



Urban Malaria, the Malaria of the Future?

Following the ongoing rural exodus and rapid, unregulated urban development around large African cities, malaria – once viewed as a rural disease – is becoming a growing health problem in urban and suburban areas.

Introduction

Half the world's population is at risk of malaria; close to 100 countries across Africa, Asia-Pacific and the Americas. Every year, malaria causes over 200 million cases and over 400,000 deaths, more than 90% of which occur in Africa.

It is estimated that in Africa, **a child dies from malaria every two minutes** and that the disease is one of the leading causes of death in children under 5 on the continent. Many children who survive a case of severe malaria present with learning difficulties or suffer brain damage. Pregnant women and unborn babies are also particularly vulnerable to malaria, which is a major cause of perinatal mortality, low birth weight and maternal anaemia.

Malaria is not only a health disaster but also an economic scourge. According to the World Health Organization, It is estimated that malaria reduces GDP growth by approximately 1.3% per year in severely affected countries.

Along with AIDS and tuberculosis, malaria is one of the main public health problems threatening the development of the poorest countries.

Despite significant progress since 2000, with 7.6 million lives saved and 1.5 billion new infections averted, the number of cases is stagnating for the first time, particularly in highest burden African countries. The uncontrolled development of some African cities and global warming are resulting in a dangerous increase in the number of breeding grounds for the mosquitoes that carry the malaria parasite and we are seeing the emergence of urban malaria, which could develop into an epidemic at any time.

It is essential to mobilize city leaders in malaria-affected countries as a matter of urgency to combat this new health risk.

The vector

Malaria is a parasitic disease transmitted by mosquitoes. Originally, it was believed that the disease came from marshy areas, hence the French name for the disease ('paludisme'), derived from the old word 'palud', or 'marsh'. In 1880, scientists discovered the real cause of malaria, a **parasite** called **plasmodium**. They later discovered that the parasite was transmitted from one person to another by being bitten by a female **Anopheles** mosquito, which is known as a "malaria vector".

Mosquitoes need blood to nourish their eggs and tend to bite after sunset; they are at their most active between 11pm and 6am, which is why the use of mosquito nets is the most effective form of individual prevention. Transmission is seasonal in many places, peaking during or just after the rainy season.

While malaria is found almost exclusively in rural areas in Asia, some Anopheles species have been able to adapt to specific environments, such as the suburban areas of large African cities.



Geographical distribution and at-risk populations

Some population groups run a much higher risk of contracting malaria and being severely affected than others, namely: newborns, children under five years old, pregnant women, people who are HIV-positive or suffering from AIDS, unimmunized migrants, nomadic populations and travellers. National malaria control programmes must take particular care to protect these groups from malaria, based on their situation.

The geographical distribution of malaria worldwide can be established in broad terms. Nonetheless, it is important to understand that because of the factors that influence the epidemiology of the disease mentioned above (the distribution of Anopheles, their capacity to act as a vector, the biological characteristics of the various species of Plasmodium, etc.), geographical distribution varies from one continent and one country to another, but also from one region or village to another, and sometimes even in the same village.

Global mobilization

The **RBM Partnership to End Malaria** is the largest global platform for coordinated action against malaria. Originally established as Roll Back Malaria (RBM) Partnership in 1998, it mobilizes action and resources and forges consensus among partners. The Partnership is comprised of more than 500 partners, including malaria-endemic countries, their bilateral and multilateral development partners, the private sector, non-governmental and community based organizations, foundations, and research and academic institutions.

In 2015, WHO set the target of reducing malaria by 90% by 2030 and eliminating the disease from a further 35 countries.

The Global Fund to Fight AIDS, Tuberculosis and Malaria, established in 2002, is the single largest source of funding for malaria, accounting for two thirds of all international funds.

This partnership between governments, civil society, the private sector and affected communities is an innovative approach to international funding for health.

Ending malaria is one of the targets of the UN's [Sustainable Development Goal no. 3](#): "By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases".

Furthermore, there is now widespread acceptance that it is essential to adopt a multisectoral approach and to incorporate malaria prevention in all the Sustainable Development Goals, given how closely the disease is linked to all stages of human development.

Spread of the vector

Although *Anopheles* mosquitoes are sensitive to pollution, they appear to have developed the ability to breed in very small areas of stagnant water, of either human or natural origin. The diversity of *Anopheles* species also allows them to adapt to a wide variety of sites and, probably more problematically, some species of *Anopheles* that were commonly found in specific places are now adapting to new environments (cf. *Anopheles stephensi*¹). Their evolution and climate change are, for example, allowing them to survive at higher altitudes than previously.

The significant demographic growth seen in cities is being accompanied by an expansion of land used for growing crops, and not only on the outskirts. Irrigation systems inevitably imply significant changes in the environment and urban agriculture is driving an increase in the number of breeding grounds used by *Anopheles*, effectively creating rural areas in city centres.



In addition, the practice of leaving containers out to collect rainwater for prolonged periods transforms them into perfect homes for *Anopheles*. Uncontrolled disposal of domestic wastewater in households that have no individual sanitation system also creates pools of water that encourage mosquitoes to breed.

