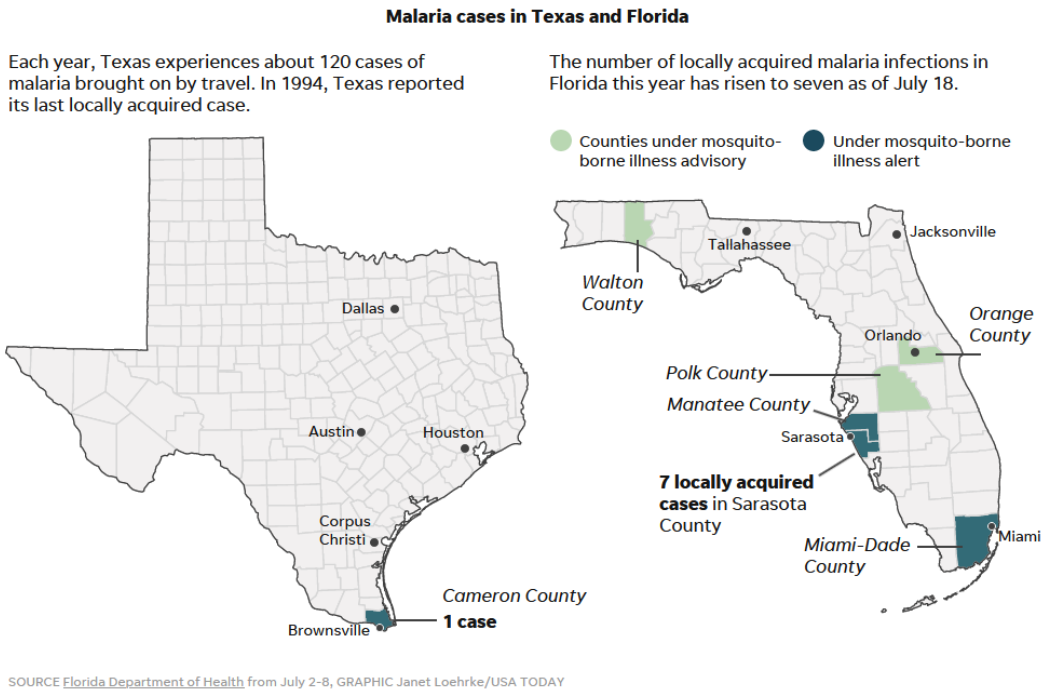
Malaria and West Nile Virus in the US: a tale from the past to inform the future

Gonzalo Vazquez Prokopec

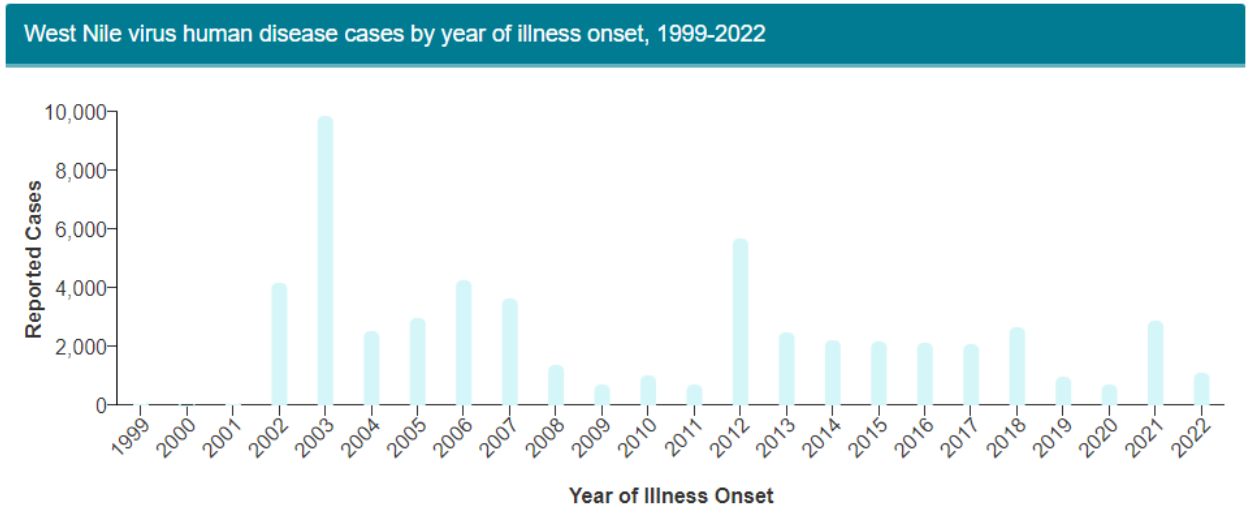
Winship Distinguished Associate Professor

