

“Climate Change and Infectious Diseases: A Global Perspective.”

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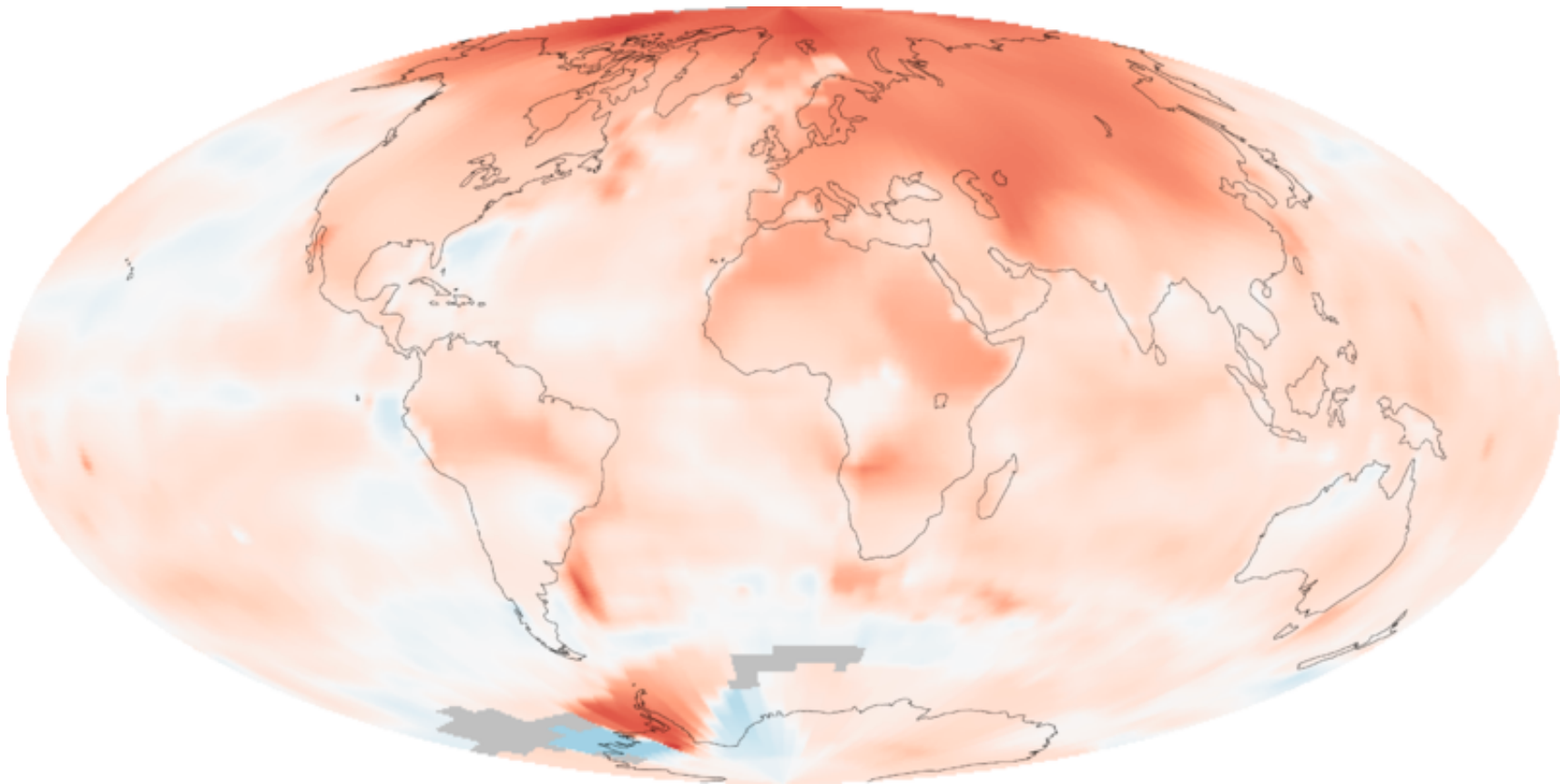
Arctic Investigations Program, Anchorage

Alaska, USA

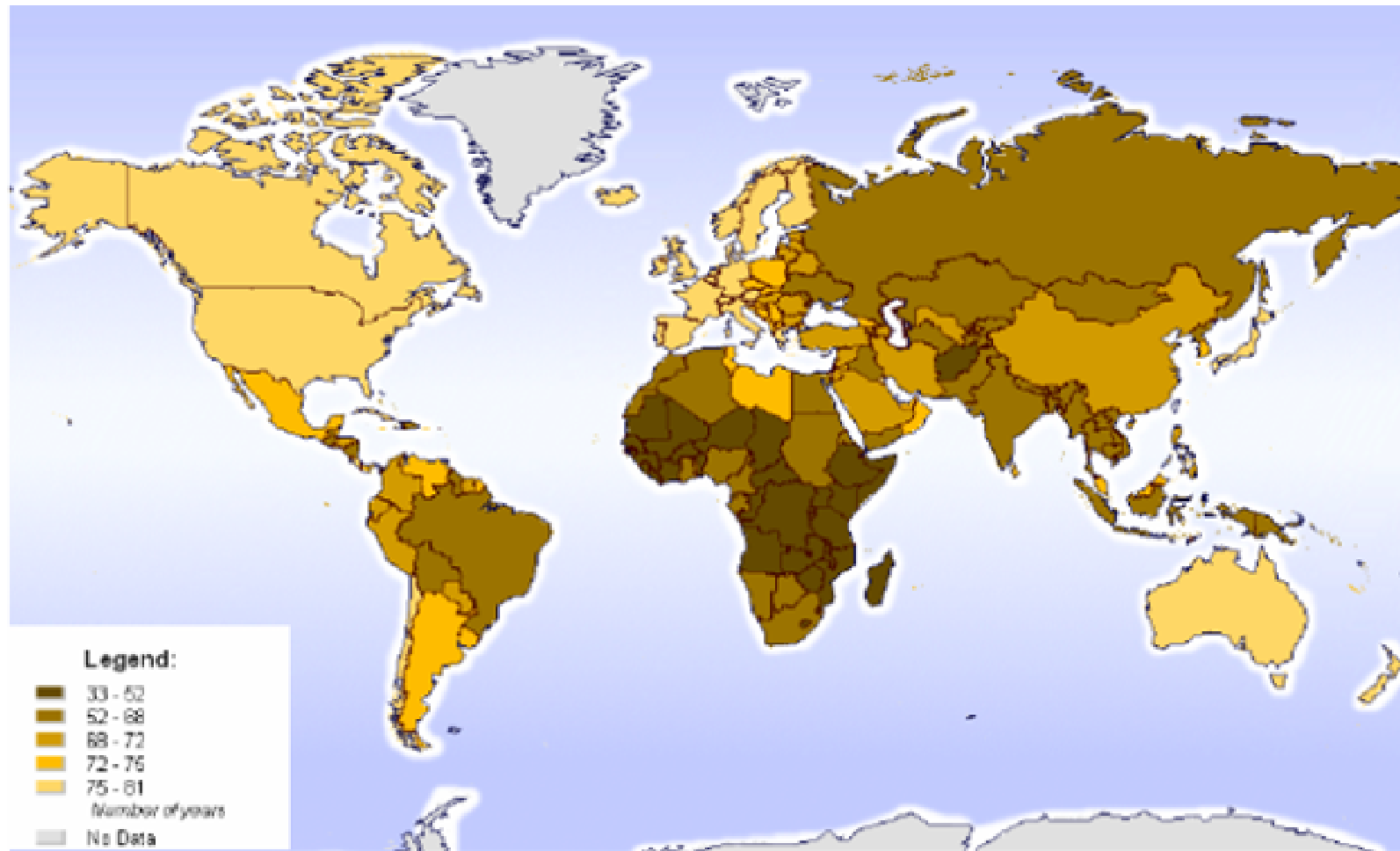
Where are we going?

