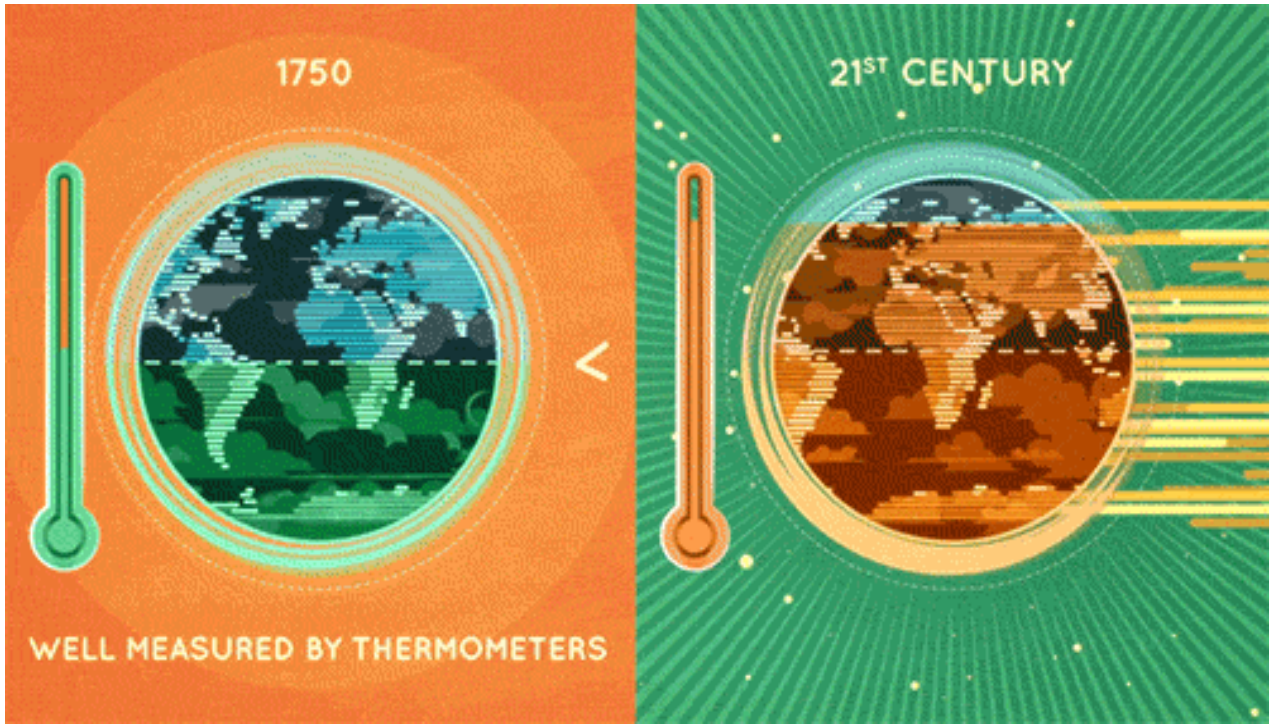
Coming in Hot



THE EFFECT OF CLIMATE CHANGE ON PREDICTED VIRAL TRANSMISSION PATTERNS

Objectives

Review trends in global climate change and its predicted effect on vector borne diseases

Brainstorm personal, medical practice, and policy changes to help mitigate the effect of climate change

Clinical Case

HPI: 43 year old. 1 week of low grade fevers, myalgias, malaise.

Day 3: bilateral hand/foot swelling.

No recent travel, hiking, unprotected sex, sick contacts.

Pruritic centripetal rash.

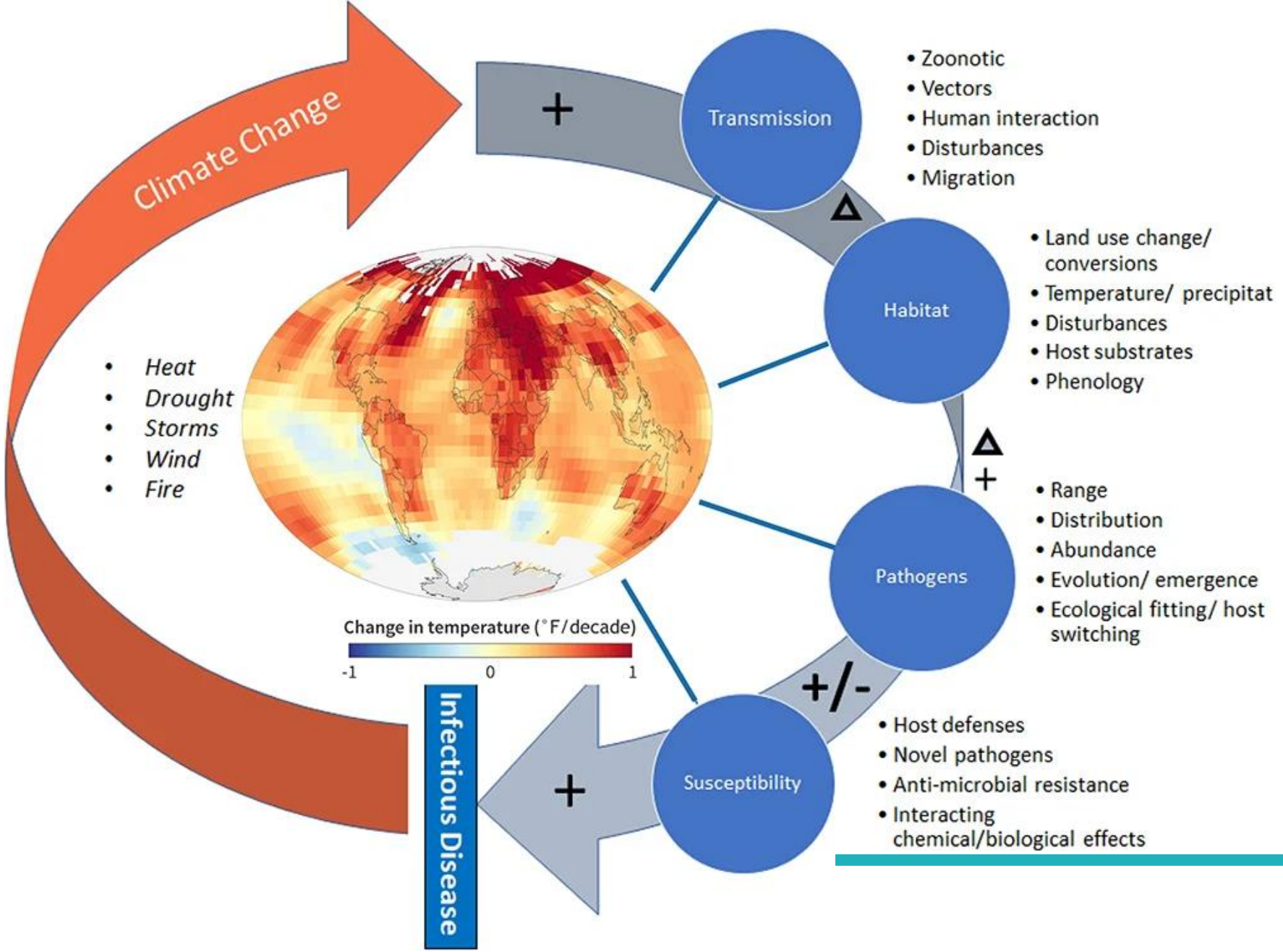
ROS: +night sweats, +retro-orbital pain, headaches, nasal congestion. -n/v/d/chest pain.

