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Zika virus: A call to action for physicians in the era of climate change

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*Commentary***Zika Virus: A Call to Action for Physicians in the Era of Climate Change****Abstract**

In February 2016, the World Health Organization declared the mosquito-borne Zika virus to be a "public health emergency of international concern" as the disease linked to thousands of birth defects in Brazil spreads rapidly. The distribution of the *Aedes* mosquitos, in particular, have drastically increased over the past few decades, which have also been the hottest decades on Earth in more than 1,000 years based on climate proxy measures. Although it's a combination of reasons that explain the current Zika virus outbreak, it's highly likely that climate changes are contributing to the spread of *Aedes* mosquitos that are carrying the Zika virus, a pathogen causing serious birth defects. As trusted and educated members of society, physicians, both individually and collectively, have critical roles to play. In addition to clinical management and prevention of Zika, physicians should communicate about the health benefits of addressing climate change in straightforward, evidence-based language to their local community and policymakers, and support for policies mitigating climate change.

*Commentary***Zika Virus: A Call to Action for Physicians in the Era of Climate Change**

As climate concerns grow, amid unseasonably warm temperatures, scientists have expressed concerns about virulent infectious diseases, such as West Nile, dengue fever, and Zika.¹ These diseases, borne by mosquitoes, thrive in weather conditions of heat, precipitation, and humidity, where mosquitoes can expand their range, accelerate their life cycles, and boost their ability to carry these diseases and infect humans.² Zika is the newest infection to present one of the worst health scares in recent history on a global scale. The World Health Organization recently declared the mosquito-borne Zika virus to be a "public health emergency of international concern" (PHEIC) as the disease linked to thousands of birth defects in Brazil spreads rapidly.³ In this paper, we argue that physicians should take a more active role in combating the changes in the climate that can facilitate the spread of Zika, along with other infectious diseases.

Zika and Climate Change

Zika is an infectious disease, spread mainly by *Aedes* mosquitoes.³ The same species of mosquitoes that transmits Zika also spreads dengue and chikungunya.³ Although Zika, dengue, and chikungunya share similar initial symptoms, they have different complications.³ The Zika outbreak has been linked to microcephaly and other birth complications and Guillain-Barre syndrome in older individuals.³

Zika virus was first detected in Zika Forest in Uganda in 1947 in a rhesus monkey, and again in 1948 in the mosquito *Aedes africanus*, which is the forest relative of *Aedes aegypti*.³

Aedes aegypti and *Aedes albopictus* can both spread Zika.³ Zika emerged in Brazil in May 2015 with the first reported human case.³ Then Zika erupted after an extraordinarily hot and rainy El Niño summer and the severe flooding that was predicted by the Intergovernmental Panel on Climate Change as a development related to global warming.⁴ Zika soon reached epidemic proportions in Brazil, infecting between 500,000 and 1.5 million Brazilians in an eight-month period.³ Zika has since quickly spread to dozens of countries.³

Although it's a combination of reasons that explain the current Zika virus outbreak, including movement of people and interruption of mosquito eradication campaigns,⁵ there are reasons that aspects of climate change, warmer wetter weather and flooding, may be contributing to the crisis.¹ First, mosquitoes flourish in warm humid climates, defining their range based on temperature and moisture.^{6,7} With climate change, mosquitoes can expand their range as new areas become more suitable habitat.^{6,7} Once requirements to outbreak initiation and other disease dynamics are in place, mosquitoes can then introduce diseases to populations that otherwise would have been safely out of reach. The distribution of the *Aedes* mosquitos, in particular, have drastically increased over the past few decades, which have also been the hottest decades on Earth in more than 1,000 years based on climate proxy measures.⁸ The current epidemic took off in 2015, the hottest year in South America and globally since record-keeping began 136 years ago.⁸ It should be noted that temperature change can affect the development rate and transmission rate of disease in the cold-blooded mosquito.^{6,7} There is also the potential for the mosquito to be alive longer while infectious, thus having more time to transmit the disease.^{6,7} Further, female mosquitoes require blood for reproduction. Mosquitoes may feed more frequently with higher temperatures.^{6,7}

Physicians' Roles in Climate Change

For years, scientists have anticipated the possible medical effects for humans of global warming.¹ Physicians are now reporting these repercussions as respiratory problems aggravated by poor air quality, wildfire smoke, longer pollen seasons, and reactions to mold growth, as well as injuries and illness that they believe are as a result of extreme weather events.^{9,10} Nevertheless, climate change has taken a much lower level of attention in the medical community than it should be having. Climate change could put vulnerable populations at greater risk of becoming ill. Persons who are elderly, sick, or poor are especially susceptible to these potential consequences. Limiting climate change and increasing awareness of the related health risks and consequences could subdue some of the medical consequences of rising temperatures, including the spread of mosquito-borne illnesses.