- Global health inequity and climate change
- Water and infectious diseases- impact of too much or too little
- Vector borne and Zoonotic diseases of concern
- Mitigating the impact on health-the public health response

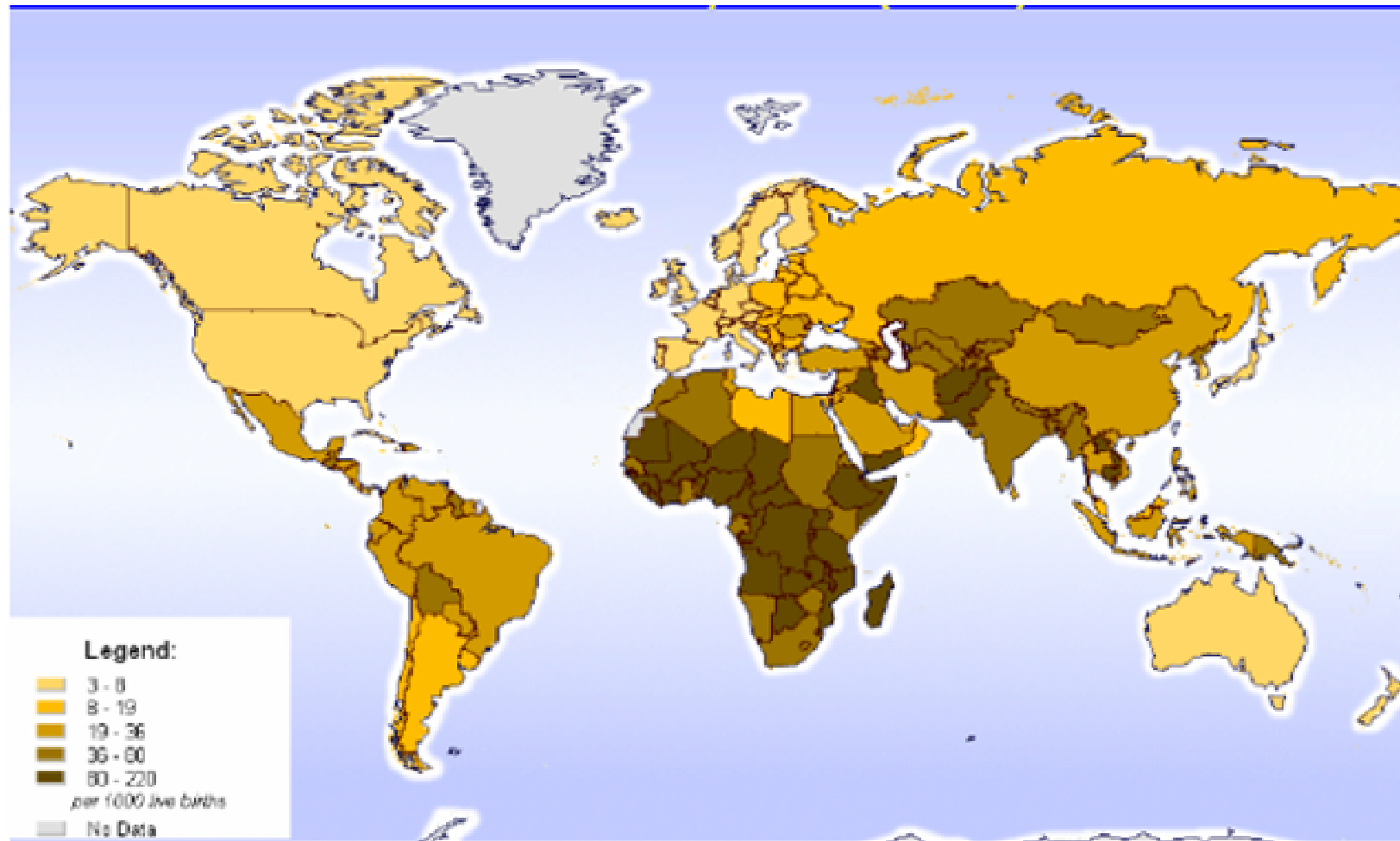
Global Temperature increase 1951-1980 vs 2000-2009



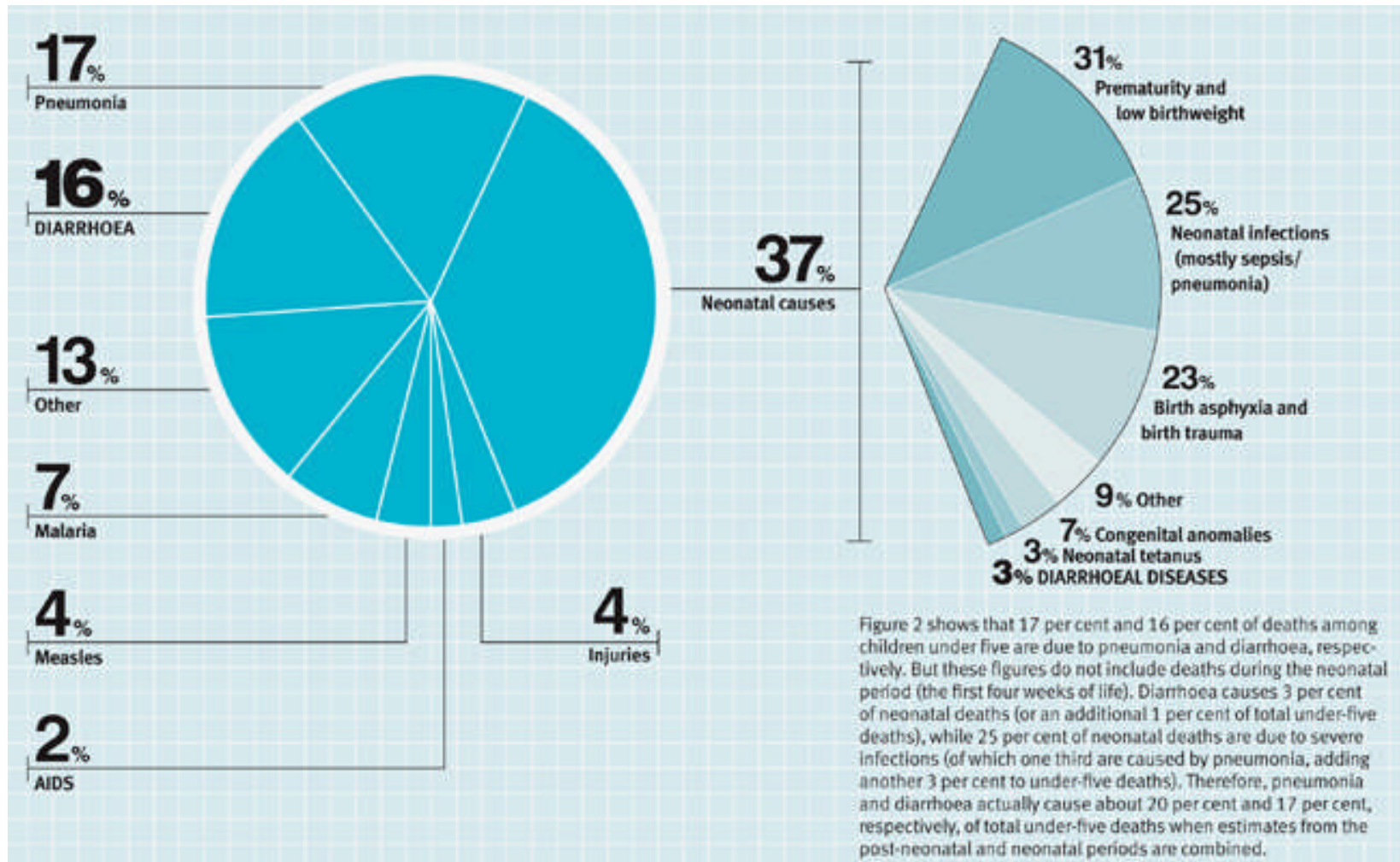
Life Expectancy (years)



