Session 2:

Effects of increases in climate-sensitive infectious disease prevalence on older adults

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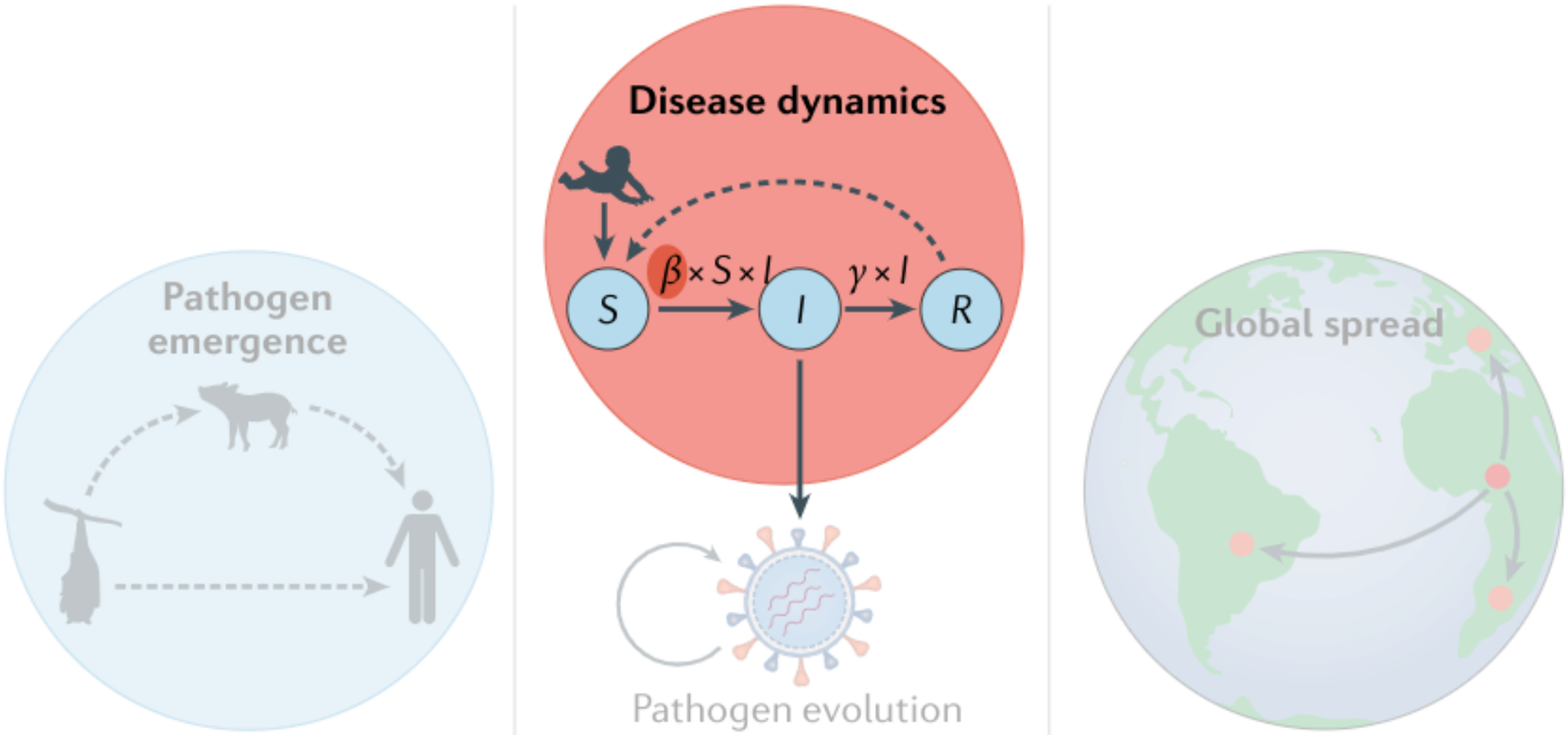
Effects of increases in climate-sensitive *infectious disease* prevalence on older adults

Infectious diseases are not a central focus for NIA, so why discuss it here?