PMH: EBV at age 20, Dengue at age 12 while living in Colombia

SHx: MSM, no new sexual partners & negative STI 4 weeks before symptom onset

PE: VSS. Synovitis of PIP/DIP.

Labs: normal CXR/CBC. Negative BCs. neg GAS, Influenza, EBV, tuberculosis, STIs, ANA, hepatitis B/C/chikungunya, zika. CRP 96. ESR 34



Hauser et al. "Climate Change and Infections on the Move in North America."
Infection and Drug Resistance 2021:14 5711–5723

Dengue Epidemiology Changes Globally (1960s-2020)

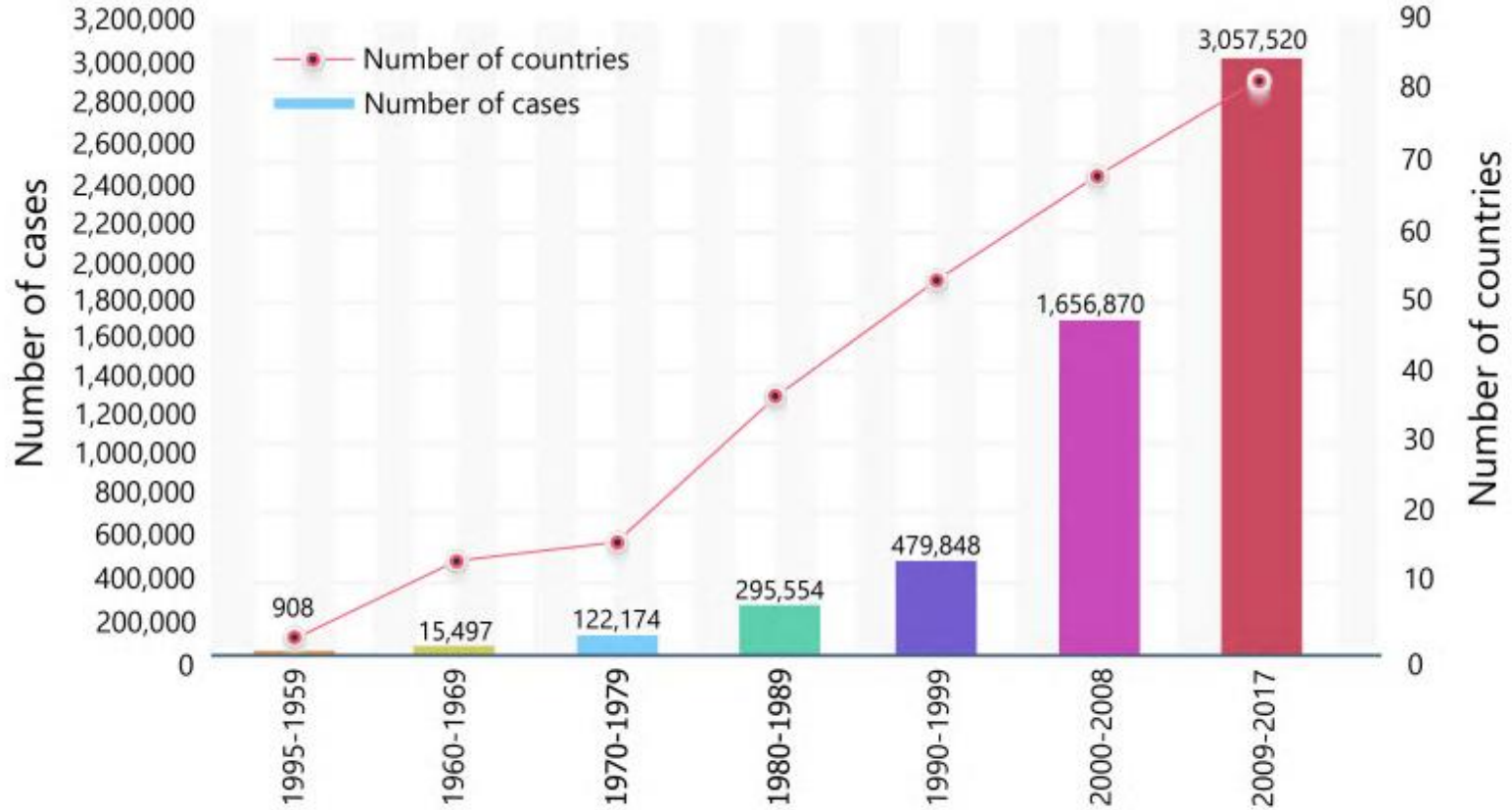
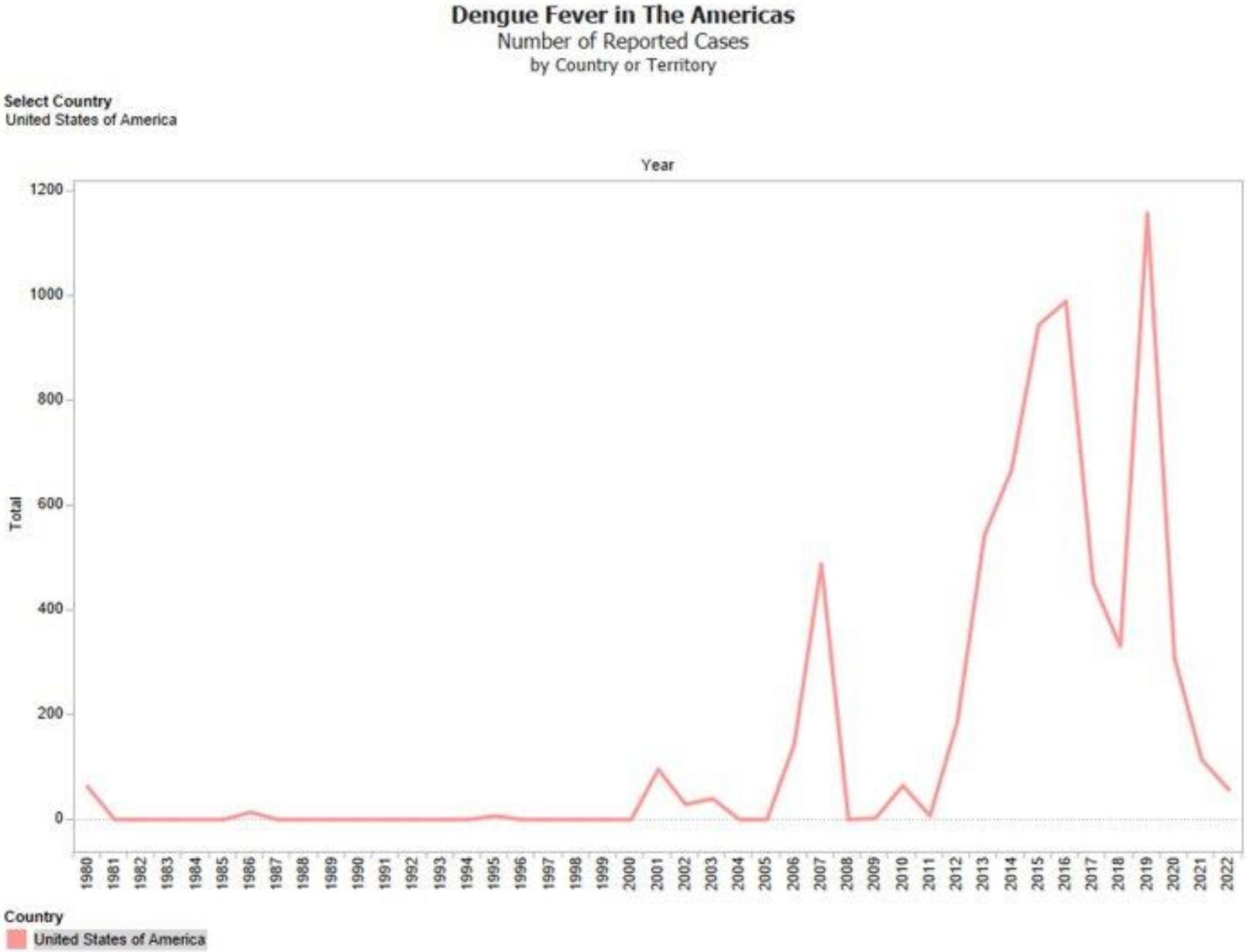


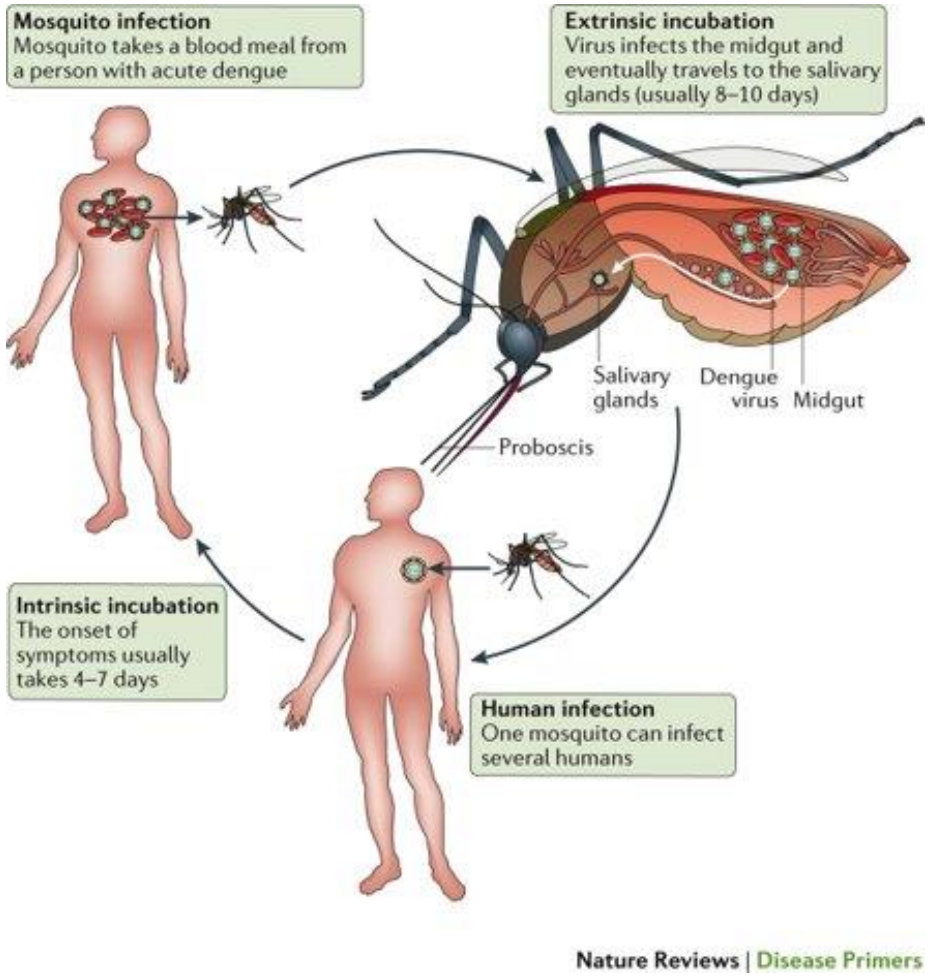
FIGURE 1. The number of reported dengue cases between 1950 – 2017.

