malaria consortium
disease control, better health

Vector control : the untapped potential for neglected tropical diseases

- Vector control has long been an under-funded aspect of the neglected tropical disease agenda, yet it has huge potential for tackling the spread of many of these diseases and supporting NTD elimination efforts
- The WHO Global Vector Control Response 2017 – 2030 provides the strategic blueprint for scaling up vector control, by endorsing the strengthening of national capacity and increasing research and innovation
- Strong political will, sustainable and predictable financing, and inter-sectoral collaboration will be crucial for the successful scaling up and integrating of vector control strategies

Vectors and neglected tropical diseases

Nine of the 12 major diseases that are transmitted by vectors are classified as neglected tropical diseases (NTDs) and they collectively account for nearly 300,000 deaths a year[1]. Despite this, vector control interventions for these diseases have often been an overlooked and under-funded aspect of NTD prevention, control and elimination strategies. The scale up of mass drug administration has been highly effective at driving the NTD agenda in recent years; however, in order to continue making progress and tackle the challenge of rapidly spreading and newly emerging diseases, now is the time to make vector control a central part of NTD control approaches, where it is expected to have a significant impact.

Vectors are organisms that transmit pathogens and parasites from one infected person (or animal) to another, causing serious diseases in human populations. Mosquitoes are the most common and best known vector, with mainly *Aedes*, ***Anopheles*** and *Culex* genera involved in disease transmission. Sand flies, fleas, ticks, black flies, triatomine bugs and some freshwater snails are also responsible for transmitting some of these diseases.

Some vectors are responsible for spreading multiple diseases, such as the *Aedes* mosquito, which can transmit chikungunya, dengue, yellow fever, Zika virus disease and lymphatic filariasis. In total over 80 percent of the world's population now live in areas at risk from at least one vector-borne disease, and over 50 percent are at risk from at least two[2]. These diseases disproportionately affect low and middle-income countries, which are also the countries with fewer resources to adequately manage a high disease burden.

Successful vector control, predominately though the distribution of insecticide-treated nets and indoor residual spraying, has been at the heart of the

successes achieved against malaria since 2001, with mortality rates falling by an impressive 62 percent[3]. Advances against Chagas disease and onchocerciasis have similarly relied upon significant investments in vector control[4]. With this history of success, now is the time to unlock the potential of vector control for a broad range of NTDs.

The rise of vector borne diseases

The last few decades have seen both the spread of existing major vector-borne diseases as well as the emergence of new challenges to existing disease control strategies. Combined, vector-borne diseases now account for roughly 17 percent of the global communicable disease burden and cause about 700,000 deaths a year[5].

Dengue, which is transmitted principally by the *Aedes aegypti* mosquito, has seen the most dramatic spread, with the number of cases exploding from just 15,000 per year in the 1960s[6], to an estimated 390 million in 2012. In this time it has also spread from nine to 128 countries, with cases of dengue reported on every continent in 2012[7]. The true burden of dengue is hard to predict, but around 500,000 people require hospitalisation each year and roughly 12,500 people die from the disease[8].

There has been an increase in the number and severity of chikungunya outbreaks in recent years too, with over two million suspected cases in the Americas alone between 2014 and 2016[9]. Similarly yellow fever, also spread by the *Aedes* mosquito and which had all but disappeared from Central and South America, has re-emerged as a public health concern. Disease outbreaks have been also increasing in refugee camps, such as the recently reported outbreak of cutaneous leishmaniasis among Syrian refugees in Lebanon[10].

In Europe, an increased number of autochthonous visceral leishmaniasis cases have been reported in Italy, and there was an outbreak of urogenital schistosomiasis in Corsica in 2013, demonstrating that high income countries too are increasingly at risk from vector-borne diseases[11,12]. This became sharply apparently with the emergence of Zika virus disease over the last few years, which has quickly risen to being seen as a major global health threat. Cases have been reported in 67 countries, mainly across the Americas and South East Asia since 2015, including the United States of America[13].

Why are vector-borne diseases spreading?

In order to develop effective responses and invest resources responsibly, we need to know why these vector-borne diseases are spreading. Understanding the complex relationship between disease, vector, human and/or animal host and the environment is one of the key challenges to knowing how to defeat these diseases, as well as predict where the next global threat could come from.