Infant Mortality(per 1000, live births)



Causes of Death in children under 5 years of age



Climate Change Water and Infectious Diseases

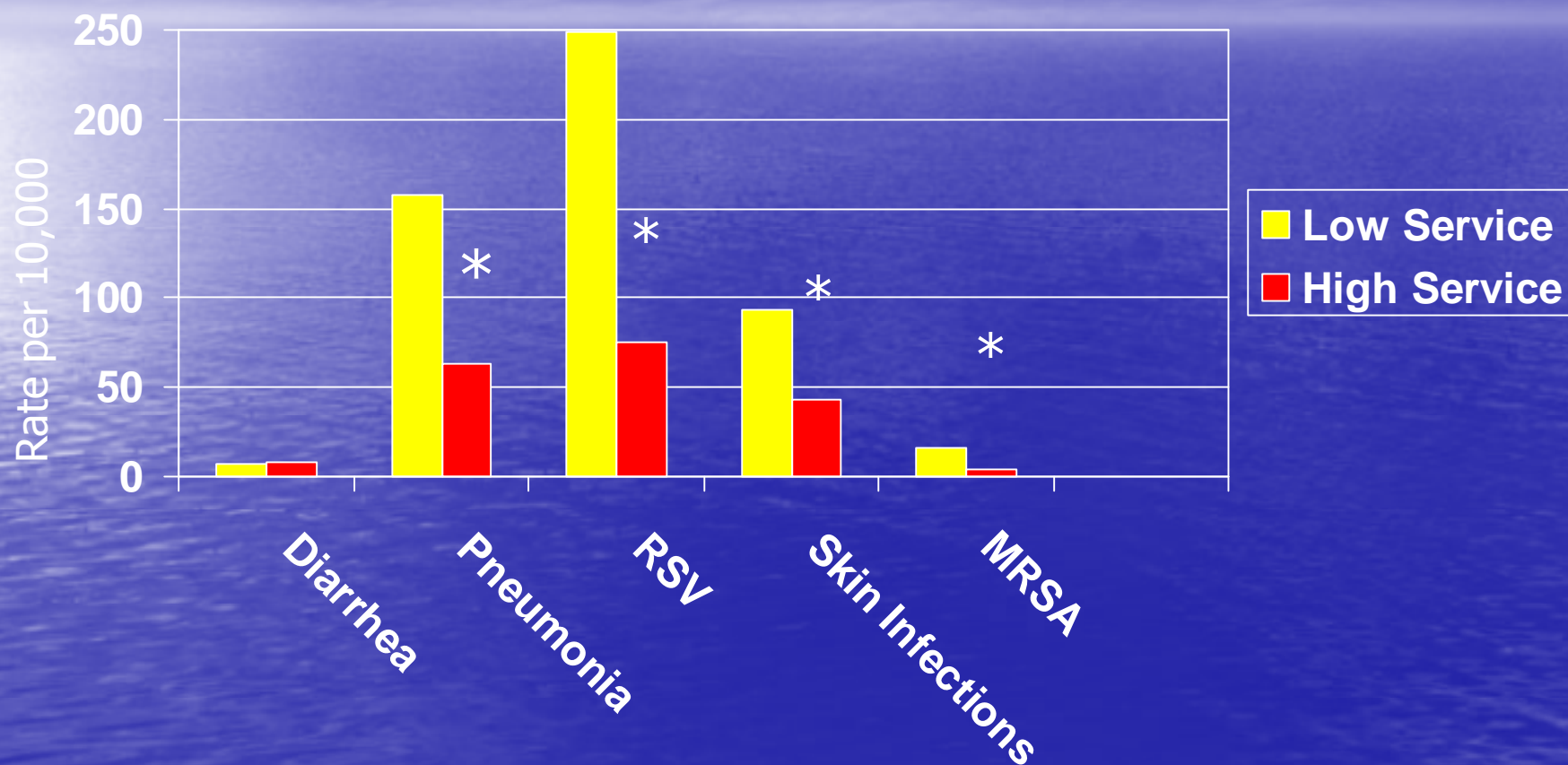
- linkages between water availability, household access to improved water, and the health burden due to diarrhoeal diseases;
- the role of extreme rainfall (intense rainfall or drought) in facilitating water-borne outbreaks of diseases through piped water supplies or surface water;
- effects of temperature and runoff on microbiological and chemical contamination of coastal, recreational and surface waters;
- direct effects of temperature on the incidence of diarrhoeal disease.

Types of systems

- Point source & Honey Bucket
- Closed Haul system
- Piped System



Hospitalization Rates for “High” and “Low” Water Service Regions, Alaska, 2000-2004



* $P < 0.05$



Some episodes of food and waterborne infection related to climate and weather



Montana, USA (1980): Waterborne outbreak of giardiasis associated with heavy rainfall (980 cases)[9](#)

New York State, USA (1999): Waterborne outbreak of *E. coli* O157: H7 related to heavy rainfall[10](#)

Milwaukee, USA (1993): Waterborne outbreak of cryptosporidiosis associated with heavy rainfall and run-off (403 000 cases, 54 deaths)[7](#)

Florida (1997–1998): Human enteroviruses; greater faecal contamination of waters and shellfish associated with heavy rainfall caused by El Niño[11](#)

Peru (1991): Waterborne cholera epidemic associated with El Niño (250 000 cases)[12](#)

Peru (1997–1998): Increase in hospital admissions for diarrhoea in Lima associated with El Niño[13](#)

United Kingdom (1982–1991): Food poisoning associated with monthly temperature (estimated potential extra 179 000 cases with 2.1°C temperature rise)[14](#)

Bangladesh (1980–1996): Rise in cholera cases during El Niño[15](#)

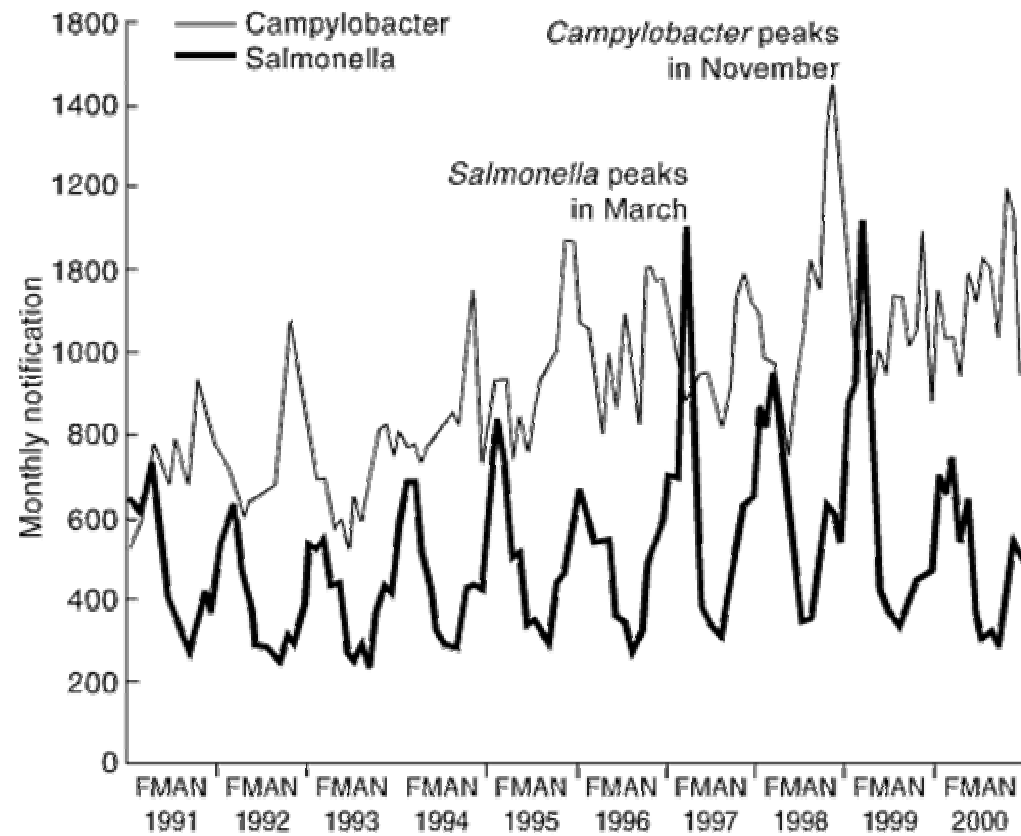
Pacific countries (1986–1996): Incidence of diarrhoea related positively to average annual temperature and negatively to water availability[16](#)