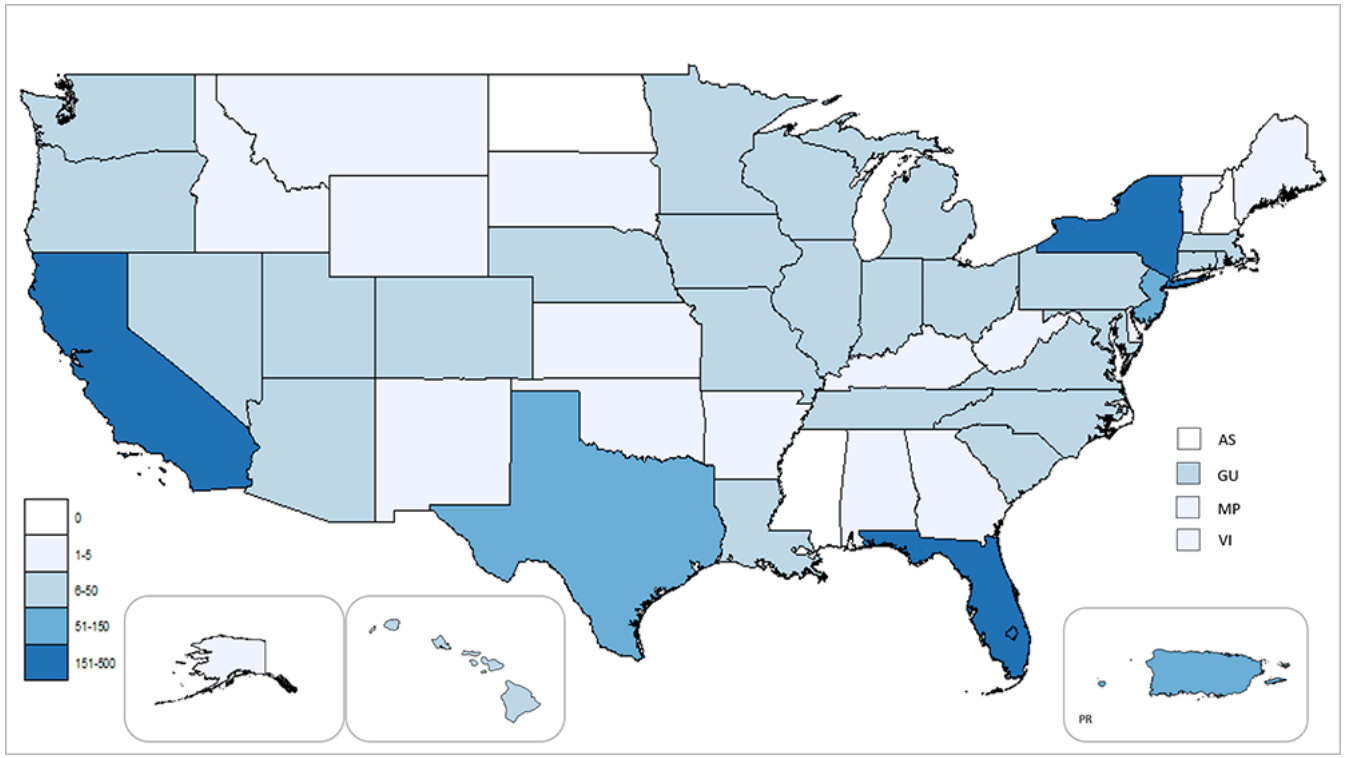
Siriyasatien, Padet & Chadsuthi, Sudarat & Phd, Katechan & Kesorn, Kraisak. (2018). Dengue Epidemics Prediction: A Survey of the State-of-the-Art Based on Data Science Processes. IEEE Access. 6. 1-39. 10.1109/ACCESS.2018.2871241.



Pan American Health Organization
Source: Health Information Platform for the Americas (PLISA) - Data reported by Ministries & Institutes of Health.
Number of reported cases of dengue includes all dengue cases, suspected, probably, confirmed, non-severe, and severe cases/deaths.