The realisation that we are not well equipped to deal with the speed, scale and variety of threats posed by infectious diseases prompted Dr Margaret Chan, speaking at the 69th World Health Assembly in May 2016, to state simply that "the world is not prepared to cope". If we are to halt and reverse the spread of diseases like dengue, as well as be prepared for the next threat, we urgently need to invest in vector control.

MAIN VECTOR-BORNE NEGLECTED TROPICAL DISEASES

- Dengue
- Chikungunya
- Lymphatic filiarisis
- Chagas disease
- Onchocerciasis
- Japanese encephalitis
- Human African trypanosomiasis
- Leishmaniasis
- Schistosomiasis

WHY ARE VECTOR-BORNE DISEASES SPREADING

RAPID AND UNPLANNED URBANISATION

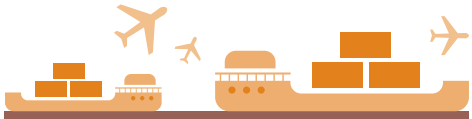
Rapid and unplanned urbanisation is putting large populations at risk from the emergence and expansion of certain arboviral diseases, such as dengue and Zika virus disease, which are spread by mosquitoes

LACK OF PROVEN, EFFECTIVE VECTOR CONTROL INTERVENTIONS

There is a lack of proven, effective vector control interventions, partly due to insufficient quality research on what works, why and in what context

CHANGING LAND USE PATTERNS

Changing land use patterns are drastically altering the environment, modifying vector habitats and bringing humans into greater contact with vectors



INCREASED GLOBAL TRAVEL AND TRANSPORTATION OF GOODS

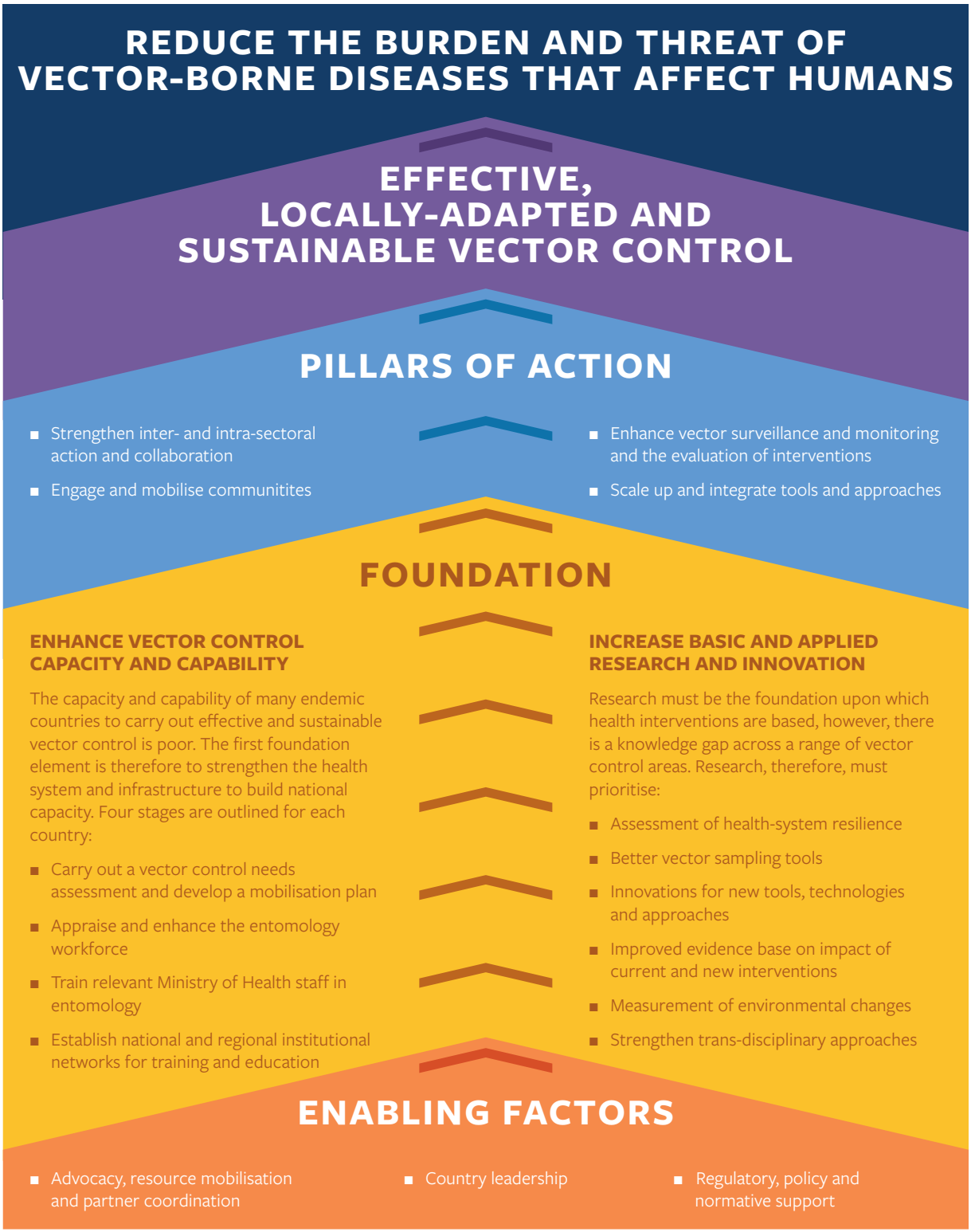
Increased global travel and transportation of goods is facilitating the spread of vectors and humans infected with diseases, which can then be transmitted to vulnerable populations