Department of Environmental Sciences,
Emory University,
Atlanta GA, USA

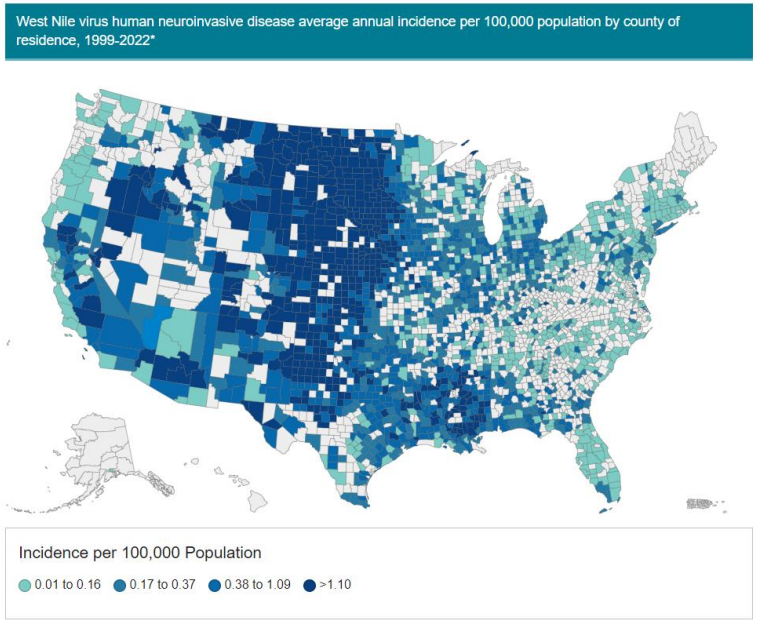
Malaria and West Nile virus: different threat and concern