States and territories reporting dengue cases – United States, 2019





US States

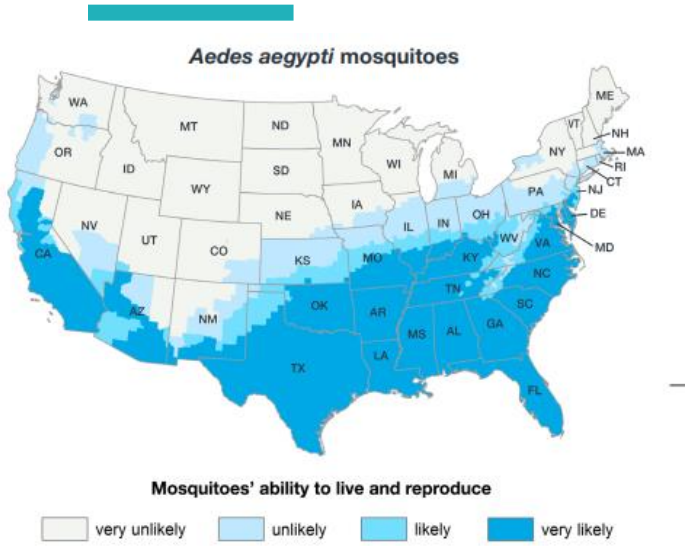
- 1,475 dengue cases reported

US Territories

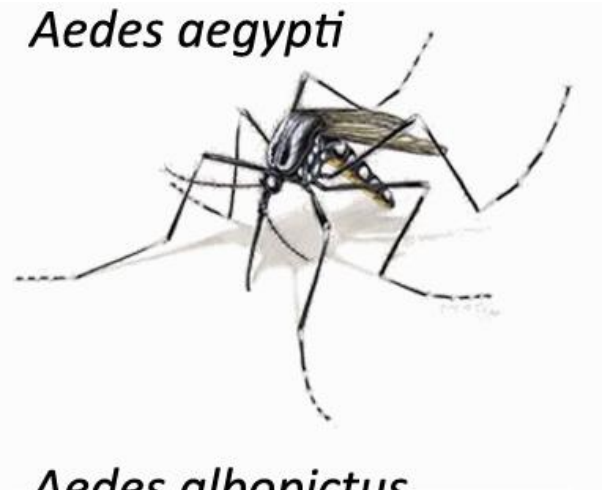
- 118 dengue cases reported

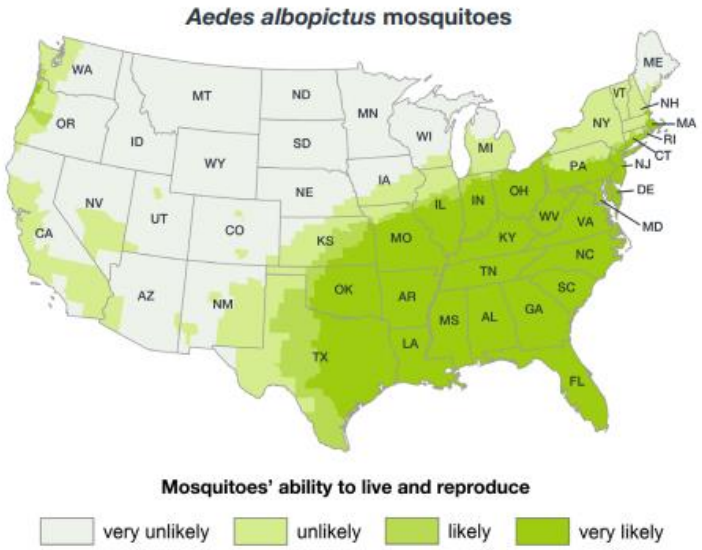
https://www.cdc.gov/dengue/statistics-maps/2019.html

Dengue Transmission Mosquitos in the US

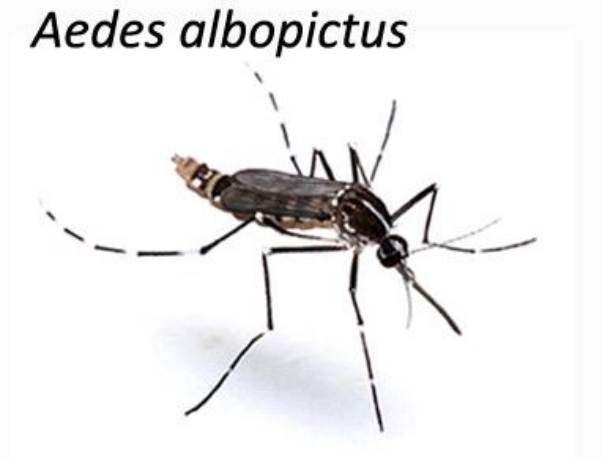


- Aedes aegypti
- Preferentially feeds off humans
- Transmits chikungunya, yellow fever, Zika, Dengue



