the challenges of insecticide resistance and transmission that occurs at places and times when populations are not adequately protected by these two core interventions.

The value of a multi-sector developmental approach that couples current interventions with complementary strategies addressing key social and environmental determinants of malaria has been recognised by RBM and the United Nations Development Programme. The AIM framework cited above, notes the potential contribution of the housing sector to malaria control and elimination. AIM also considers the relation...
Global Vector Control Response 2017-2030

- Broaden collaborations within & **beyond the health sector**
Global policy development
UNDRR’s Making Cities Resilient campaign is the key policy document for those dealing with environmental threats

- SDG11 gave rise to the concept of making cities resilient against environmental threats
- UN’s Disaster Risk Reduction says ‘making cities safe from disaster is everybody's business’.
- ...but, health is not included
- Yet, *Aedes*-transmitted diseases are an environmental threat
Keeping the messages simple
Summary

• BOVA Network brings together experts in vector-borne diseases with those in the built environment

• Vector-borne diseases are a major environmental threat to countries & their economies

• Building out vectors will lead to more resilient cities in the future
Acknowledgments:
Find out more about the network!

www.bovanetwork.org

@bovanetwork