Preparing for Zika

The pace at which the Zika virus has moved across Latin America and the Caribbean indicates the emergence of a new global pandemic threat. The link between Zika and microcephaly, a birth defect in new-born babies, is not yet fully proven, but there is sufficient cause for crisis response in afflicted and at-risk areas, notably the Americas and the Caribbean. The approach of the Rio 2016 Olympic Games creates an August deadline for the Brazilian government to address the threat by tackling the mosquito vector after its failure to tackle the initial outbreak of the virus.

Pandemic Potential

- Ahead of the Rio 2016 Olympic Games in August-September, the spread of Zika threatens a global health emergency, but the situation is likely to prove less critical than initially feared due to apparent over-reporting of the link with microcephaly in Brazil and the low incidence of mosquitoes in Rio de Janeiro in August.
- Nevertheless, organisations in geographies with high prevalence of the aedes aegypti mosquito, which spreads the virus, should begin to consider their future response to a fast-moving pandemic through the southern US, sub-Saharan Africa, the Indian Subcontinent and South-east Asia. After the Americas, sub-Saharan Africa faces the highest risk.
- In countries already suffering outbreaks in the Americas, campaigns to exterminate mosquito populations require extensive support from corporate, government and public resources to eliminate reservoirs of both the vector and the virus. Brazil is the test case, as its government belatedly begins to respond to the outbreak, which has long since spread elsewhere.
- The link between microcephaly and Zika has yet to be confirmed scientifically, but the body of evidence from Brazil suggests that a connection is likely. Whether or not they show symptoms, pregnant women in at-risk areas should undergo early screening to inform personal decisions about their pregnancy.
- Until the severity is better understood, responses should focus on what is proven to work against the mosquito vector instead of magic bullet solutions, such as undeveloped vaccines or gene technology, useful as these may become at a future date. Meanwhile, health authorities must resist the emerging conspiracy theories and myths about the origins of the outbreak.

Threat Profile

Zika

The Zika virus was first identified in Uganda in 1947 during monitoring of monkeys with yellow fever. Before 2007, there had only been 14 documented cases. The first major outbreak occurred in Micronesia and ever since, the virus has moved around the world, mostly within the Americas and the Pacific. It was first identified in Brazil in May 2015, possibly having arrived from the Pacific with a traveller to the 2014 FIFA World Cup. By the end of the year, over a million people had been infected.

Initially, it attracted little attention. Patients typically experience mild symptoms, including a minor fever, sore body, headache, a body rash and red eyes. Some may suffer abdominal pain, nausea and diarrhoea. Many cases experience no symptoms at all. On rare occasions, Zika can lead to Guillain-Barré syndrome, a rare and potentially fatal neurological condition involving muscle weakness and paralysis.

Awareness of the most serious concern emerged later, after a significant body of evidence emerged that suggests the disease can induce a birth defect in pregnancies known as microcephaly, blocking the cranial development of the foetus. This February, the Brazilian government reported there had been 4,180 suspected cases of Zika-linked microcephaly since October 2015. The figure contrasted with just 147 cases of microcephaly reported nationwide the previous year. There was also a rise in birth defects in the French Polynesian islands after an outbreak there.

Babies born with the birth defect have smaller heads, often causing life-long development problems that can range from no problems at all to severe motor and learning disabilities. The cases in Brazil also point to further issues in brain development that suggest brains shrank while in the womb. The virus has been identified in brain tissue and the amniotic fluid of 17 babies and stillborn foetuses with microcephaly in mothers with Zika symptoms.

Nevertheless, the evidence linking the birth defects to Zika remains largely circumstantial. Although the World Health Organisation (WHO) deemed it serious enough to declare an international health emergency on 1 February, concerns over Brazil’s ability to collect reliable microcephaly data suggest that the connection with Zika may not be as widespread as initially feared, as the apparent spike in microcephaly also came via increased monitoring, not solely from Zika. The WHO’s response comes after it was criticised for its slow reaction to the Ebola crisis in West Africa, indicating threat perceptions may be overblown as scientists work to better understand the disease.
Defeating Mosquitoes

The pace of Zika's spread across Latin America results from the *aegypti* mosquito's adaptation to conditions related to the development pressures of rapid urbanisation. It thrives in densely populated areas without reliable water supplies, waste management and sanitation, demonstrating its threat to low-income populations. In richer countries such as the US and Chile, outbreaks will remain small and localised.

For governments:
- Incentivise local authorities with rewards for successful mosquito eradication outcomes and sanctions for officials responsible for failures to adhere to best practice.
- Support joined-up mosquito eradication programmes combining public health, security and education assets, with targeted support for high-prevalence areas.

For companies:
- Inform and educate staff about how to tackle the issue, such as encouraging employees to install screens on windows and offering guidance for pregnant women.

For travellers:
- Preventing bites is key. The mosquito mostly feeds at dusk and dawn, indoors, in shady areas or when the weather is cloudy.
- Wear long-sleeved clothing, use insect repellents containing DEET and keep residences cool with air conditioning.

The transmission vector is uniquely dangerous as the *aegypti* mosquito is exceptionally well-adapted to live alongside humans. Unlike other species that breed near larger bodies of water, it breeds in small pools of stagnant water, often near human habitation. As a result, it is crucial that individuals, businesses and local communities take proactive steps to limit mosquito-breeding habitats, such as clearing vegetation and removing litter and debris, particularly tyres.

**Aedes Aegypti**

The genus of Zika is a flavivirus, including it among some of the most fatal or widespread viruses for humans, including yellow fever, dengue, Japanese encephalitis and West Nile viruses, which are most commonly transmitted by bites from infected mosquitoes. One Zika case in Texas has been confirmed to have been linked to sexual transmission, but this remains extremely rare and evidence is more theoretical than practical.

With rare exceptions, Zika spreads by mosquitoes, not from person to person. It is primarily transmitted via the *aedes aegypti* mosquito, an invasive species widely spread across the tropical zones (see Figure 1). There is evidence that *aedes albopictus* can also transmit the virus, posing a threat to the US due to its greater range (see Figure 2).

**Figure 1:** Global map of the predicted distribution of *Ae. aegypti*. [The global distribution of the arbovirus vectors *Aedes aegypti* and *Ae. albopictus*. Kraemer, Moritz U G; Sinka, Marianne E; Duda, Kirsten A; Mylne, Adrian Q N; Shearer, Freya M et al. (2015) eLife vol. 4, p. e08347 http://elifesciences.org/lookup/doi/10.7554/eLife.08347.004]

**Figure 2:** The distribution of the occurrence database for *Ae. aegypti* (A) and *Ae. albopictus* (B) [Kramer et al.]
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