Fiji (1978–1998): Incidence of diarrhoea increased with temperature and extreme rainfall[16](#)

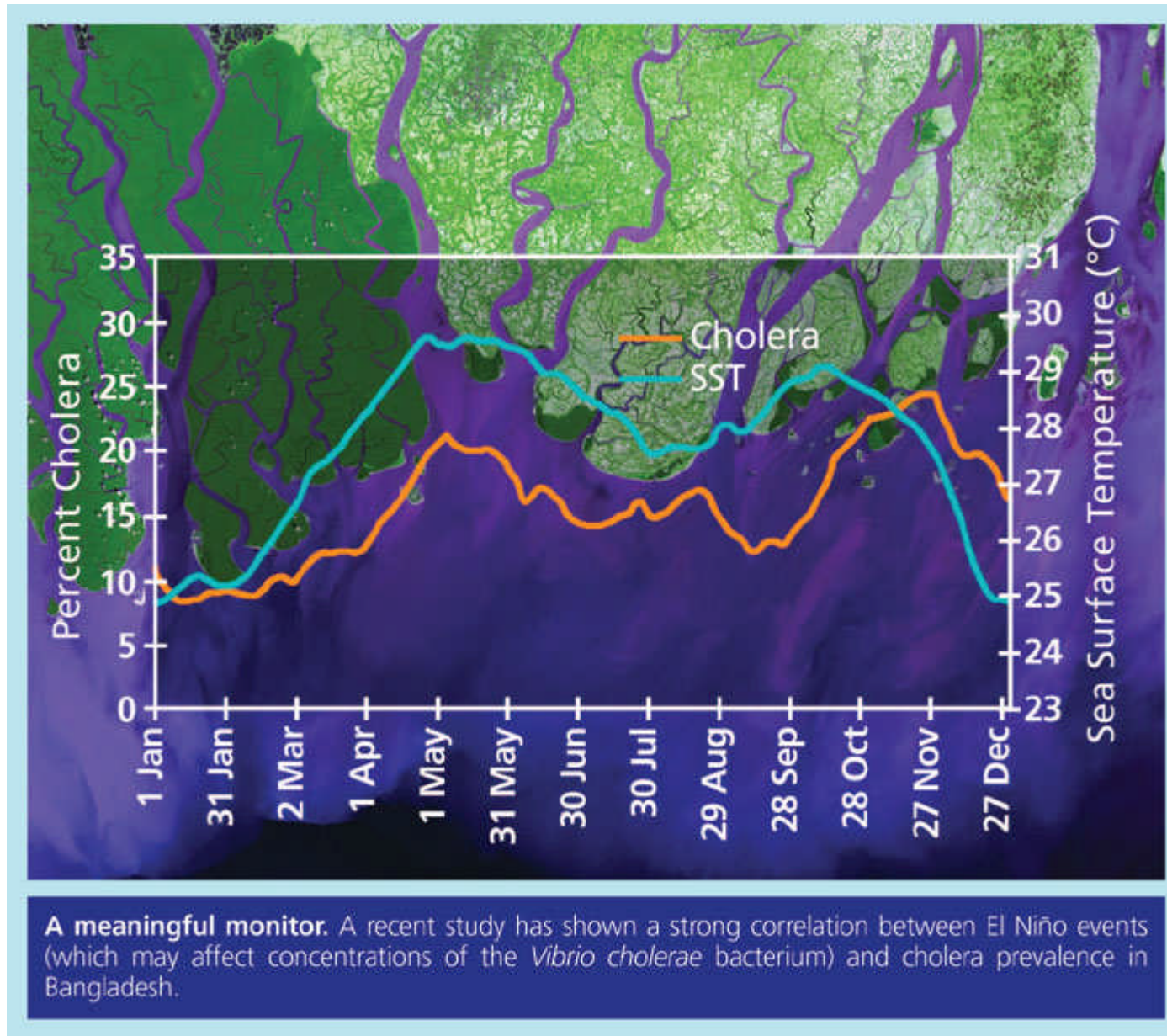
Eastern Australia (2001): Increased rates of *Salmonella* infection with decreasing latitude (corresponding to higher ambient temperatures)[5](#)

Victoria, Australia (1997): Increased outbreaks of foodborne disease during hottest summer on record[17](#)

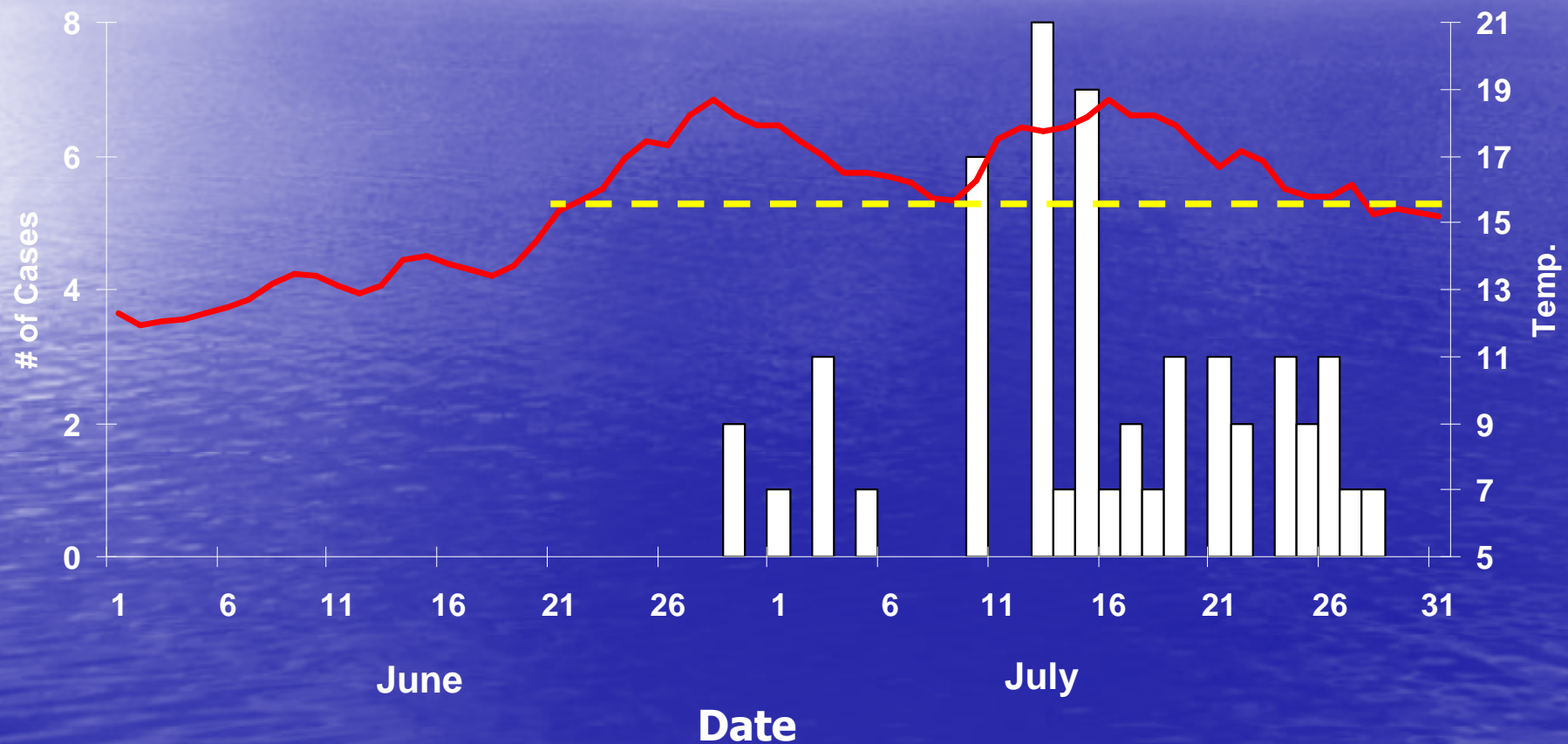
Total monthly notifications of Salmonella and
Campylobacter infections in Australia, 1991–
2000