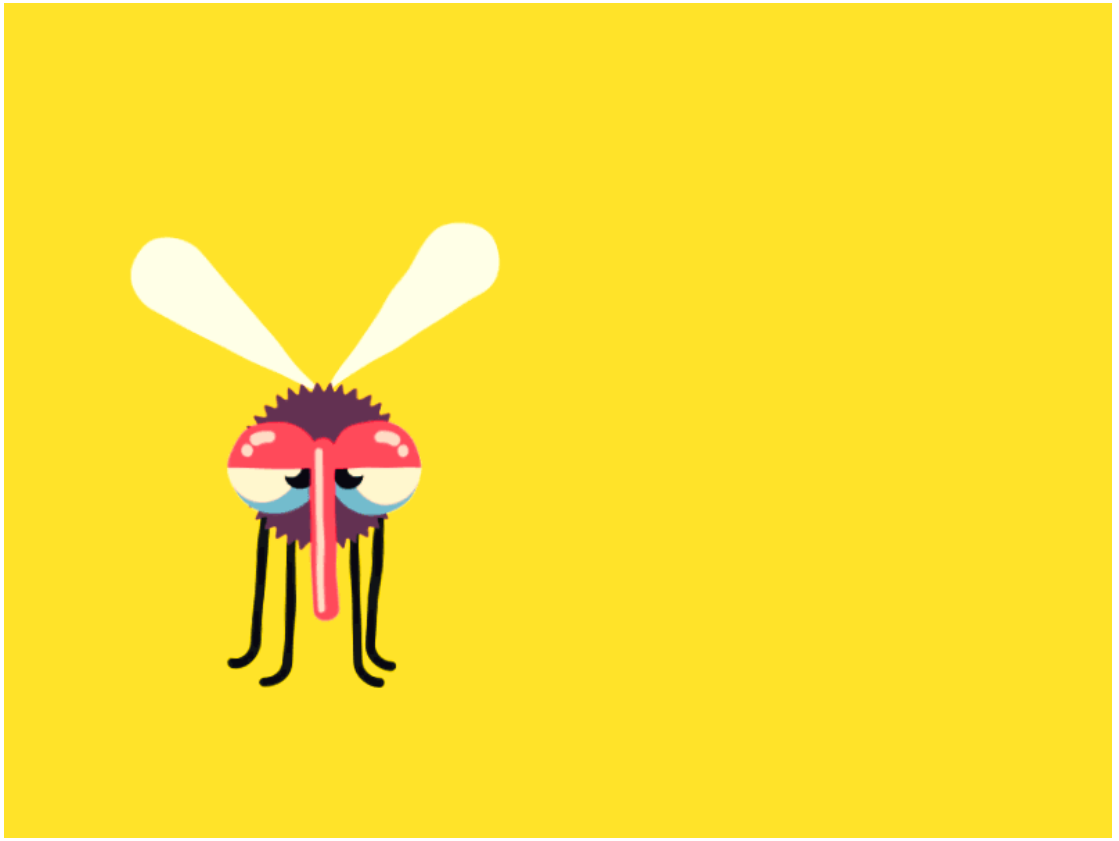


- Aedes albopticus
- Secondary dengue vector
- Est. In urban areas
- Tolerates colder conditions



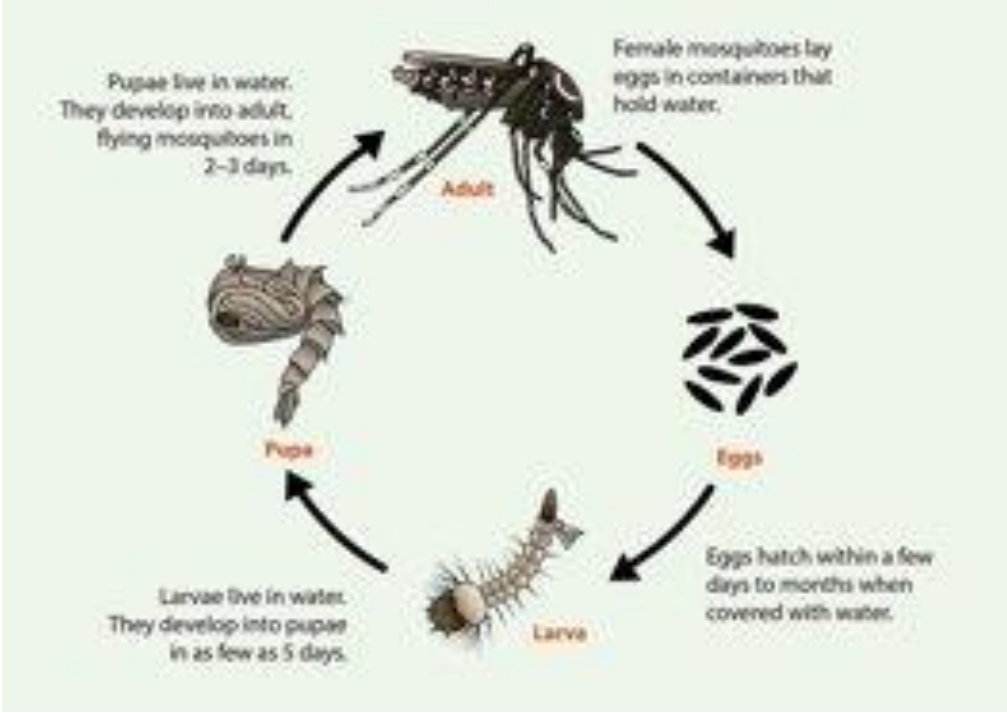
https://www.cdc.gov/zika/pdfs/Zika-mosquito-maps.pdf

How does climate change affect dengue virus transmission and Aedes Aegypti?



Some like it hot.

- Ideal temperature range: 29C
- Below 15C, 0% eggs survive
- At 20C, 90% of eggs survive
- At 15C = 60 days between egg to maturity
- Between 27-34C: maturity within 6 days.
- Mosquitos must feed to breed
- Warmer temperatures = increased biting frequency



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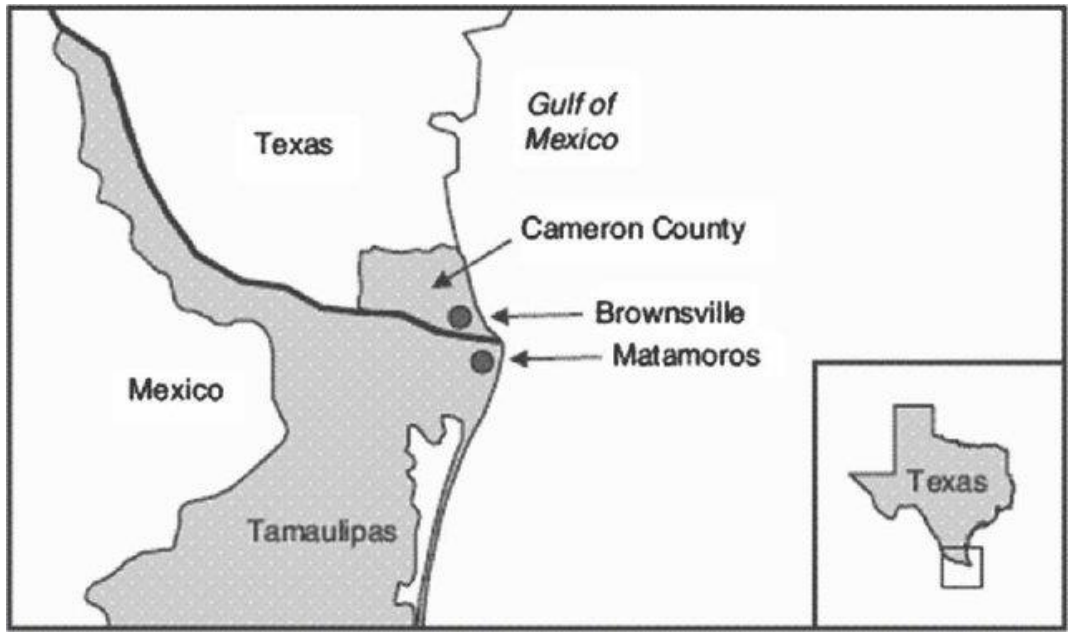
What does this mean for us?