Beyond the direct impacts on morbidity and mortality, climate change-related increases in infectious disease prevalence may have large spillovers into areas of life for the older population that are part of NIA's mission:

- Loneliness, social isolation, depression, cognitive decline
- Progression and access to treatment of chronic conditions
- Residential mobility patterns at older ages
- Economic shocks which affect retirement savings and planning

The dynamics and spread of infectious diseases in human populations



Climatic change	Drives range shifts for reservoir species	Affects transmission and susceptibility	Affects the geographical range of vectors
Demographic change			
Population growth and land use	Increased contact with reservoir species	Population numbers affect evolution, birth rates affect dynamics	Larger population travelling
Urbanization	Depends on species	Density affects contact rate	Urban population more connected
Ageing	Imunosenescence affects spillover risk	Ageing population increases transmission	Possible larger burden

Baker, Mahmud *et al.* (2021) *Nature Reviews Microbiology*

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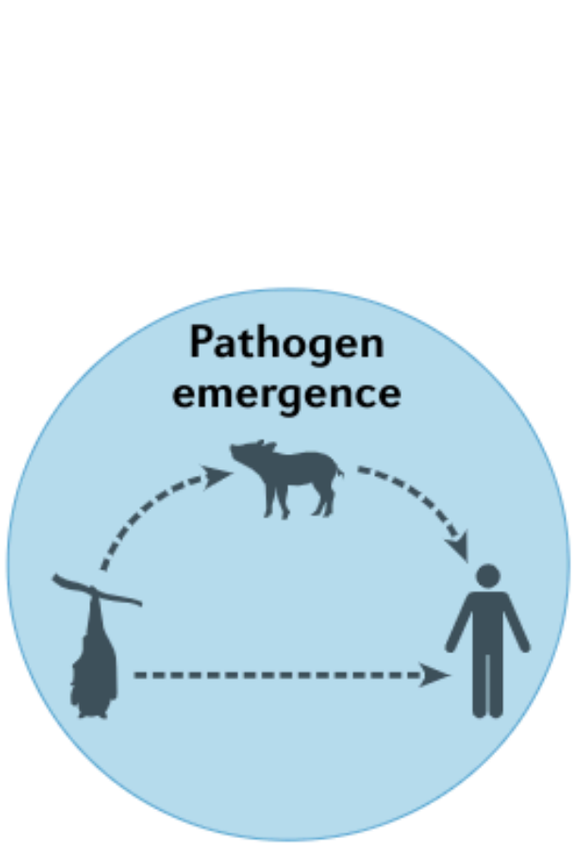