Sea surface temperature and cholera in Bangladesh



Mean Daily Farm "A" Water Temperature by Date, and Number of Farm "A"-associated Case-patients by Harvest Date of Consumed Oysters-2004

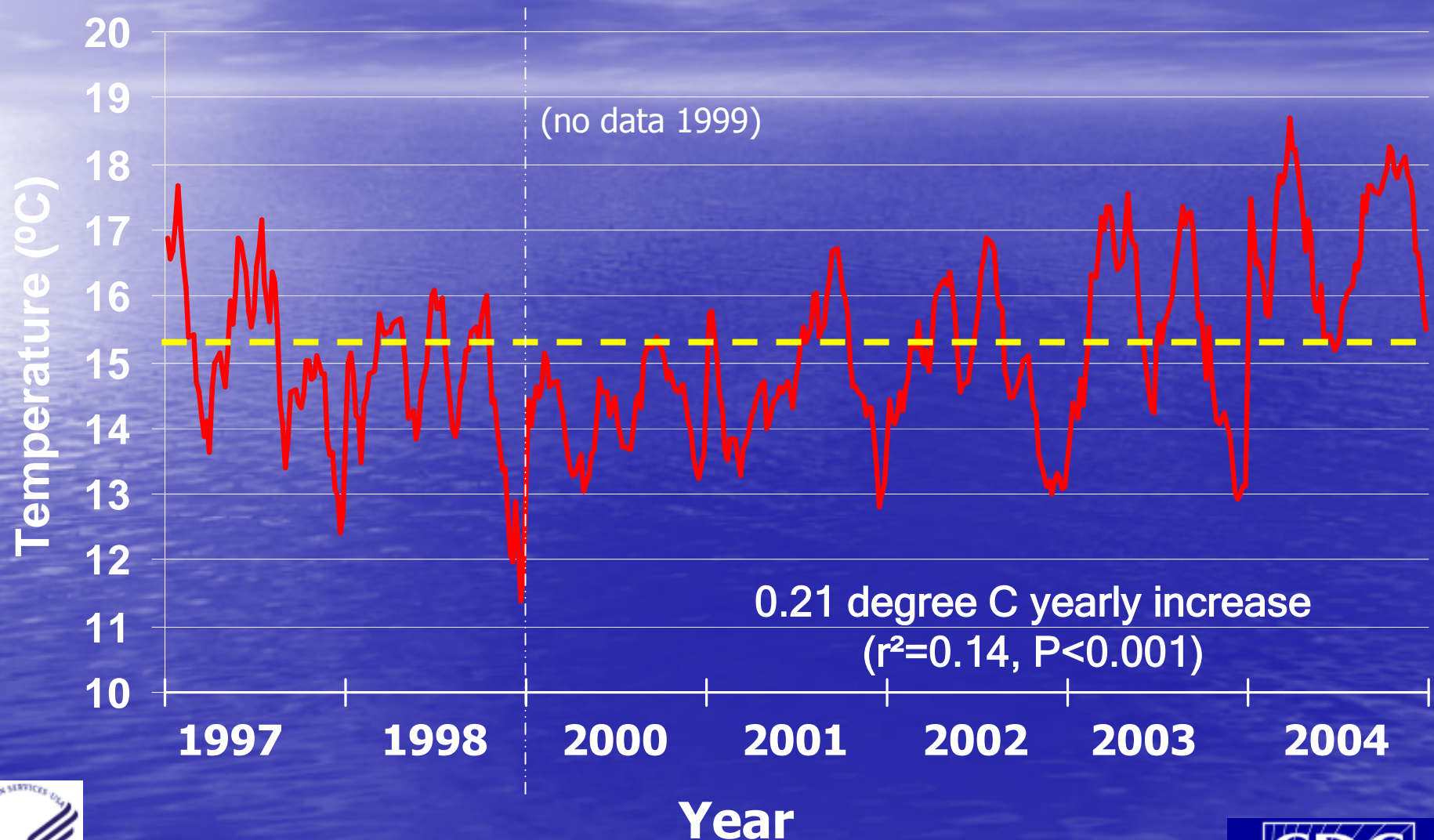


From McLaughlin et al NEJM 2005 353: 1463-70



Environmental Investigation Results

Farm A July-August Water Temperatures by Year



From McLaughlin et al NEJM 2005 353: 1463-70

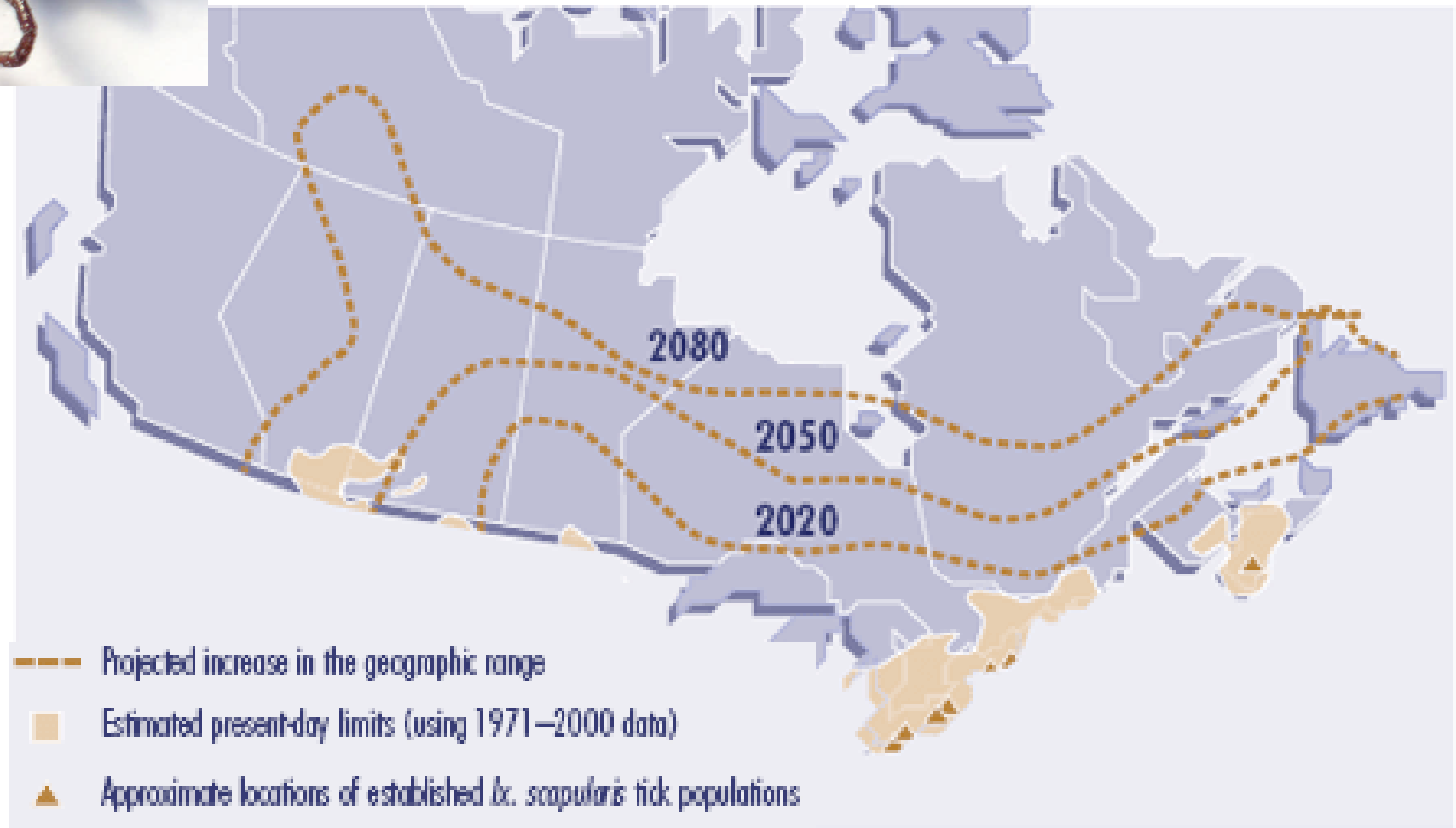


Climate Change and Vector borne and Zoonotic Infectious Diseases

- altered the distribution of some infectious disease vectors
- continue to change the range of some infectious disease vectors
- have mixed effects on malaria; in some places the geographical range will contract, elsewhere the geographical range will expand and the transmission season may be changed
- increase the number of people at risk of dengue;