CLIMATE CHANGE

Climate change is expected to have an impact on the environment and ecosystems, causing changes in vector distribution, composition and vector habits that could lead to greater burdens of vector-borne diseases

INSECTICIDE RESISTANCE

Insecticide resistance is a growing challenge that threatens the efficacy of existing vector control interventions



Adapted with permission from World Health Organization (2017), *Global Vector Control Response 2017-2030*

The WHO Global Vector Control Response Strategy 2017-2030

In response to the spread and emergence of vector-borne diseases, the World Health Assembly ratified the Global Vector Control Response 2017-2030 in May 2017. The Global Vector Control Response builds upon the integrated vector management approach, but goes further by focusing on the need to strengthen human capacity to advocate, plan and implement vector control in an integrated manner. It provides the framework for the scaling up and integrating effective, locally adapted and sustainable vector control strategies globally, with the aim of reducing the burden and threat of vector-borne diseases. The response framework, endorsed by the WHO, comprises two foundation elements, four pillars of action and three enabling factors (see page 4).

What does integrating vector control mean?

Integrating vector control across diseases will reduce duplication, improve efficiency and rationalise the use of limited resources, so that they can be directed where they are needed most:

- **Interventions can be integrated:** combining vector control interventions to target every vector responsible for human illnesses, as well as integrating vector control to compliment MDA and other public health strategies preventing diseases.
- **Disease and entomological mapping can be integrated**: by conducting an integrated situational analysis of a country's vector species and vector-borne diseases, a fuller picture of the national context can be gained, which will strengthen our understanding of what vector control strategies are needed and when, and therefore avoid the deployment of unnecessary interventions.
- **Capacity building can be integrated:** by training laboratory and entomologists to work on all the relevant vectors that cause priority diseases in that country (e.g. malaria and vector-borne NTDs), in order to strengthen much-needed capacity and use existing resources for multi-vectorial approaches.
- **Integration within and between sectors:** responsibility for implementing vector control lies with a wide range of stakeholders in and beyond the health sector. Coordination of activities and information sharing will be essential to ensure efficient use of resources.

Costs and benefits of investing in integrated vector control for NTDs

Implementing WHO's Global Vector Control Response will require significant financial investment. The cost of carrying out the priority activities outlined under the Foundation and Pillars of Action in the framework (page 4) for the interim period 2017–2022 has been estimated at US$330million per year. This amounts to about US$0.05 per person per year at risk from at least one vector-borne disease, excluding the cost of commodities, implementation and research and development[14].