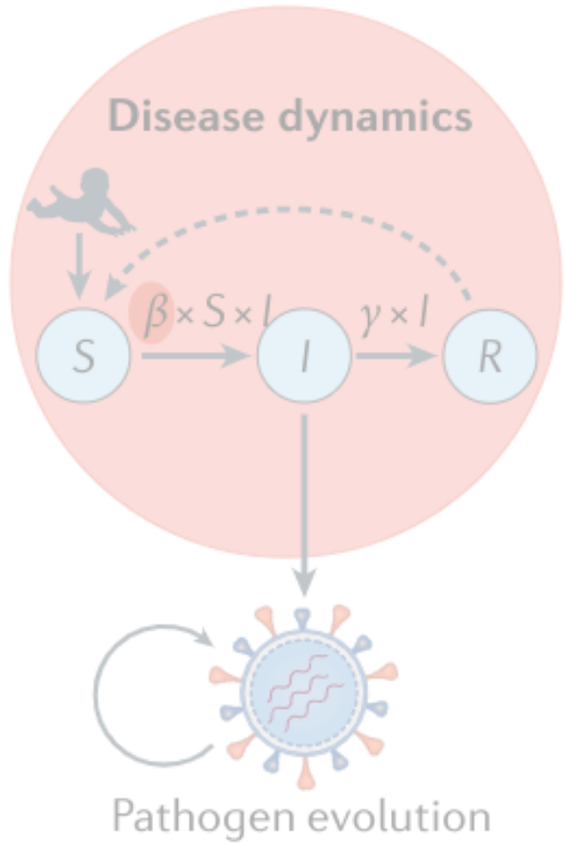

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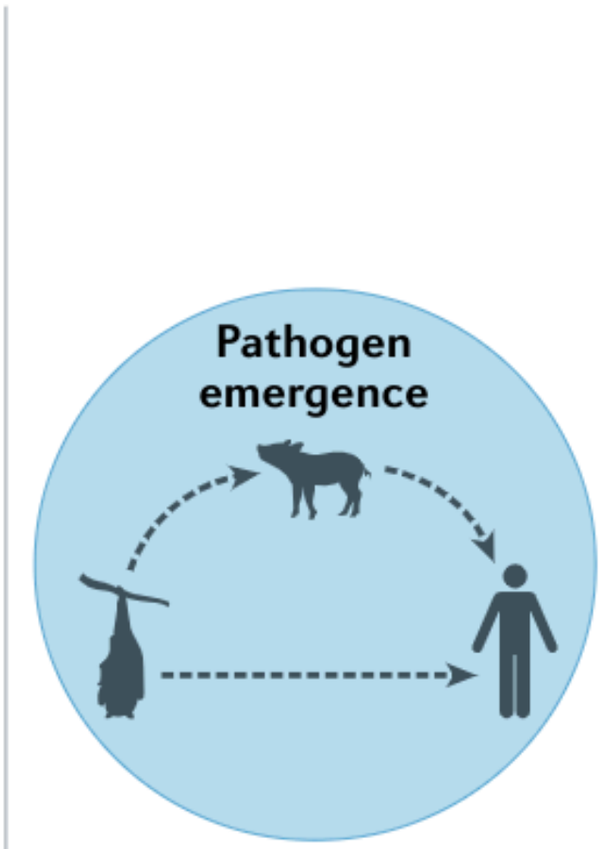