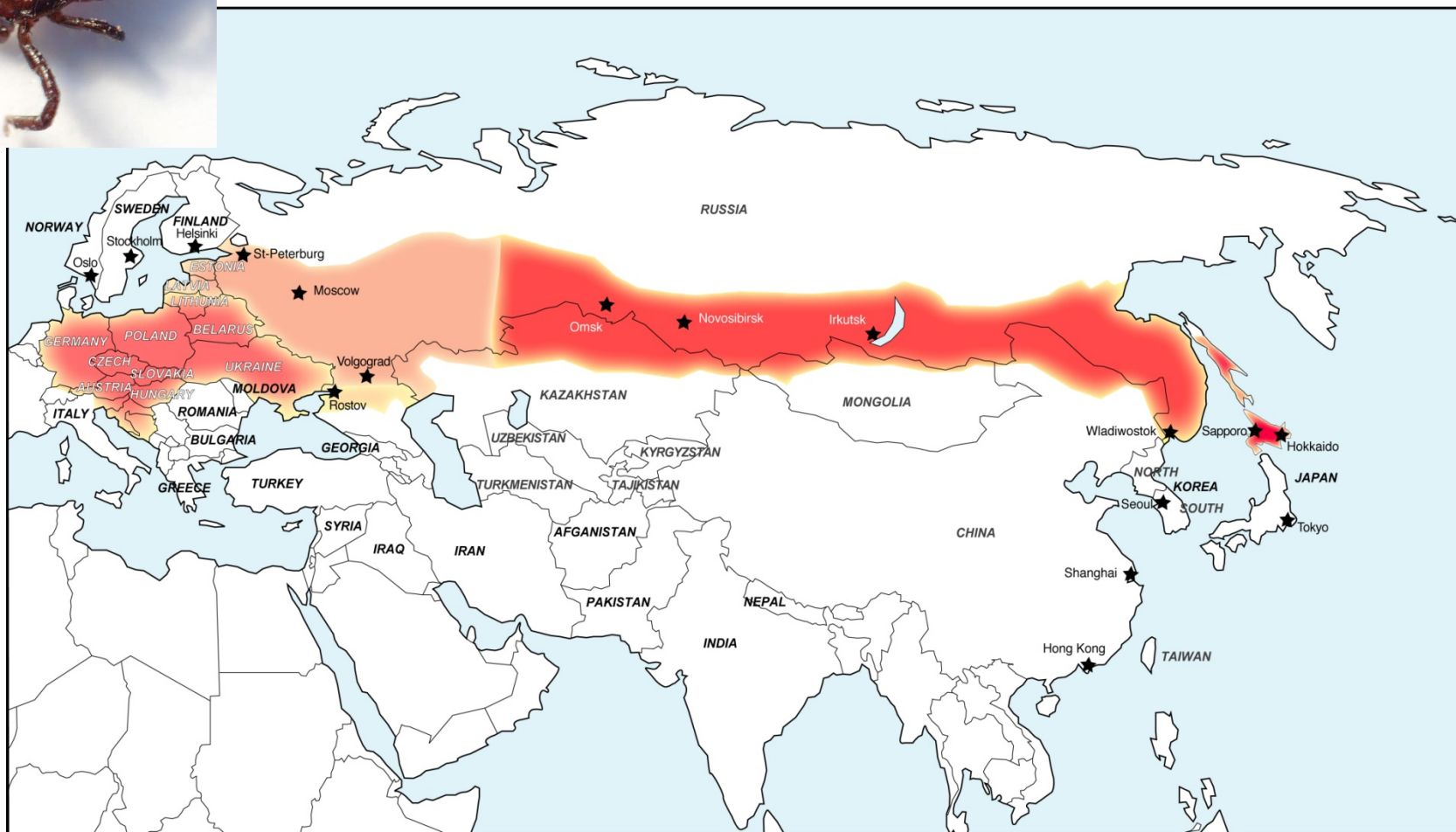


Lyme Disease

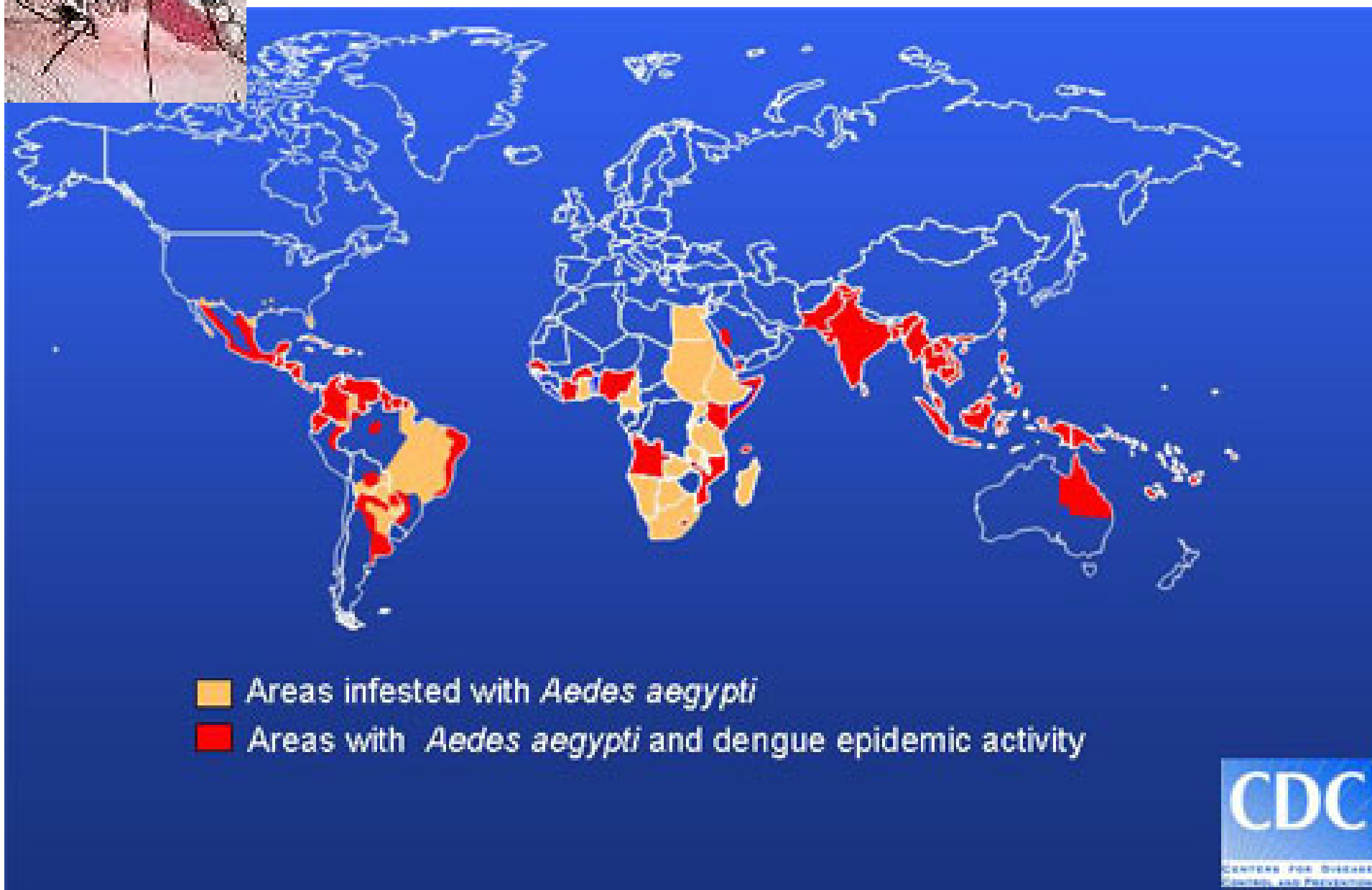




