



Editorial

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

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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 has drastically increased over the past few decades, which have been the hottest decades on Earth in more than 1000 years based on climate proxy measures. Although a combination of factors explains the current Zika virus outbreak, it's highly likely that the changes in the climate contribute to the spread of *Aedes* vector carrying the Zika virus, the pathogen causing serious birth defects. Physicians, both individually and collectively, as trusted and educated members of society 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 communities and policymakers, and make clear their support for policies mitigating climate change.

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1. Introduction

As climate concerns grow, amid unseasonably warm temperatures, scientists have expressed concerns about virulent infectious diseases, such as West Nile, dengue fever, chikungunya and Zika (Kahn, 2016). These diseases, borne by mosquitoes, thrive in weather conditions of heat, precipitation, and humidity, where mosquitoes expand their range and accelerate their life cycles, boosting their ability to carry such diseases and infect humans (Bradshaw and Holzapfel, 2006). 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 and Puerto Rico continues to spread rapidly (World Health Organization, 2016). 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, and other infectious diseases.

2. Zika and climate change

Zika is an infectious disease, spread mainly by *Aedes* mosquitoes (World Health Organization, 2016). The same species of mosquitoes that transmits Zika also spreads dengue and chikungunya (World Health Organization, 2016). Although Zika, dengue, and chikungunya share similar initial symptoms, they have different complications

(World Health Organization, 2016). The Zika outbreak has been linked to microcephaly and other birth complications and Guillain-Barre syndrome in older individuals (World Health Organization, 2016).

Zika virus was first detected in the 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* (World Health Organization, 2016). *Aedes aegypti* and *Aedes albopictus* can both spread Zika (World Health Organization, 2016). Zika emerged in Brazil in May 2015 with the first reported human case (World Health Organization, 2016). Then a Zika outbreak erupted after an extraordinarily hot and rainy El Niño summer with severe flooding that was predicted by the Intergovernmental Panel on Climate Change as a development related to global warming (Intergovernmental Panel on Climate Change, 2014). Zika soon reached epidemic proportions in Brazil, infecting between 500,000 and 1.5 million Brazilians in an eight-month period (World Health Organization, 2016). Zika has since quickly spread to dozens of countries (World Health Organization, 2016).

Although it's a combination of reasons that explains the current Zika virus outbreak, including movement of people and interruption of mosquito eradication campaigns (Pan American Health Organization, 1997), there are reasons that aspects of climate change, warmer wetter weather and flooding, may be contributing to the crisis (Kahn, 2016). First, mosquitoes flourish in warm humid climates, defining their range based on temperature and moisture (Wu et al., 2007; Barrera et al., 2011). With climate change, mosquitoes can expand their range as new areas become more suitable habitat (Wu et al., 2007; Barrera et al., 2011). 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

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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 1000 years based on climate proxy measures (National Oceanic and Atmospheric Administration, 2016). The current epidemic took off in 2015, the hottest year in South America and globally since record-keeping began 136 years ago (National Oceanic and Atmospheric Administration, 2016). It should be noted that temperature change can affect the development rate and transmission rate of disease in the cold-blooded mosquito (Wu et al., 2007; Barrera et al., 2011). Female mosquitoes require blood for reproduction. Mosquitoes may feed more frequently with higher temperatures. There is also the potential for the mosquito to be alive longer while infectious, thus having more time to transmit the disease (Wu et al., 2007; Barrera et al., 2011).

3. Physicians' roles in climate change

For years, scientists have anticipated the possible medical effects on humans of global warming (Kahn, 2016). Physicians are now reporting repercussions such as respiratory problems that are aggravated by poor air quality, wildfire smoke, longer pollen seasons, and allergic reactions to mold growth, as well as injuries that they judge to be a result of extreme weather events (Sarfaty et al., 2015; Sarfaty et al., 2016). Nevertheless, climate change is getting a much lower level of attention in the medical community than it should. 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 how to protect against them could lessen the medical consequences of rising temperatures, including the spread of mosquito-borne illnesses.

A 2014 study shows that primary care physicians are one of the most trusted source for information on climate change issues related to health (Roser-Renouf et al., 2015). Moreover, this trust is largely consistent across all segments of the population regardless of current beliefs and attitudes toward climate change (Roser-Renouf et al., 2015). This puts physicians in a unique position in society today to combat climate change (Sibbald, 2013; Widge, 2016). 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 physicians only treat individuals and fail 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.

4. 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 (Centers for Disease Control and Prevention, 2016; Pan American Health Organization, 2016). 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 (Koh, 2016). 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 (Maibach et al., 2015). 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 (Van Der Linden, 2016). 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 (Frieden, 2015).

Climate change is already having an adverse effect on human health (Crowley, 2016). 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.

5. 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.

Transparency document

The Transparency document associated with this article can be found, in the online version.

List of where and when the study has been presented in part elsewhere, if applicable

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