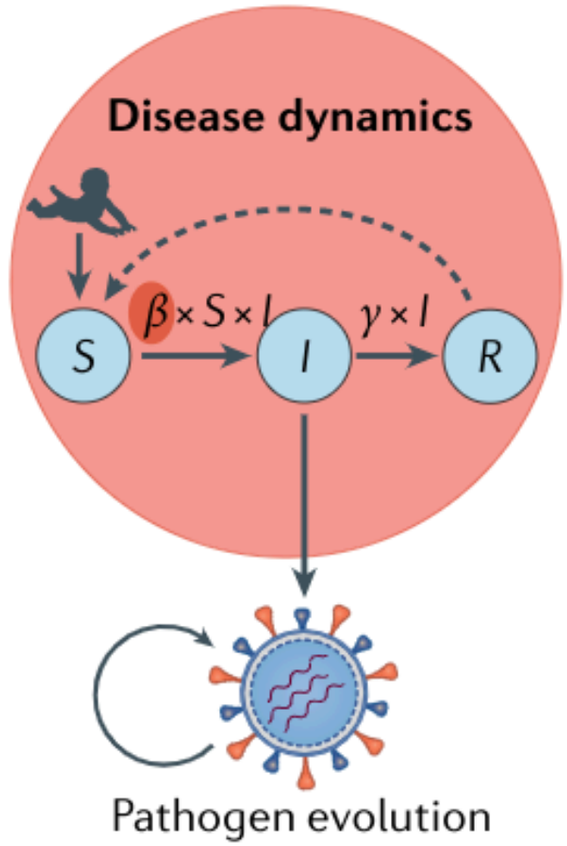

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