How is climate change affecting the spread of vector-, water- and food-borne diseases?

EPH247

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Findings

We found that climate change has increased the geographical spread of vector-, water- and food-borne diseases as well as the risk of acquiring these diseases. Of the identified studies, most reported on the effect of climate change on vector-borne diseases, with fewer describing the impacts on water- and food-borne diseases. This is unsurprising given the current increase in the frequency of diseases such as dengue; however, as global temperatures are expected to rise further and the burden of these diseases is likely to increase, more research is needed to quantify the impact this will have in the future.

Introduction

In the past decade, global temperatures have risen by ~1°C relative to preindustrial times,[1–3] leading to rising sea levels, extreme weather events and potential displacement of populations.[3–5] The incidence of vector-, water- and food-borne diseases is exacerbated by climate change, particularly due to rising temperatures and extreme weather events.[1–21] Vector-borne diseases are those spread by arthropod vectors, such as mosquitoes and ticks, while water- and food-borne diseases are caused by ingesting pathogens via contaminated water and food.[17] This review aims to understand how climate change has influenced the spread of vector-, water- and food-borne diseases in recent years and explore the human burden associated with the rise in these diseases.

Methods

A literature review was conducted to investigate how climate change impacts vector-, water- and food-borne diseases. We searched MEDLINE for reviews published within the last 5 years. The search strategy used a combination of keywords such as ‘climate change’, ‘global warming’, ‘vector-borne’, ‘water-borne’ and ‘food-borne’. Abstracts and full articles were assessed for eligibility.

Eligible articles contained data relating to the geographical spread of disease, the increased risk of disease, the impact of extreme weather events on these diseases, and the humanistic, societal and economic burden that these diseases present.

Objective

To explore how climate change has increased the spread of vector-, water- and food-borne diseases and understand how this could impact these diseases in the future as global temperatures continue to rise.

Results and interpretation

In total, 21 studies were eligible for inclusion, reporting on a range of vector-, water- and food-borne diseases associated with climate change (Figure 1). All studies noted the substantial influence climate change exerts on these diseases,[1–21] with one study reporting that 58% of infectious diseases worldwide have been exacerbated by climate change.[3]

Fifteen studies reported on the increased geographical spread and risk of vector-, water- and food-borne diseases due to climate change,[2–14,20,21] while eight studies described the impact of extreme weather events on these diseases.[3,5,8,12,13,15,16,21] Only five studies reported on the disease burden caused by the rise in climate-sensitive diseases, focusing on how they are predicted to increase mortality (Figure 2).[7,17–19,21] Vector-borne diseases were particularly sensitive to rising temperatures,[1] which increased vector abundance, lengthened the transmission season in endemic areas and allowed vectors to spread to regions they had not previously inhabited.[4,7,12–14] Extreme weather events such as flooding provided additional breeding sites for vectors, increasing the spread of vector-borne diseases.[13,16] These events also led to the contamination of drinking water supplies, increasing the spread of water-borne diseases.[3,15–17] Overall, there was a shortage of studies on this topic, compounded by the fact that reporting of climate events and/or disease incidence is not standardized and is lacking in many countries.

Figure 1: Percentage of studies reporting the impacts of climate change on vector-, water- and food-borne diseases.