The benefits of scaling up vector control are numerous and go beyond reducing the suffering and estimated 700,000 deaths they cause each year[15]. These diseases disproportionately impact the poorest and most vulnerable and the costs of treatment can push families further into poverty. The illness and disabilities that they cause can inhibit the ability of people to work, reducing family incomes and limiting employee productivity that negatively impacts national economies. For example, it has been estimated that $842 million is lost in India each year to treatment costs and reduced work days associated with lymphatic filariasis[16]. The annual global cost of Chagas disease in 2013 was calculated to be roughly $7 billion, while human African trypanosomiasis is estimated to impact more than 40 percent of the annual income of affected rural households in the Democratic Republic of Congo[17]. Making progress against these diseases is therefore an important step for tackling poverty and promoting prosperity in low and middle-income countries.

Vector control and the Global Goals

Tackling vector borne diseases will contribute to achieving a large number of the Global Goals for Sustainable Development, as can be seen on page 6.

VECTOR CONTROL AND THE GLOBAL GOALS

1 NO POVERTY

Vector-borne diseases disproportionately affect the poorest and most vulnerable in society, trapping people in a cycle of illness, suffering and poverty

3 GOOD HEALTH AND WELL-BEING

By reducing the prevalence of the major vector-borne diseases, vector control contributes to defeating malaria and NTDs, achieving universal health coverage, and reducing maternal and neonatal mortality

4 QUALITY EDUCATION

Vector-borne diseases can cause a significant level of school absenteeism during high transmission seasons, seriously impacting the educational opportunities of children. Infections also cause underperformance at school and adversely affect the overall physical and mental development of children, with a devastating impact on their future

5 GENDER EQUALITY

Some vector-borne diseases disproportionately affect women, due to either higher exposure or biological vulnerability such as pregnancy, while others predominantly affect men, as the result of occupation-related exposure

6 CLEAN WATER AND SANITATION

Water plays a crucial role in the life cycle of most vectors and many diseases. Therefore cooperation and integration with the water and sanitation sector will be necessary for vector control to be successful

7 AFFORDABLE AND CLEAN ENERGY

The construction of hydro-electric dams result in complex environment changes that alter vector epidemiology, and have been linked to outbreaks of schistosomiasis and changes to malaria epidemiology

8 DECENT WORK AND ECONOMIC GROWTH

Vector-borne diseases cause illness, disability and stigma that damage economic growth, reduce productivity and hinder the potential of the workforce

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Cities need to be built in ways that reduce vector habitats

11 SUSTAINABLE CITIES AND COMMUNITIES

Successfully implemented vector control will lead to cleaner, safer and more sustainable cities and communities, without the breeding grounds for vectors

13 CLIMATE ACTION

It is expected that global warming will cause more outbreaks of vector-borne diseases, leading to higher disease burdens across a larger number of countries. Vector control can therefore be considered a form of climate adaptation

17 PARTNERSHIPS FOR THE GOALS

Successfully implemented vector control will require a joint commitment and coordinated efforts from partners across sectors and countries

Recommendations

In order for vector control to be successfully implemented and the Global Vector Control Response achieved, Malaria Consortium recommends that:

- **DEVELOPMENT PARTNERS** should conduct advocacy to raise awareness of vector borne diseases, mobilise stakeholders across sectors to take action, and work with civil society and community groups to hold governments to account on vector control progress.
- **DONORS** should work with endemic countries to take a more integrated approach to vector control by providing long-term, predictable funding that incentivises integration. Allocation of funding should be based upon needs identified through a bottom-up approach.
- **INTER-SECTORAL NATIONAL TASKFORCES** should be established to facilitate cross-sector collaboration, comprising ministers from all relevant departments. The responsibility of tackling vector borne diseases is shared by all in society.
- **THE PRIVATE SECTOR** should work with donors through public-private partnership mechanisms in order to provide the market incentives for developing new drugs and insecticides, which would otherwise not be commercially viable.
- **COMMUNITIES** in endemic countries should mobilise in order to hold their governments to account, and work with partners and institutions to develop and implement local, context-specific solutions.
- **NATIONAL GOVERNMENTS** should take action to integrate disease-specific programmes to ensure resources are allocated where they are needed most. Political leaders should show strong leadership including providing a positive regulatory and policy environment, facilitating cross-sector collaboration, allocating sufficient national resources and mobilising other domestic funding.
- **THE WORLD HEALTH ORGANIZATION** should provide technical guidance, facilitate the efficient uptake of proven and new vector control tools, and coordinate capacity building activities at the regional and country level. Local WHO offices support countries to develop disease and vector surveillance capacity and a locally-tailored surveillance strategy.
- **ACADEMIA** should conduct robust basic, applied and operational research to the highest standard to add to the evidence base that informs vector control interventions. The applied research agenda should be guided by national vector-borne disease control programmes, and aimed at linking entomological control with impact on disease burdens.