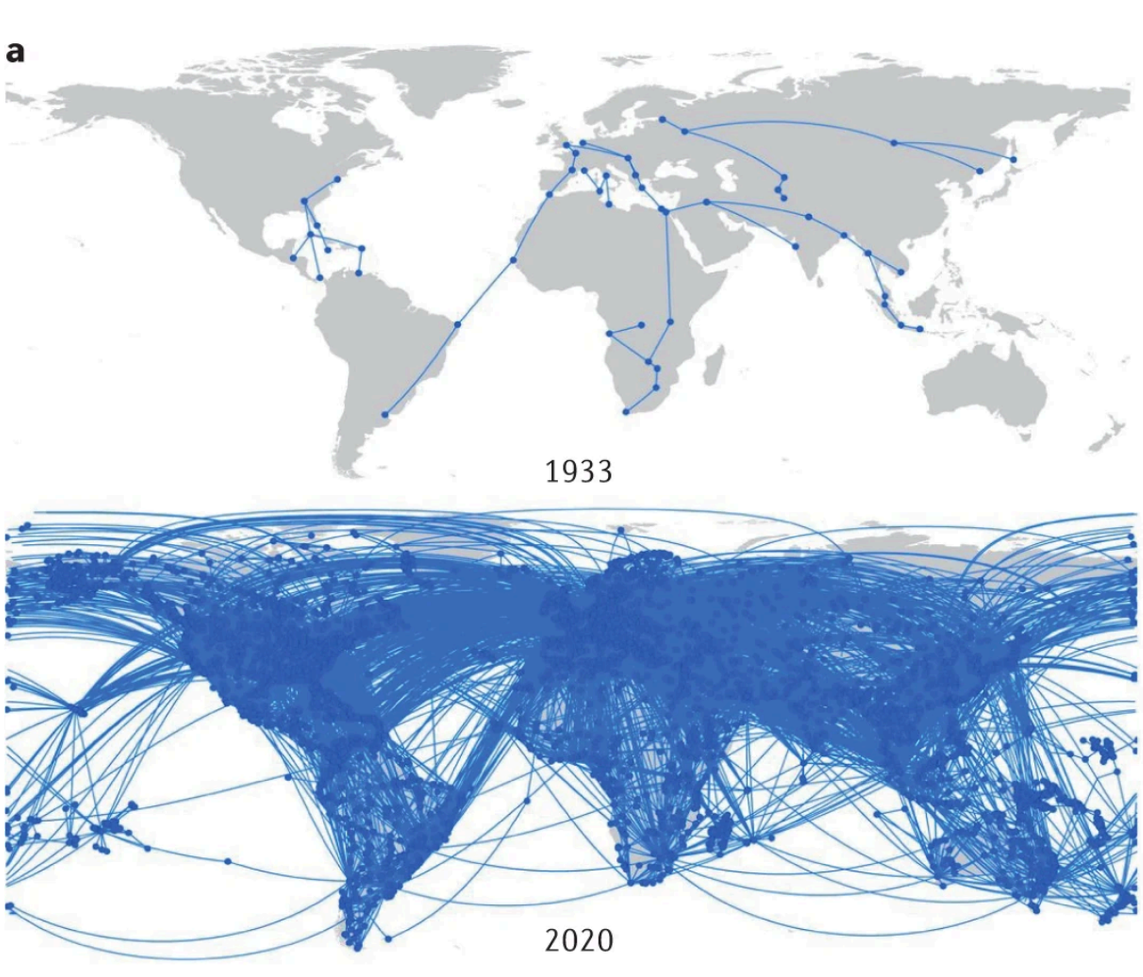
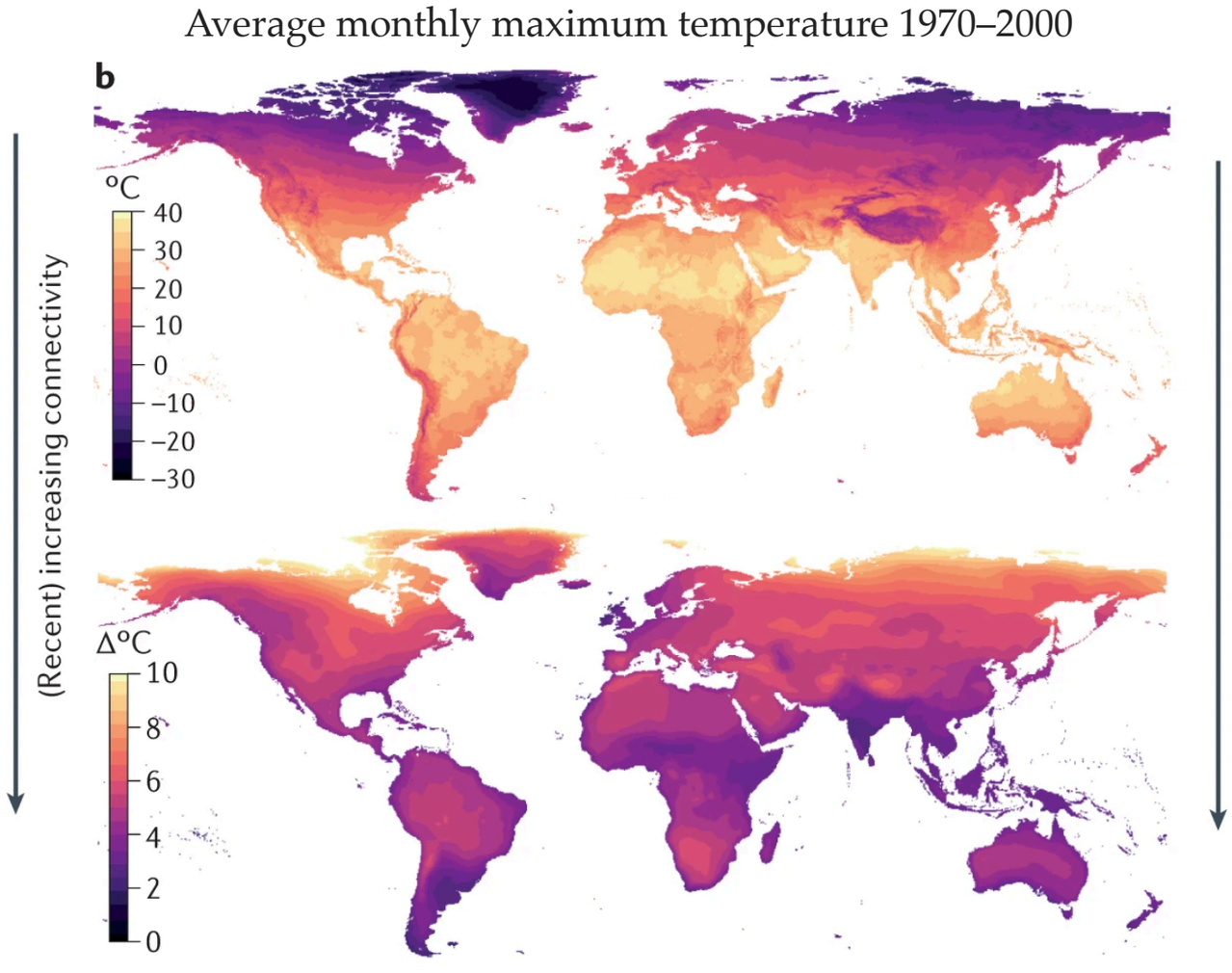
Infectious diseases in an era of global change