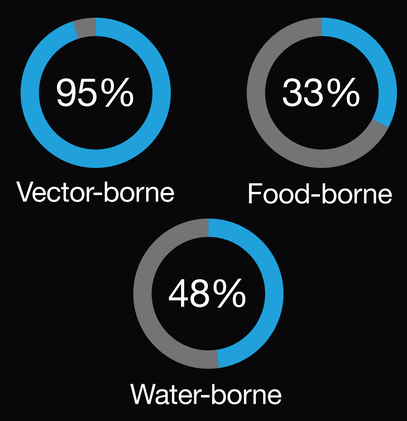
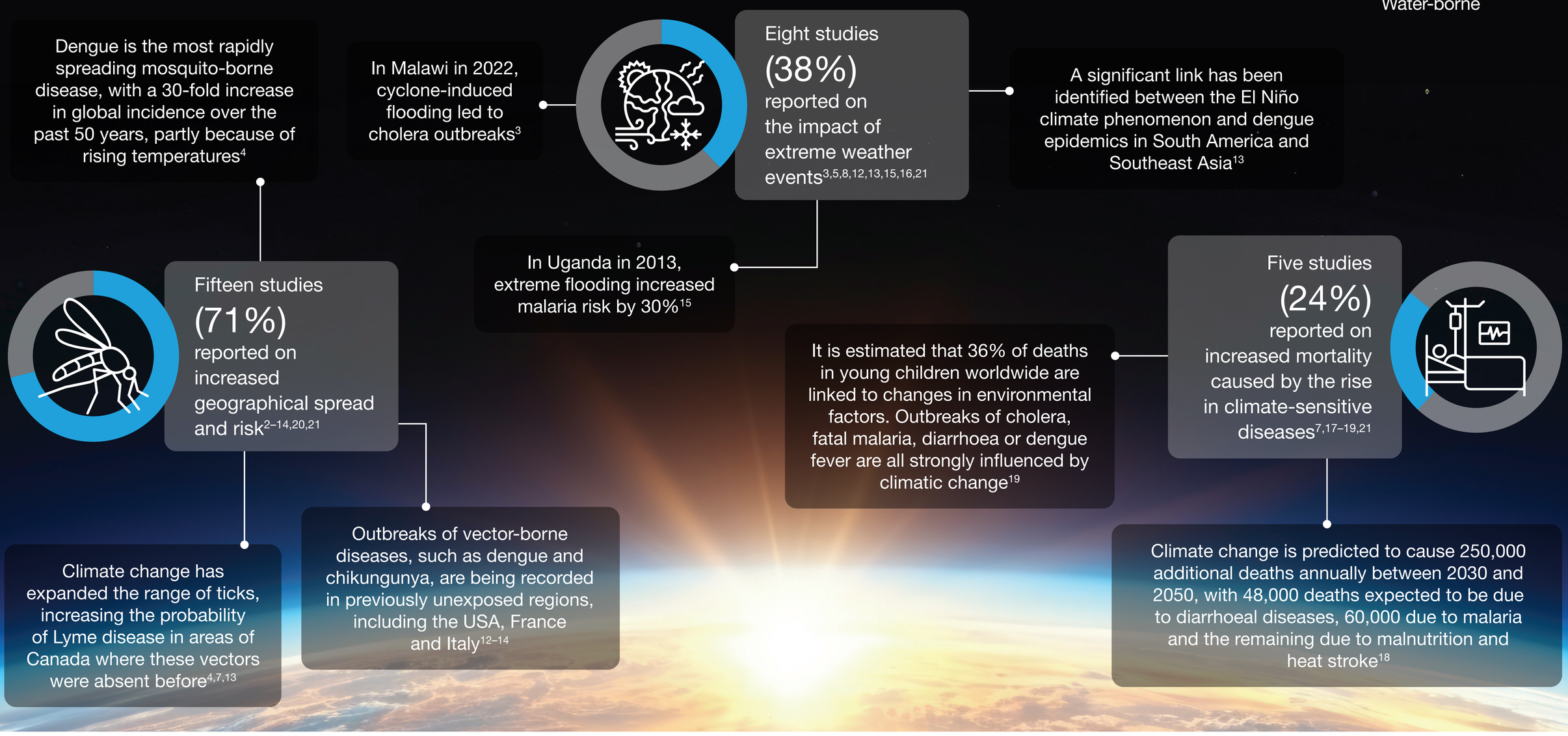


Figure 2: Eligible studies that contained data relating to geographical spread and risk of disease, the impact of extreme weather events on diseases and the human burden caused by climate-sensitive diseases.



References

1. Baharom M *et al. Int J Environ Res Public Health* 2021;18:11117.
2. Khatib A. *Curr Infect Dis Rep* 2023;25:77–85.
3. Kim CL *et al. Front Public Health* 2023;11:1252910.
4. Caminade C *et al. Ann N Y Acad Sci* 2019;1436:157–73.
5. Mahmud A *et al. Curr Environ Health Rep* 2020;7:384–91.
6. Adepjou O *et al. Curr Trop Med Rep* 2023;10:47–70.
7. Chala B *et al. Front Public Healt*h 2021;9:715759.
8. Khan M *et al. Int J Environ Res Public Health* 2019;16:2799.
9. Leal Filho W *et al. Int J Environ Res Public Health* 2022;19:893.
10. Rocklov J *et al. Nat Immunol* 2020;21:479–83.
11. Salvador C *et al. Annu Rev Public Health* 2023;44:213–32.
12. Semenza J *et al. Lancet Reg Health Eur* 2021;9:100230.
13. Semenza J *et al. Infect Dis Ther* 2022;11:1371–90.
14. Tidman R *et al. Trans R Soc Trop Med Hyg* 2021;115:147–68.
15. Fouque F *et al. Infect Dis Poverty* 2019;8:51.
16. Aune K *et al. Int J Environ Res Public Healt*h 2021;19:165.
17. Cissé G *et al. Acta Trop* 2019;194:181–8.
18. Ahmed T *et al. Int J Environ Res Public Health* 2019;16:3165.
19. El-Sayed A *et al. Environ Sci Pollut Res Int* 2020;27:22336–52.
20. Miranda LS *et al. Biology* 2024;13:182.
21. Zain A *et al. Singapore Med J* 2024;65:211–9.

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