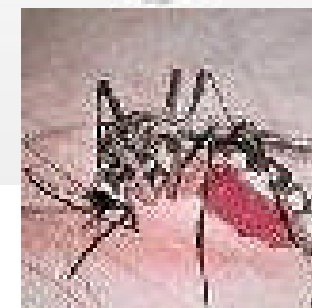
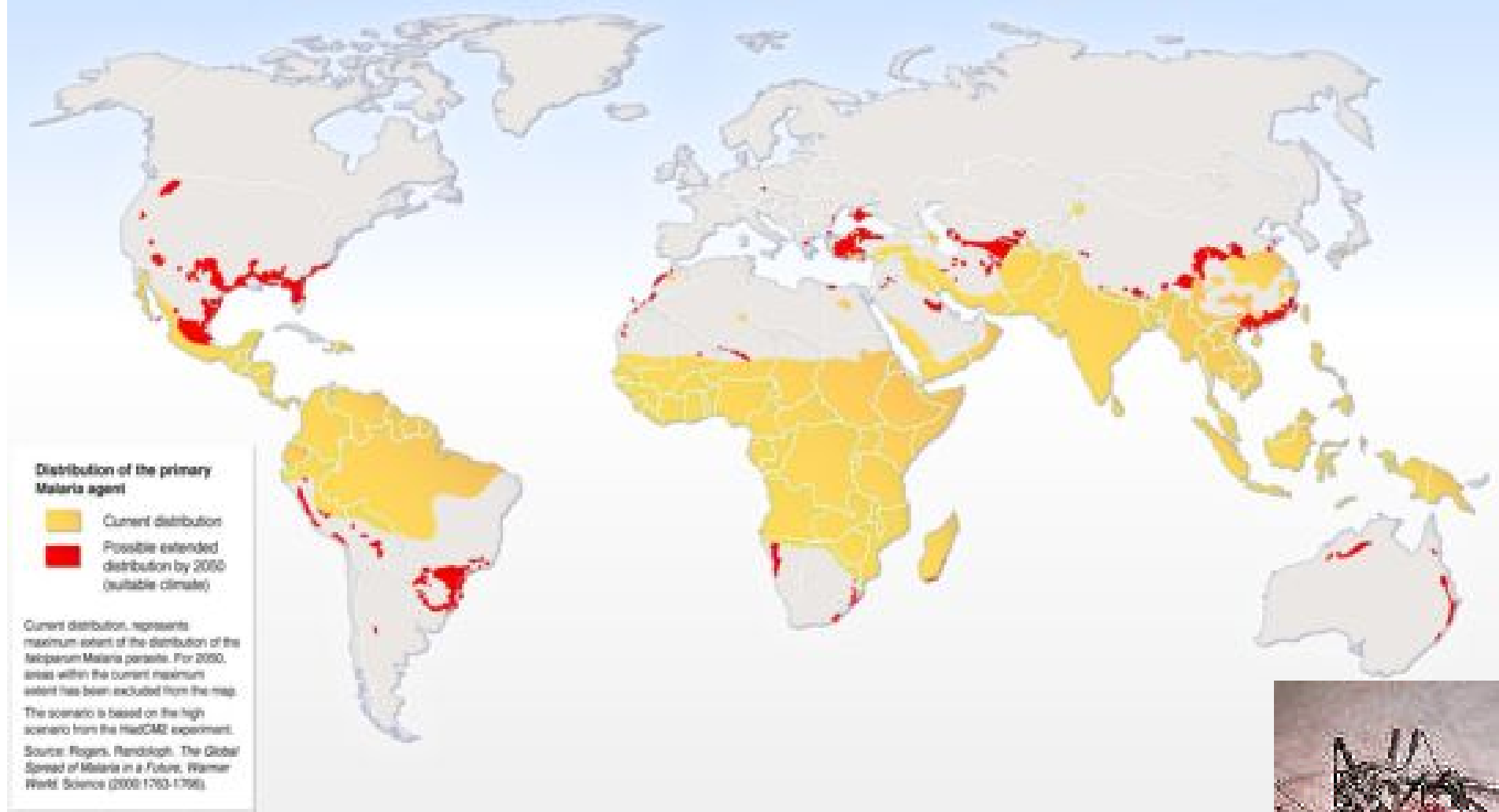
Tick Borne Encephalitis