Largescale global demographic, climatic, and technological changes, have been altering the landscape of infectious disease emergence and transmission.





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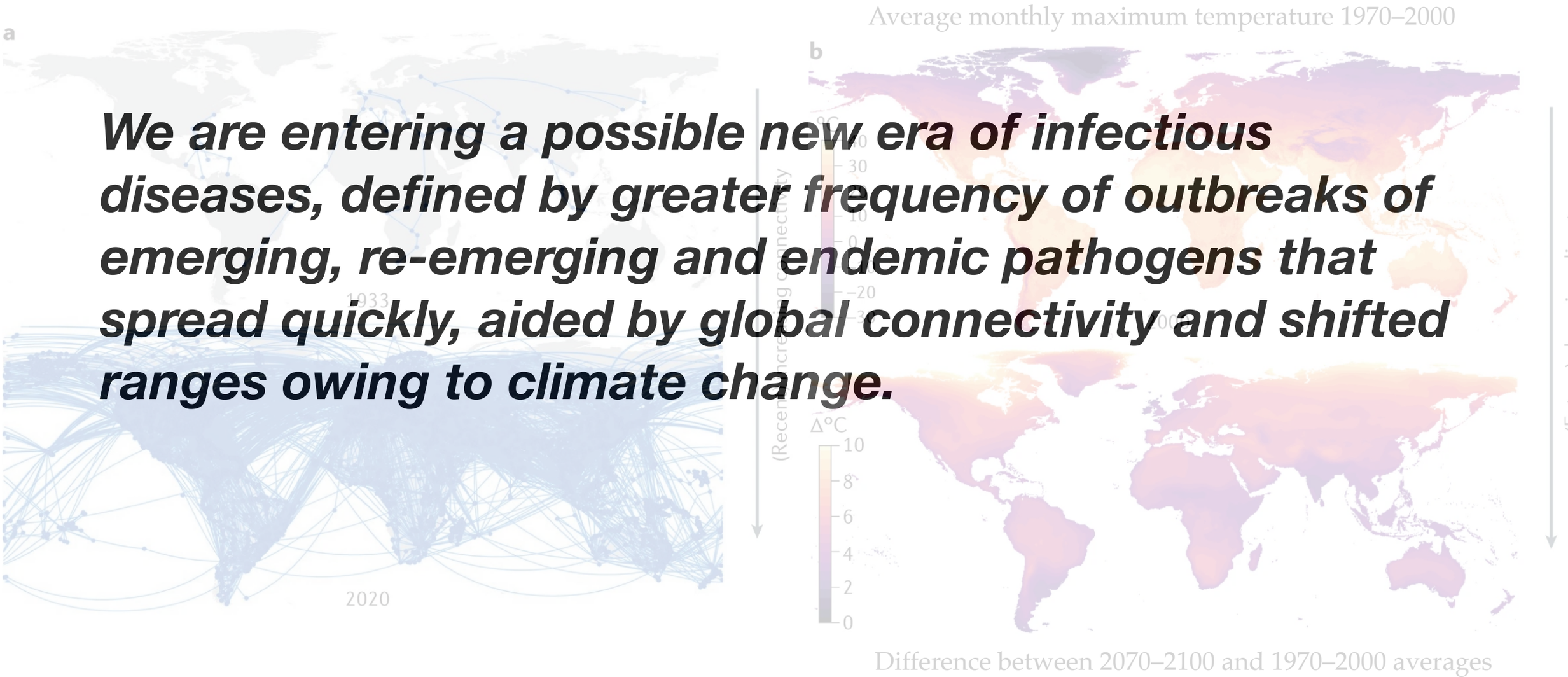
We are entering a possible new era of infectious diseases, defined by greater frequency of outbreaks of emerging, re-emerging and endemic pathogens that spread quickly, aided by global connectivity and shifted ranges owing to climate change.