“The risk depends on the public health measures.”

—MARINA ROMANELLO

Environmental responses matter

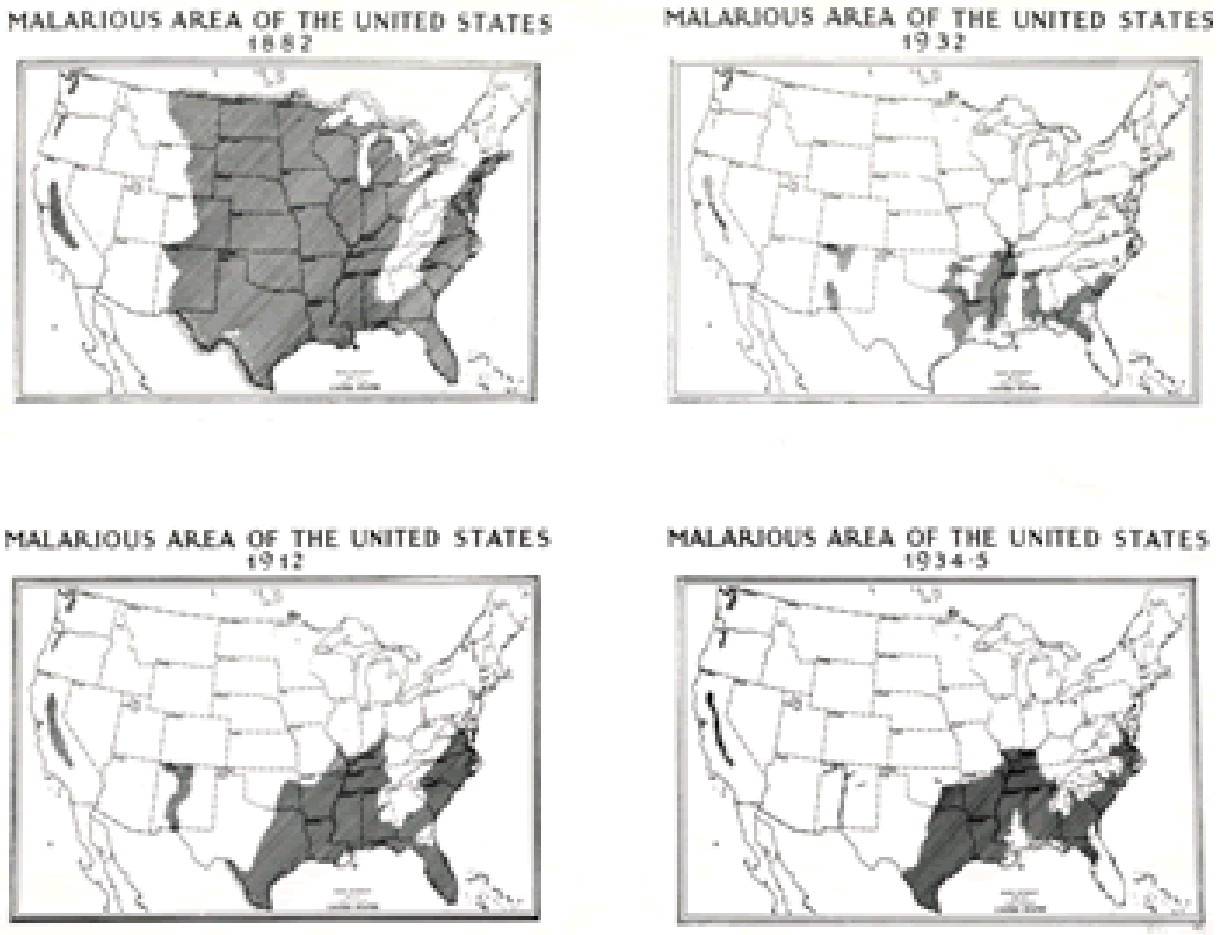
- Vector borne diseases disproportionately affect the poor
- Matamoros 32% seroprevalence for dengue
- Brownsville 4% seroprevalence for dengue
- Reduced access to air conditioning
- Smaller lot size
- Decreased use of insect repellants



M. M. Ramos, H. Mohammed, E. Zielinski-Gutierrez et al., "Epidemic dengue and dengue hemorrhagic fever at the Texas-Mexico border: Results of a household-based seroepidemiologic survey, December 2005," *American Journal of Tropical Medicine and Hygiene* 78/3 (2008), pp. 364-369.

Malaria Eradication in the US

- In 1850, malaria was the leading cause of death in America
- In 1949, malaria "eradicated" from the US through public health measures



1850-1860: Malnutrition and Immune Disorders. *J Econ Hist*. 2007;67(4):1001-1035. doi:10.1017/S002205070700472targated mosquito responses, malaria was eradicated in US