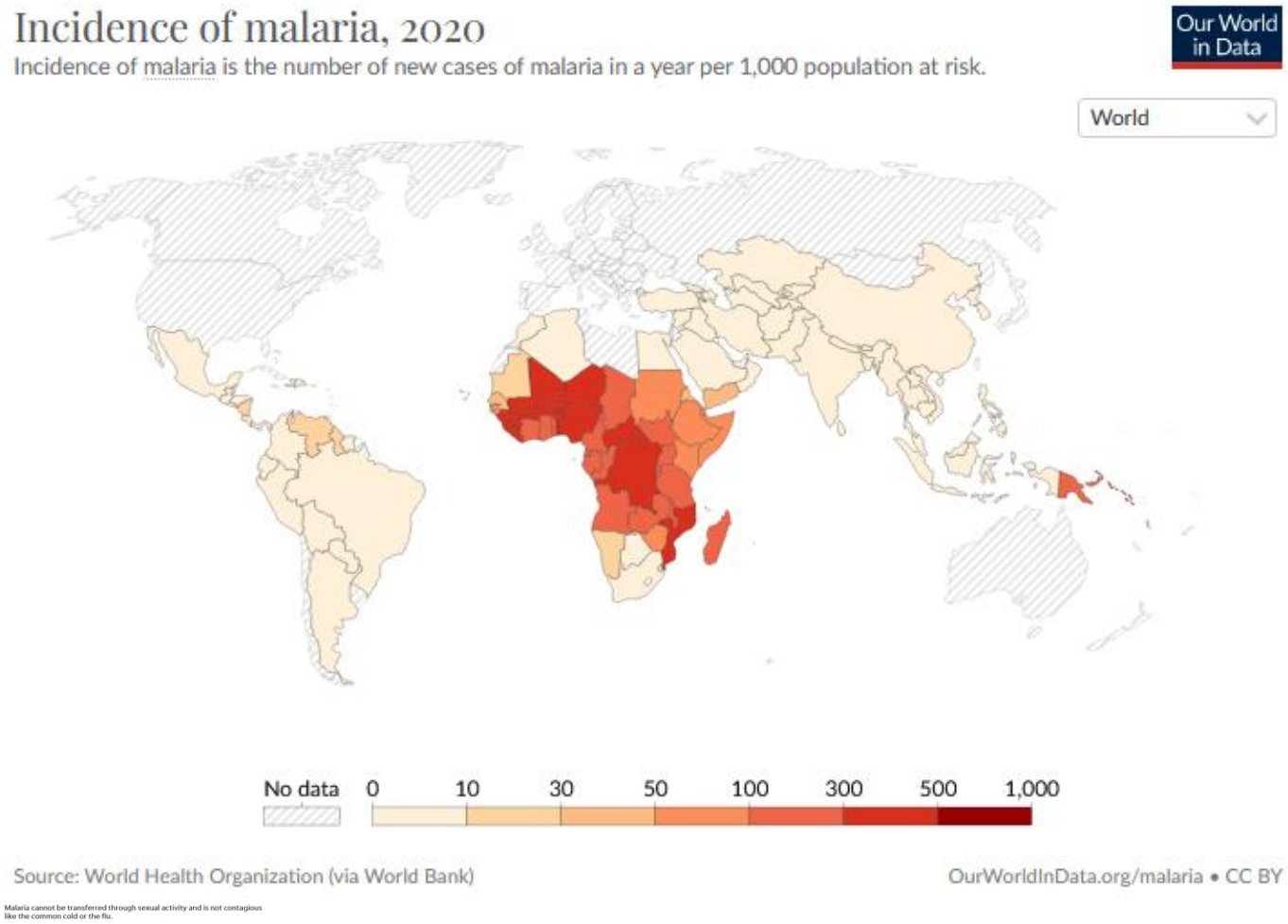
https://www.usatoday.com/story/graphics/2023/07/12/malaria-cases-florida-texas-explained/70400044007/

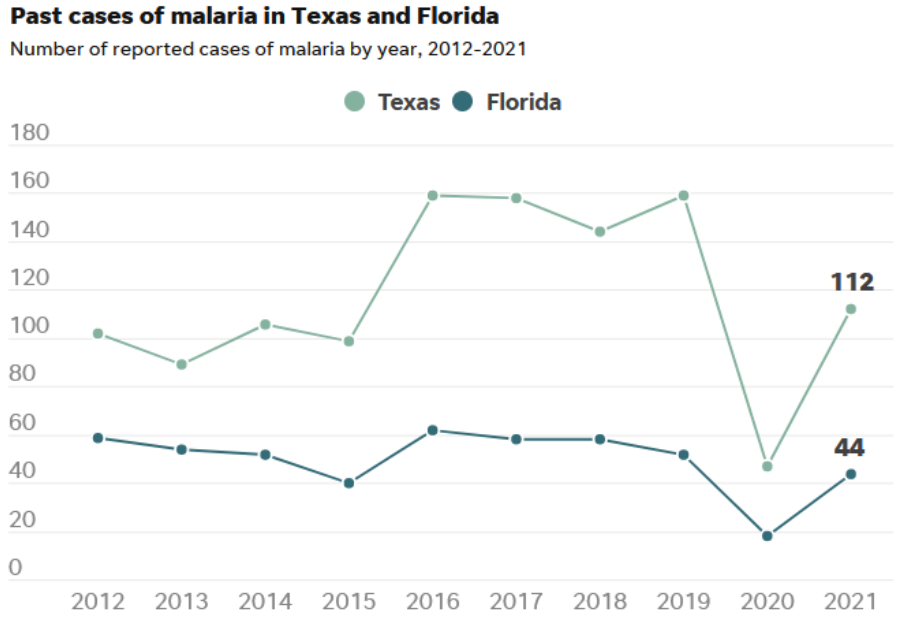


Source: Arbonet



Malaria: no reason to panic





- While significant progress has been made, malaria still persists as a public health concern in Africa and, to a lesser extent, in Asia and LAC.
- P. falciparum and P. vivax malaria are prevalent (P.f more serious)
- Introductions of Plasmodium sp. To the US via travelers are common.