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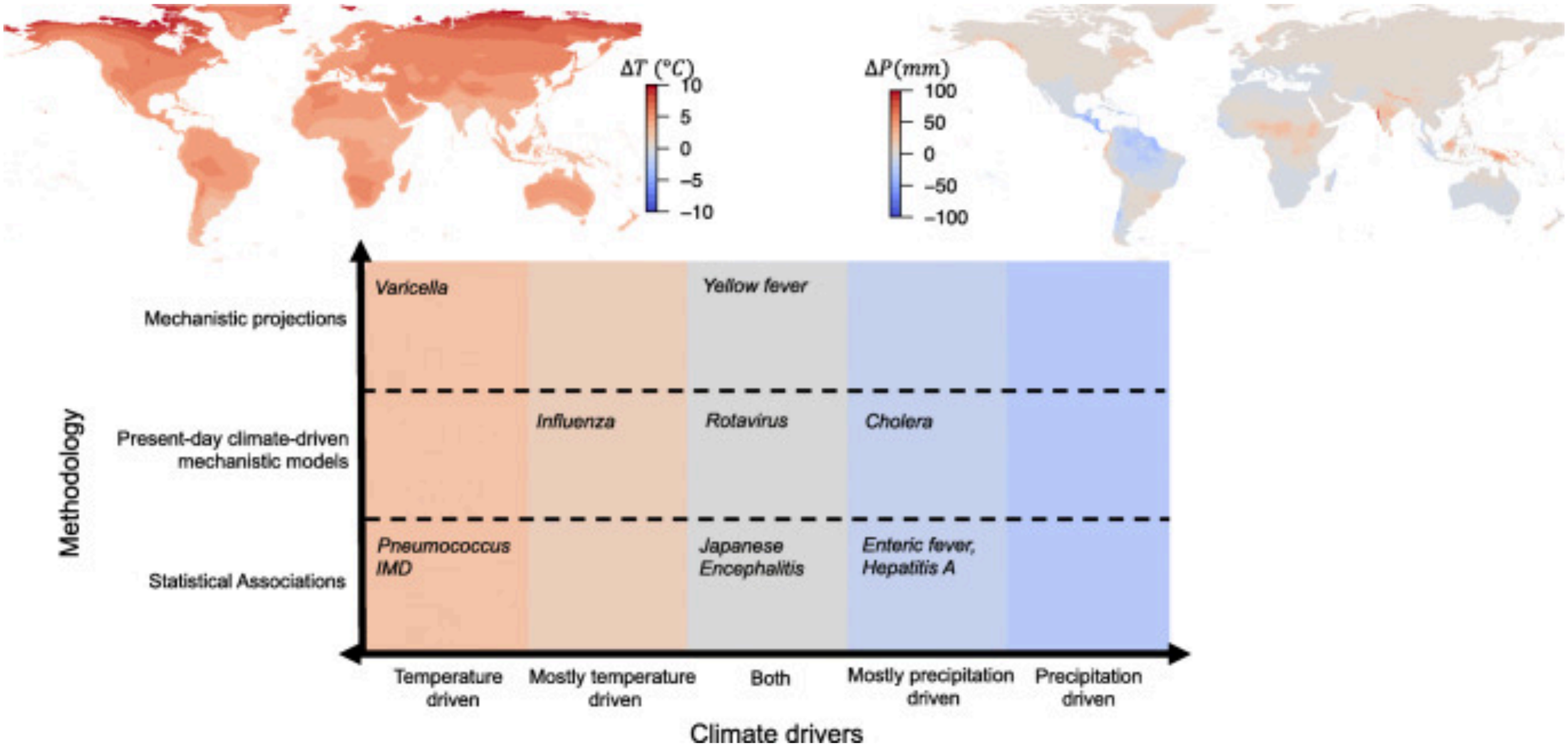
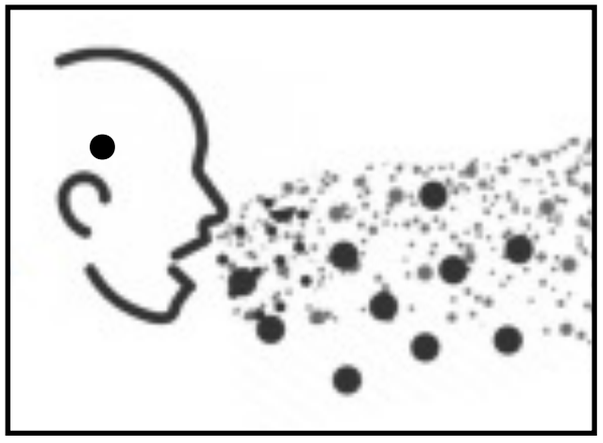
Evidence for the link between changing climate and infectious disease risk and burden