Dengue Fever

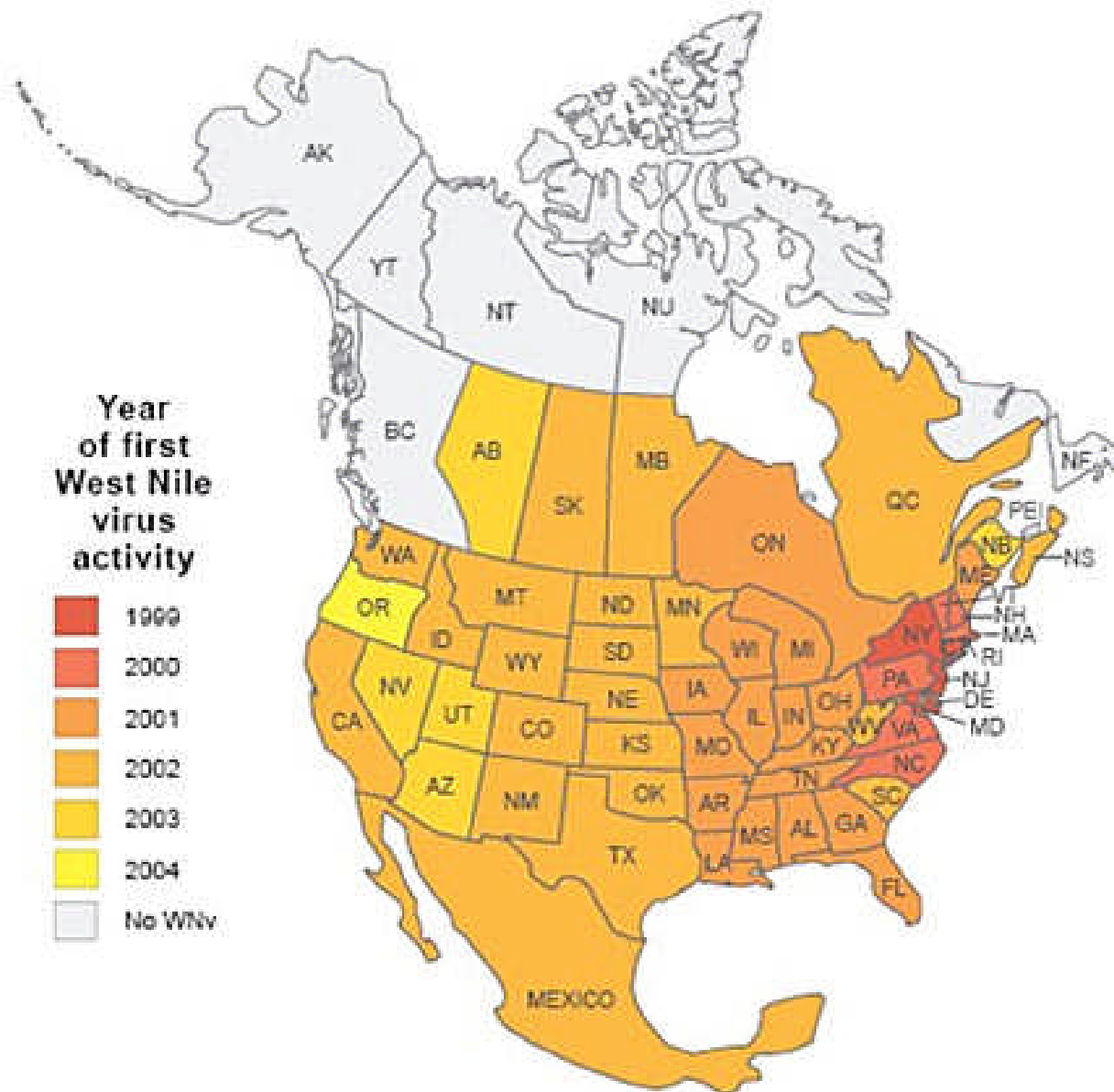


Climate Change and Malaria





West Nile Virus Activity in North America



West Nile virus activity includes positive corvids, mosquitoes, horses and humans.
Data sources: www.cdc.gov, www.phac-aspc.gc.ca, EID 2003 Dec;9(12):1804-7

Climate Change: Mitigating the impact on health

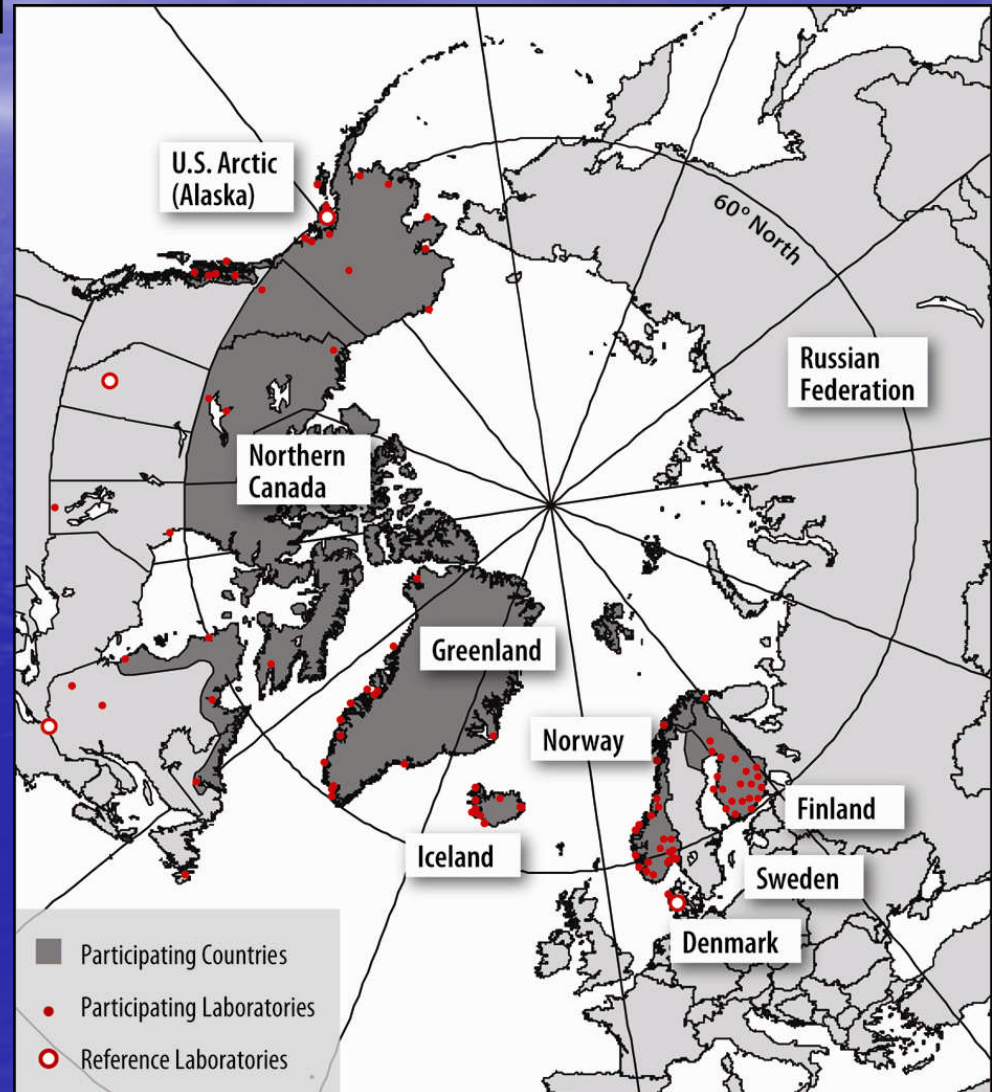
- Capitalize on and enhance essential public health services and to improve coordination efforts between agencies, academia, the private sector and non government organizations.
 - Vaccination programs
 - Water and sanitation systems
 - Health outreach education communication on health impacts of climate change

Climate Change: Mitigating the impact on health

- Surveillance
 - Monitor health status to identify and solve health problems that will have a large impact
 - Respiratory diseases in children
 - Skin infections
 - Diarrheal diseases
 - West Nile virus
 - Tickborne encephalitis
 - Lyme diseases,
 - Dengue,
 - Malaria,
 - Capitalize on existing surveillance networks,

Climate Change: Mitigating the impact on health

- Harmonize disease registries, laboratory methods, clinical surveillance definitions across administrative jurisdictions to allow comparable reporting and analysis



Climate change: Mitigating the impact on health

- Outbreak response
 - Food and waterborne diseases
 - Vectorborne diseases
 - Zoonotic diseases
- Relate to weather/climate factors

Climate Change: Mitigating the impact on health

- Research and development of new vaccines
- Public health research is needed to determine the baseline prevalence of potentially climate sensitive infectious diseases in both human and animal populations in regions where emergence may be expected.

Thank you!

- Questions?