ABOUT MALARIA CONSORTIUM

Malaria Consortium is one of the world's leading international non-governmental organisations. Our mission is to improve lives in Africa and Asia through sustainable, evidence-based programmes that combat targeted diseases and promote child and maternal health. We target key health burdens, including malaria, pneumonia, dengue and neglected tropical diseases (NTDs), along with other factors that impact child and maternal health. We achieve our goals by:

- designing and conducting cutting-edge implementation research, surveillance and monitoring and evaluation
- selectively scaling up and delivering sustainable, evidence-based health programmes
- providing technical assistance and consulting services that shape and strengthen national and international health policies, strategies and systems and build local capacity
- Seeking to ensure our experience, thought leadership, practical findings and research results are effectively communicated and contribute to the coordinated improvement of access to and quality of healthcare

We work across Africa and Asia with communities, government and non-government agencies, academic institutions, local and international organisations, to ensure good evidence is used to improve delivery of effective services. We currently operate in Burkina Faso, Cambodia, Chad, Ethiopia, Mozambique, Myanmar, Nigeria, Sierra Leone, South Sudan, Thailand and Uganda.

Notes

1. World Health Organization, *Global Vector Control Response 2017-2030* (2017)
2. World Health Organization, *Global Vector Control Response 2017-2030* (2017)
3. World Health Organization, *World Malaria Report 2016* (2016)
4. World Health Organization, *Global Vector Control Response 2017-2030* (2017)
5. World Health Organization, *Global Vector Control Response 2017-2030* (2017)
6. Anders KL and Hay S. 'Lessons from control to help meet the rising challenge of dengue'. *Lancet Infectious Disease*, 12(12): 977-984. (2012) www.thelancet.com/journals/lancet/article/PIIS1473-3099(12)70246-3/
7. Brady OJ, Gething PW, Bhatt S, Messina JP, Brownstein JS, Hoen AG et al. 'Refining the global spatial limits of dengue virus transmission by evidence-based consensus'. *PLoS Neglected Tropical Diseases*, 6(8):e1760. (2012) http://journals.plos.org/plosntds/article?id=10.1371/journal.pntd.0001760
8. Malaria Consortium, *Dengue: Falling Between the Cracks* (2016)
9. www.who.int/mediacentre/factsheets/fs327/en/
10. wwwnc.cdc.gov/eid/article/20/10/14-0288_article
11. www.eurosurveillance.org/ViewArticle.aspx?ArticleId=20530
12. www.ncbi.nlm.nih.gov/pubmed/27197551
13. www.who.int/emergencies/zika-virus/situation-report/25-august-2016/en/
14. World Health Organization, *Global Vector Control Response 2017-2030* (2017)
15. World Health Organization, *Global Vector Control Response 2017-2030* (2017)
16. Ramaiah KD, Das PK, Michael E, Guyatt HL. 'The economic burden of lymphatic filariasis in India'. *Parasitology Today*. 16:251–3 (2000).
17. World Health Organization, *Global Vector Control Response 2017-2030* (2017)

For more information, please contact Oliver Williams, o.williams@malariaconsortium.org

Published by Malaria Consortium 2017

Malaria Consortium
Development House 56-64 Leonard Street, London EC2A 4LT, United Kingdom
info@malariaconsortium.org / www.malariaconsortium.org
UK Registered Charity No: 1099776/US EIN: 98-0627052

malaria **consortium**
disease control, better health