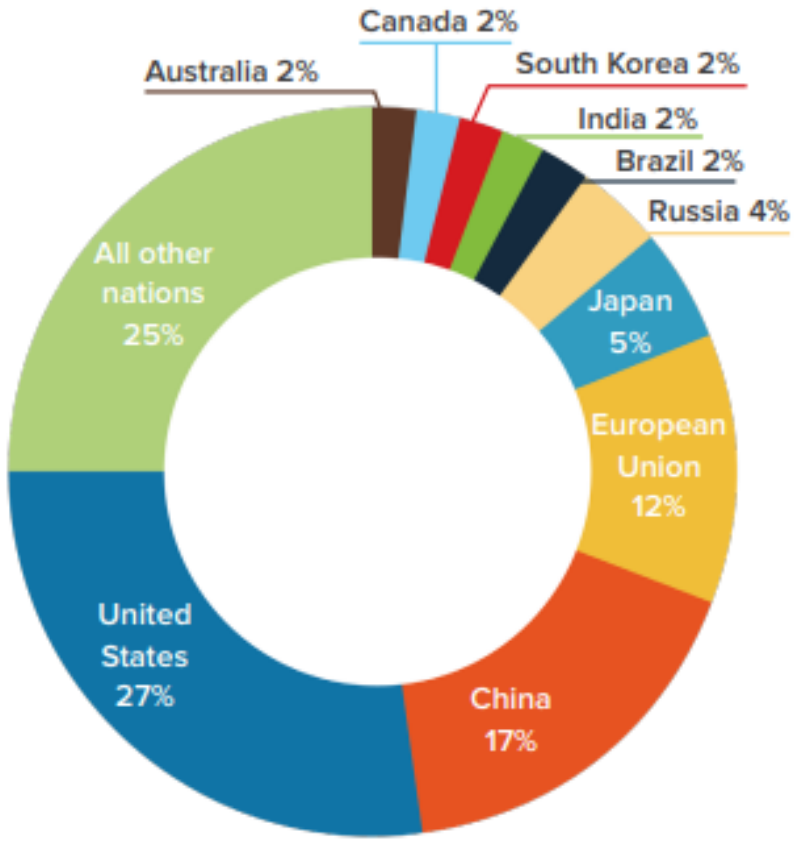


Figure 8: Top ten emitters as percentage of global health care footprint.

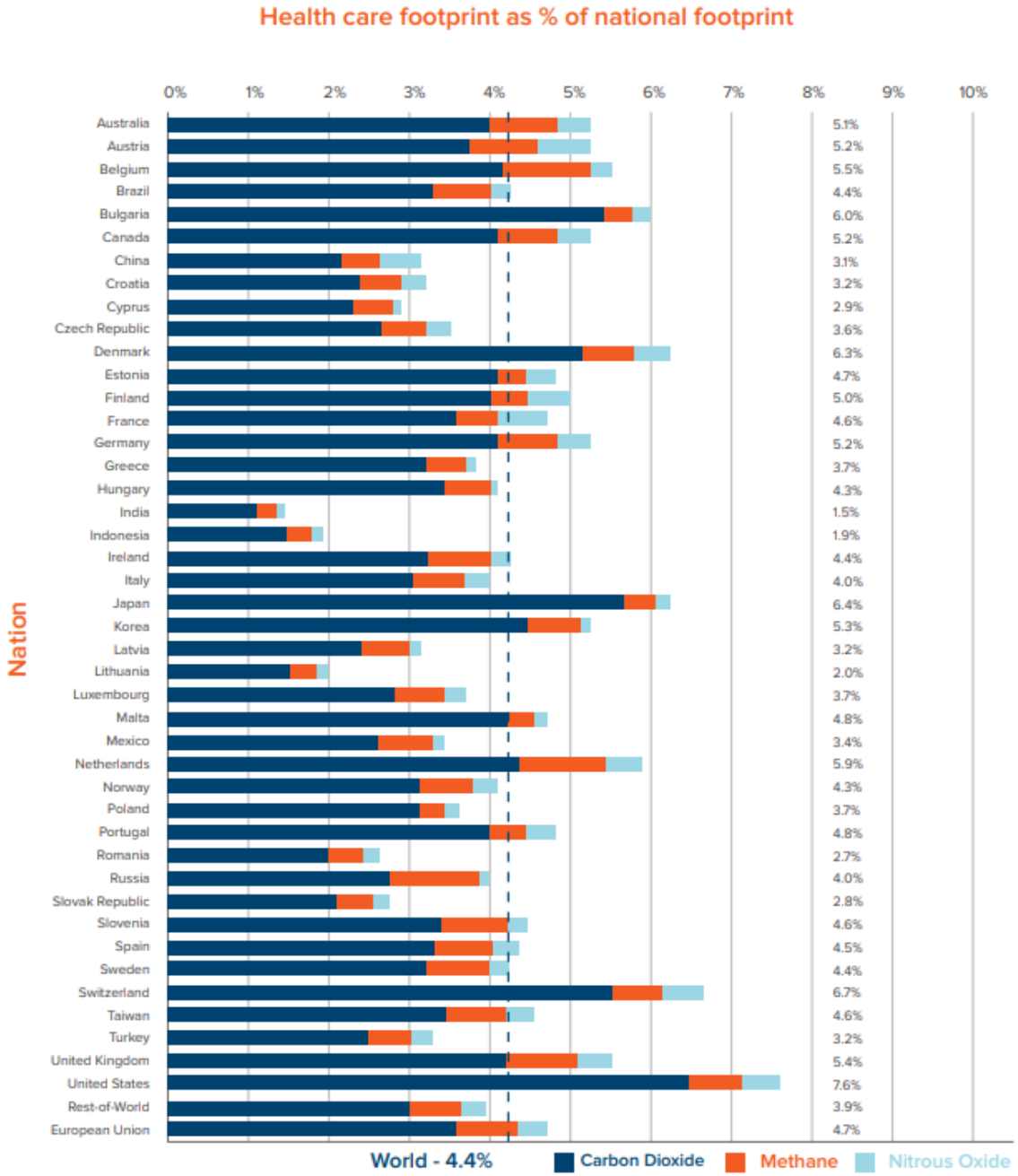


Figure 7: Health care footprint as a percentage of national emissions for all nations and regions covered in this study

Health Care's Climate Footprint – Health Care Without Harm – Produced in September 2019.

Take-aways

- Climate change is complex
- Geographic range, pathogen prevalence, disease incubation periods, and seasonality of diseases may change
- Our differential must be broad
- Health care is a big contributor to greenhouse gases

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