Malaria vectors: expanding and more aggressive?

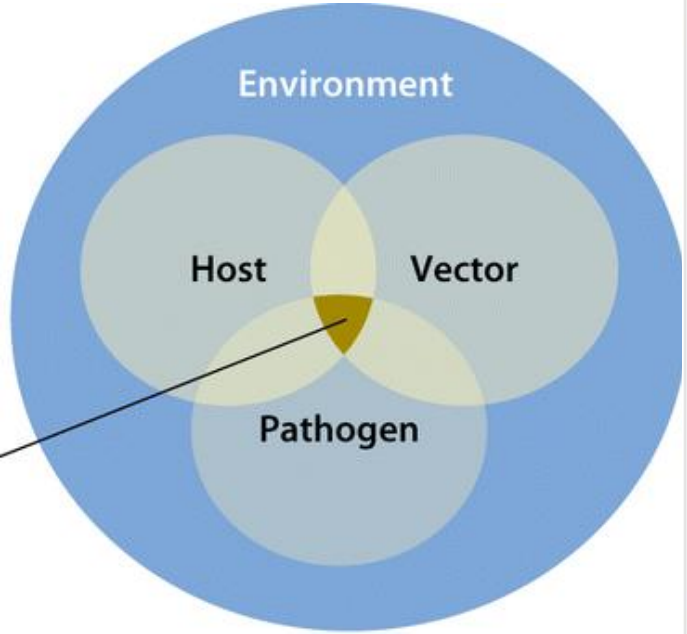


Image: Reisen, 2010. Ann. Rev. Entomol.

Mosquito collection, Emory University Field Station on Ichuaway Plantation, Baker County, Georgia, ca. 1938–1945. Photograph by United States Public Health Services Office of Malaria Control in War Areas,

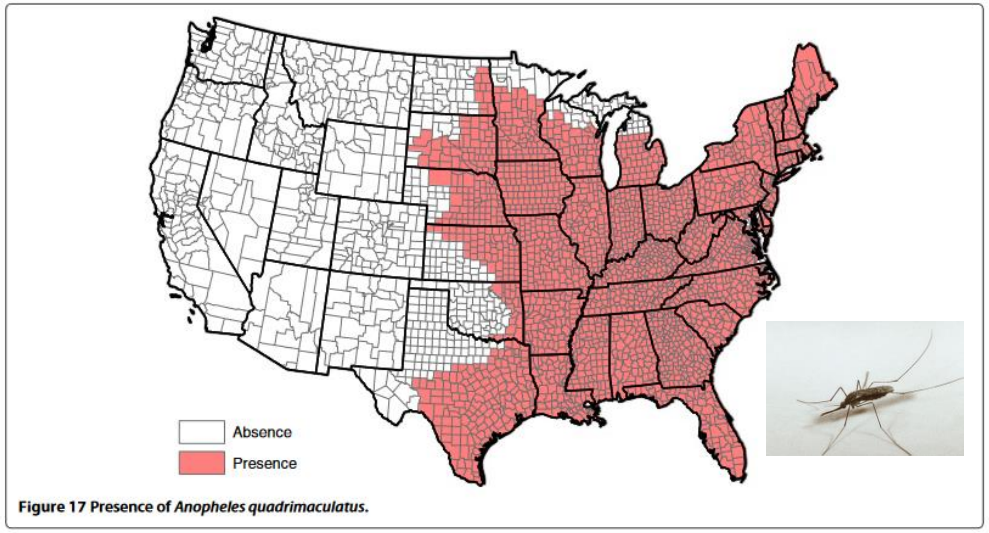


Figure 17 Presence of *Anopheles quadrimaculatus*.

