



# EDITORIALS

## Containing Zika while we wait for a vaccine

Develop point-of-care diagnostics to target behavior change and prevent spread

Ranu S Dhillon *doctor*<sup>1</sup>, Devabhaktuni Srikrishna *founder*<sup>2</sup>, Ashish K Jha *director*<sup>3</sup>

<sup>1</sup>Division of Global Health Equity, Brigham and Women's Hospital and Harvard Medical School Boston, MA, USA; <sup>2</sup>Patient KnowHow San Mateo, CA, USA; <sup>3</sup>Harvard Institute for Global Health, Boston, MA, USA

Though no longer considered an emergency by the World Health Organization, Zika virus has reached over 70 countries and continues to spread.<sup>1</sup> As long as each infected person infects, on average, at least one other person, the pandemic will grow. In highly affected areas, widespread infection and herd immunity could ultimately stall transmission but only after devastating consequences for new babies.<sup>2</sup> Efforts to develop a vaccine seem promising, but it remains at least months away.<sup>3-7</sup> In the interim, measures to eliminate mosquitoes, such as aerial spraying, cannot be effectively applied across over 70 countries. Other approaches are needed to stem transmission.

Eliminating mosquitoes is absolutely necessary only if there is substantial vertical transmission from mosquitoes to their offspring. For Zika, this is rare (1 in 290)<sup>8</sup> and insignificant compared with human mediated spread through mosquitoes and sex. About 80% of infected people are asymptomatic and therefore unaware they are propagating transmission. This “invisible” spread makes it difficult to know Zika's true transmission rate—estimates range from 1.4 to 6.6 new infections per infected person.<sup>9</sup>

Vaccines can block this transmission, but control is still possible without one. For example, malaria was eradicated in Sri Lanka by rapidly diagnosing and treating infected individuals and protecting those at risk.<sup>10</sup> We can similarly curb Zika using voluntary screening in areas of known transmission to identify infected people, then empowering them with the tools and education they need to prevent transmission. These include bed nets and repellents to prevent transmission through mosquitoes and condoms to prevent transmission through sex. Screening, which should be conducted confidentially to avoid stigma, could also identify where community level measures such as spraying might be optimally targeted. This strategy mirrors the approach Anthony Fauci proposed for ending HIV/AIDS, for which there is also no vaccine.<sup>11</sup>

Changing behavior is difficult, which is why vaccines are often prioritized during pandemics. However, during the Ebola crisis, it was large scale behavior change that marked a turning point in the epidemic.<sup>12-13</sup> For Zika, people are aware of the general advice to avoid mosquitoes and practice safe sex. However,

these messages are less effective when given in broad terms to large populations. People are more likely to change their behavior if they know they are infected and grasp the importance of protecting their loved ones and communities. In a Centers for Disease Prevention and Control meta-analysis, for example, high risk sexual behavior among people who were HIV positive was 68% lower among those who were aware of their diagnosis than among those who were unaware.<sup>14</sup>

Door-to-door screening is already happening in some counties of Florida,<sup>15-16</sup> but screening on a wider scale—as needed in Puerto Rico where one in four people may become infected<sup>17</sup>—requires a point-of-care test, ideally self administered, so people can learn their infection status. Currently, Zika is diagnosed with laboratory based methods that cannot be scaled up for screening, especially in developing countries. Even Florida, with plenty of financial resources, can perform only a few hundred tests a day,<sup>18</sup> and some pregnant women wait six weeks for results.<sup>19</sup>

A point-of-care screening test would need to be specific enough to permit laboratory confirmation of positive results yet sensitive enough to reduce the transmission rate below one.<sup>20</sup> Antibody or viral RNA tests are both possible but neither is perfect. Antibody tests would identify new cases during the first week of infection<sup>21</sup> but may also detect people with past infection who are not currently viremic and therefore no longer a source of mosquito-borne transmission (though the virus remains transmissible through semen and possibly other bodily fluids for months).<sup>22-23</sup> Viral RNA tests<sup>24</sup> would identify active viremia but miss those with recent infection.

Ideally, a test would use both approaches, but, practically, since most transmission is through mosquitoes,<sup>25</sup> whichever type is developed first should be immediately deployed. Antibody tests, likely to be faster and cheaper to develop,<sup>26</sup> could be implemented with traditional laboratory based testing to determine whether people have active or past infection.

Recently, the US government announced a \$20m (£16m; €19m) competition for point-of-care tests for antimicrobial resistance. A similar initiative is needed for Zika. The US government has awarded contracts for companies to develop point-of-care Zika

diagnostics,<sup>27-29</sup> but with no accelerated or definite time frame to assure availability within the next few months—the critical timescale. If made a priority with resources to back it up, point-of-care Zika tests could be developed within months at a fraction of the cost of vaccines.<sup>28-31</sup>

In countries with even rudimentary health systems, screening could be implemented through existing clinics and community health workers, enabling rapid scale-up to areas with active transmission at minimal incremental cost. In settings where healthcare access is limited, screening could be conducted through outreach, perhaps using community based institutions such as schools and non-profit groups.

Until a Zika vaccine is available, we could mimic its effect on human mediated transmission with voluntary screening and targeted engagement and, within months, slow Zika's spread.

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