A 2014 study shows that primary care physicians are the most trusted source for information on climate change issues related to health.¹¹ Moreover, this trust is largely consistent across all segments regardless of current beliefs and attitudes toward climate change.¹¹ This puts physicians in a unique position in society today to combat climate change.^{12,13} Hence, physicians, as trusted medical advisors, health educators, and community leaders, can reach and educate large numbers of individuals on the health risks or effects associated with climate change. This is a critical component in the efforts to prevent adverse medical effects caused or intensified by environmental conditions attributable to climate change. As health risks increase from climate change, physicians will find themselves on the front lines of patient care for those that are affected by it. If all physicians are doing is treating on an individual basis and failing to understand some of the causes for those individual care challenges, then opportunities are missed from a policy and regulatory level to get at some of the larger causes of these problems.

A Call to Action

As suggested by the Centers for Disease Control and Prevention and the Pan American Health Organization, physicians play a crucial role in the clinical management and prevention of Zika.^{14,15} Although some physicians might be hesitant to take a public stand on climate change, most physicians will have to contemplate its implications when it comes to patient care. Already a growing number of physicians is calling for more direct dialogue with patients about the health risks associated with climate change.¹⁶ By doing so, physicians can promote better disease management and prevention.

Also, it is imperative that patients are aware that climate change affects human health. As a 2015 study reveals that while many Americans have a generic sense that global warming may be detrimental to health, relatively few know the kinds of harm it brings about or who is most likely to be affected.¹⁷ For that reason, physicians can play a crucial role in ensuring that patients, especially those most at risk, have a reasonable understanding of this link. However, awareness itself is likely inadequate for patients to take action to minimize personal health risks.¹⁸ When communicating with patients about climate change-related health risks, physicians can corroborate what their patients are already experiencing. For example, summer heat waves are becoming more severe and allergy seasons are growing longer. By doing so, physicians can help patients connect personal experiences with greater health risks. When coupled with suggested actions to mitigate these risks, patients may feel more empowered to act.

Additionally, physicians can lead by example by promoting recycling, switching to renewables, or reducing energy waste at work. This facilitates physicians to communicate a "lifestyle message" to their patients. This involves posting signs or distributing pamphlets in the

waiting room about how climate change could impact their health and what action they can take to minimize the effects. These measures can help encourage patients' healthy eco-friendly behaviors.

Furthermore, physicians can advocate for policy change, as individual practitioners or collectively through professional associations, such as the *American College of Physicians*, *American Medical Association*, and the *Global Climate and Health Alliance*. These organizations can use their power and influence on public policy to add credence to the climate change discussion and move it from debate to planning and prevention. While some consider climate change a politicized issue, it is easier for a policymaker to pay attention to climate change when it is framed as a health issue. Indeed, physician advocacy is having an impact on policymakers, as evidenced by the first Summit on Public Health and Climate Change at the White House in summer 2015.¹⁹

Climate change is already having an adverse effect on human health.²⁰ There is a growing role for physicians to engage with patients and policymakers to promote better health outcomes. With Zika virus continuing to spread and likely reaching all territories where *Aedes* mosquitoes can be found, there is no better time for action.

Conclusion

It's highly likely that climate changes are contributing to the spread of the *Aedes* mosquitos that are carrying the Zika virus, a pathogen causing serious birth defects. As trusted and educated members of society, physicians, both individually and collectively, have critical roles to play. In addition to clinical management and prevention of Zika, physicians should communicate about the health benefits of addressing climate change in straightforward,

evidence-based language to their local community and policymakers, and support for policies mitigating climate change.

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