Increase in the “plasmodium reservoir”

The number of individuals who have been previously infected in rural areas where the disease is endemic will increase in urban areas in response to migration or periodic trips (for example, to go to market). Where there are sudden or prolonged population movements (internally displaced people, migrant workers, etc.), exposure to plasmodium for *Anopheles* in urban areas becomes possible and the cycle of transmission is established. The main challenge is being able to determine the modes and scale of transmission in an urban area. Before a targeted response can be triggered, it is essential to be able to confirm whether urban transmission is a reality and to what extent, or whether cases of malaria have been imported from rural areas, hence the importance of a stronger surveillance system². Surveillance systems of this kind are an essential prerequisite for an adequate and effective response.



Specific characteristics of urban malaria

- **Relatively low prevalence:** the risk of malaria is still lower in cities and it remains essentially a rural disease.
- **Heterogeneous and unstable:** urban malaria may have a very different epidemiological characteristics from one region, one city and even one neighbourhood to another.
- **A more severe form of malaria:** although prevalence is lower in urban areas, there is also a downside. While city dwellers are less commonly infected and there is little consistency between them, they generally have poor, late and unstable immunity. Conversely, urban populations have better access to medical and health facilities and care, with more doctors, nurses, dispensaries and health centres, as well as a more assured supply of medicines.
- **Epidemic potential:** the chances of human-parasite encounters increase in the city because of the high concentration of people, the proximity of *Anopheles* sites and because the city limits wildlife and is home to few domestic animals: people are therefore the only prey available. Adult *Anopheles* therefore find ecological conditions in the city that tend to increase their power as vectors. Epidemic outbreaks are a risk when conditions suddenly become more suitable for *Anopheles*.

¹ Willlem Takken and Steve Lindsay Increased Threat of Urban Malaria from *Anopheles stephensi* Mosquitoes, Africa, July 2019

² Mark Wilson et al/ Urban Malaria: Understanding its Epidemiology, Ecology, and Transmission across Seven Diverse ICIMR Network Sites. *Am J Trop Med Hyg.* 2015 Sep 2; 93(3 Suppl): 110–123

Urban malaria control plan: possible avenues

It is therefore important to act quickly to protect city dwellers, who now constitute an at-risk population. Accordingly, the **International Association of Francophone Mayors** marked World Malaria Day 2019 by committing to international efforts to create a malaria-free world as part of the “Zero Malaria Starts With Me” campaign launched by the RBM Partnership to End Malaria.

Similar to – and alongside – the measures implemented to tackle dengue fever in numerous cities, there is a need for an action plan aimed specifically at urban malaria, which must be included in every city’s health plan.

1. **Commitment by local authorities and development of a dedicated urban strategy:** incorporate malaria prevention and vector-control measures into urban development strategies, including new housing and infrastructure projects. This strategy must be developed under the aegis of local authorities, town halls or joint municipal councils. A strong partnership between the public sector, private sector and civil society must be formalised and incorporated into a multisectoral strategy, involving key players from the health, environment, education and economic sectors.
2. **Adapt the control strategy to the diversity of epidemiological facies:** given the heterogeneity and instability of urban malaria, epidemiological (and, if possible, entomological) studies are necessary in order to map at-risk areas and identify target populations. Innovative methods, such as the use of salivary biomarkers for exposure, Geographical Information Systems (GIS) and remote detection can make a significant contribution, notably in the area of the aetiology of malaria in relation to environmental factors. Tools of this kind could guide malaria prevention campaigns towards higher-risk areas.
3. **Environmental management:** improve access to sanitation services and drinking water supplies. Water drainage works and developing a comprehensive plan for managing water resources that takes Anopheles breeding grounds into account.
4. **Targeted vector control in at-risk areas:** Targeted and locally appropriate vector control measures, including mosquito net distribution and indoor residual spraying, are recommended. Targeted distribution of mosquito nets and indoor residual spraying in very limited areas are, however, recommended.
5. **Health education** for at-risk communities and mass awareness-raising campaigns on preventing and treating malaria, which shares many symptoms with other diseases, including COVID-19
6. **Specialist technical training** for health care personnel and other frontline workers, to increase access to malaria prevention and care services for high-risk populations.
7. **Seasonal malaria chemoprevention:** this consists of administering a combination of anti-malaria drugs – at a therapeutic dose – during the season when the risk associated with malaria transmission is highest. SMC targeting children under five years old is recommended for areas with seasonal transmission of malaria. This measure should also be considered for urban districts at the highest risk, in conjunction with the national health authorities and institutional partners such as WHO.
8. **Targeted screening for at-risk populations:** where there is a high likelihood of an epidemic, it may be appropriate to implement systematic screening for malaria in limited urban and suburban areas identified as high risk. This strategy is used for particularly high-risk populations, such as forestry workers in South-East Asia, and can be implemented in limited areas.
9. **Stronger surveillance** of cases of malaria recorded in the city, such as local surveys for reported cases and collection of real-time information to provide reliable, relevant data to inform the local response. It is essential to be able to identify the parasite’s transmission site. Appropriate measures must be implemented if malaria transmission is within the urban environment (rather than the disease being imported from a rural area). City-to-city collaboration on the health agenda, including on surveillance strengthening, could be explored.