Wang et al. Parasites & Vectors 2014, 7:264

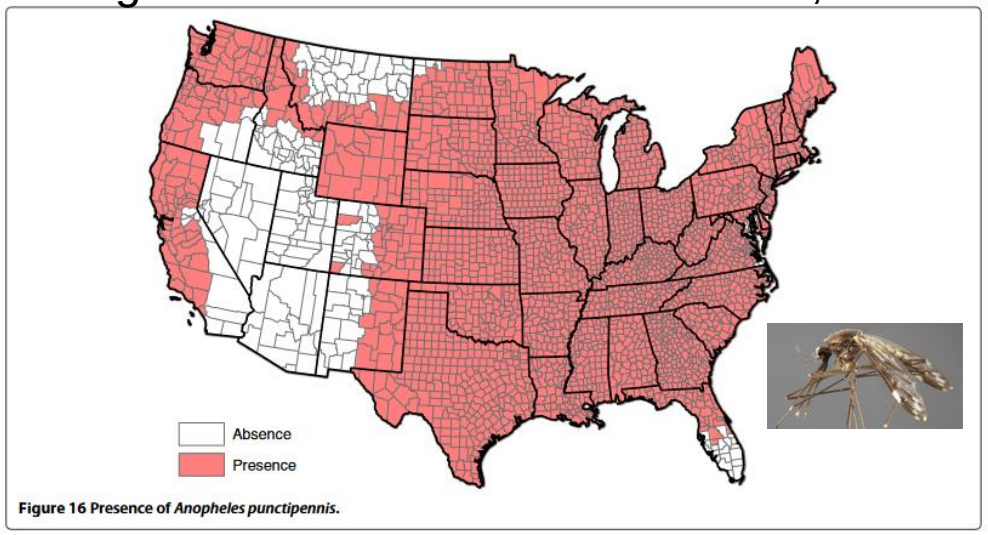
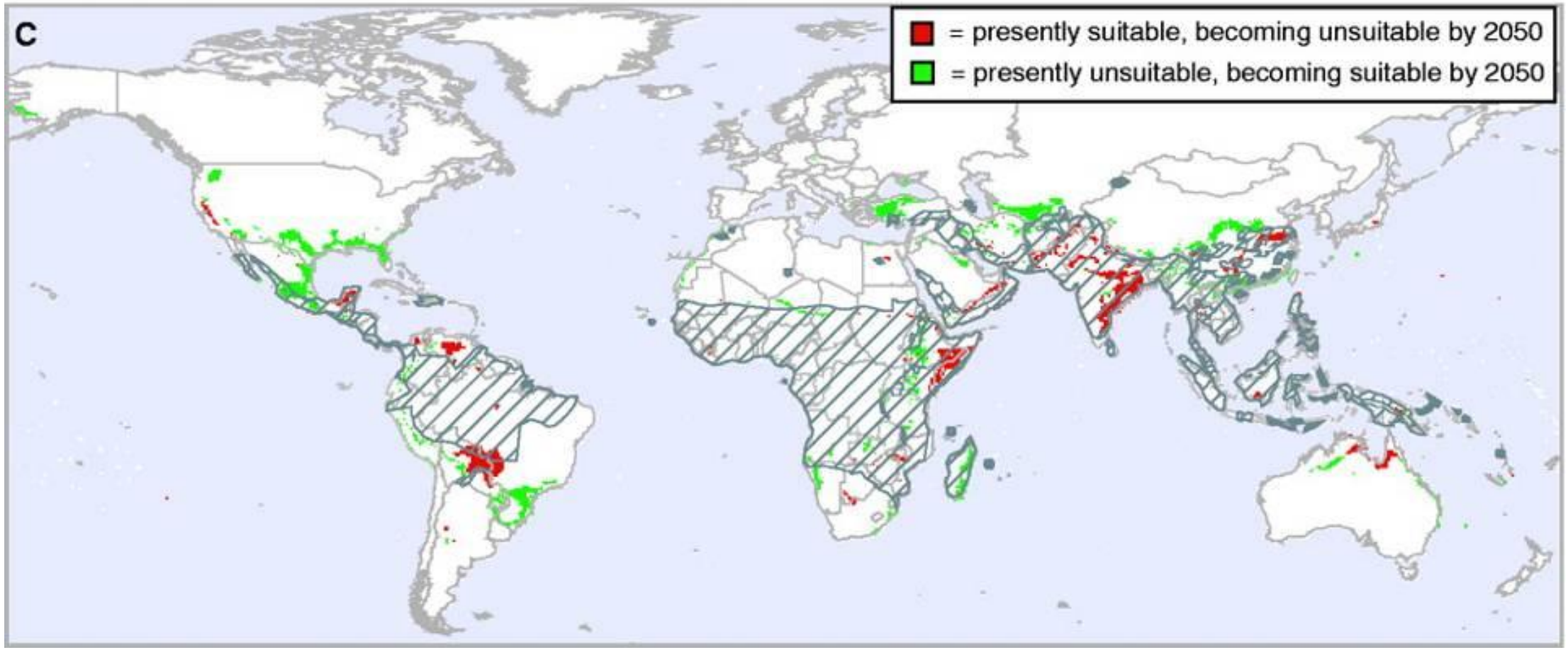