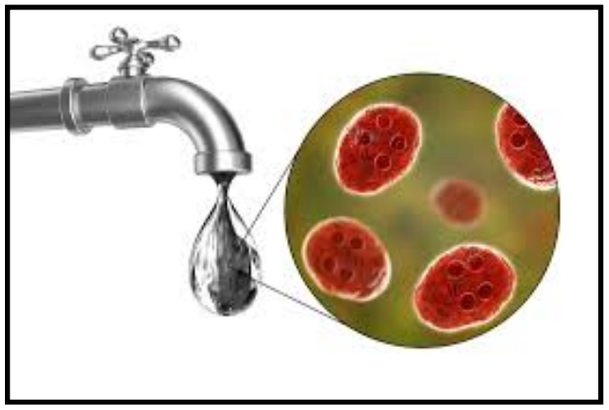
Mahmud *et al.* (2020) *Curr Environ Health Rep*

Predicted impact of climate change on infectious diseases

Direct effects on disease dynamics:



Respiratory diseases (e.g. influenza): shifts in temperature and specific humidity can change the **timing and severity** of seasonal outbreaks



Enteric/diarrheal diseases (e.g. typhoid): sensitive to precipitation and flooding events; **more frequent outbreaks** driven by increase in extreme weather events

Vector-borne diseases (e.g. dengue): **altered burden and geographic range** of diseases due to changes in temperature and precipitation

Predicted impact of climate change on infectious diseases

Risk of pathogen spillover:

- Changing environmental conditions can alter species range and density leading to novel interactions between species; e.g. long period of drought followed by extreme precipitation is hypothesized to have driven an upsurge in rodent populations causing the emergence of pulmonary hantavirus in 1993 (Patz et. al 1996)

Indirect effects on infectious diseases:

- Increased frequency of extreme weather events, population displacement, disruption of the health care system can all lead to increased burden and frequency of outbreaks

- Interaction with air pollution in rapidly urbanizing countries (often affecting the most vulnerable communities) could lead to increased burden of respiratory pathogens

Consequences of an increase in climate-sensitive infectious diseases on older adults

Direct effects on individual health:

- Infectious diseases in the elderly are typically more frequent and more severe, due to immunosenescence, malnutrition, and many age-related physiological and anatomical changes (Gavazzi et al, 2002)

- Thus, climate-induced increases in infectious disease risk and burden are likely to be borne disproportionately by the aging population; we are likely to see higher morbidity and mortality levels associated with infectious diseases

- Greater potential for the emergence of new diseases without adequate treatment

"*Ageing may be the cause of infection but infection can also be the cause of ageing*." (Gavazzi et al, 2002)

Consequences of an increase in climate-sensitive infectious diseases on older adults

Indirect effects on individual health:

- Greater social isolation and loneliness, especially for older people; greater risk of depression and cognitive decline because of isolation
- Disruptions in routine health care
- Diagnosis and treatment of chronic diseases could become more difficult because of the burden on health care providers
- Changes in the geographical spread of infectious disease (e.g., valley fever) may substantially alter residential mobility patterns at older ages
- Emerging and reemerging outbreaks (e.g., COVID-19) can have large economic effects, including impacts on retirement planning and financial security
- Impact of disease outbreaks (both direct and indirect) may be disproportionately borne by those in low-income communities, minorities, Blacks and Hispanics

Future directions for research on the impact of climate-driven changes in infectious diseases on older adults

- Understanding the socioeconomic consequences of increased and/or shifting patterns of disease burden on older adults

- The contribution of infectious disease burden among individuals and their communities on mental health; including the impact of physical distancing measures

- Quality of care and preparedness of health care systems in the face of aging populations with chronic conditions, comorbidities, and increased vulnerability to novel and endemic pathogens

- Disparate impacts of climate-change and disease burden on older adult populations in vulnerable communities

Thank You!

Questions?