Figure 16 Presence of *Anopheles punctipennis*.

DJ Rogers & SE Randolph. 2000.
Science 289, 1763 -1766

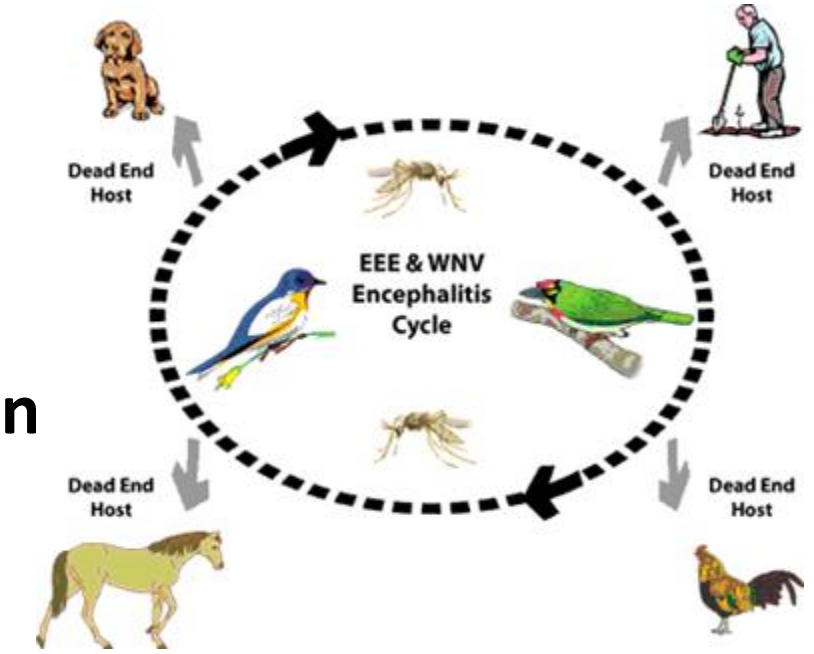
The Global Spread of Malaria in a Future, Warmer World



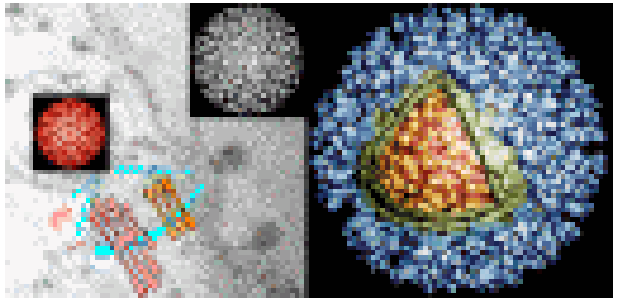
The increases in travel and human-vector contacts may make some areas (in the US) more favorable for the occurrence of sporadic locally-acquired cases.

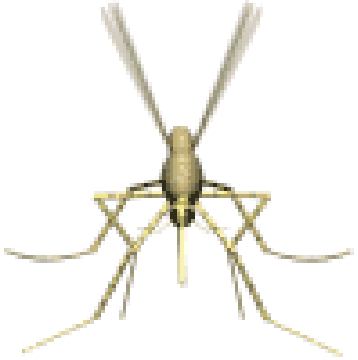
Vector-borne zoonosis: when humans and wildlife collide

- Vector survival
- Presence of reservoir hosts
- Pathogen amplification and transmission
- Opportunities for human exposure



Complex Impact of climate





Climate, weather and VBZD

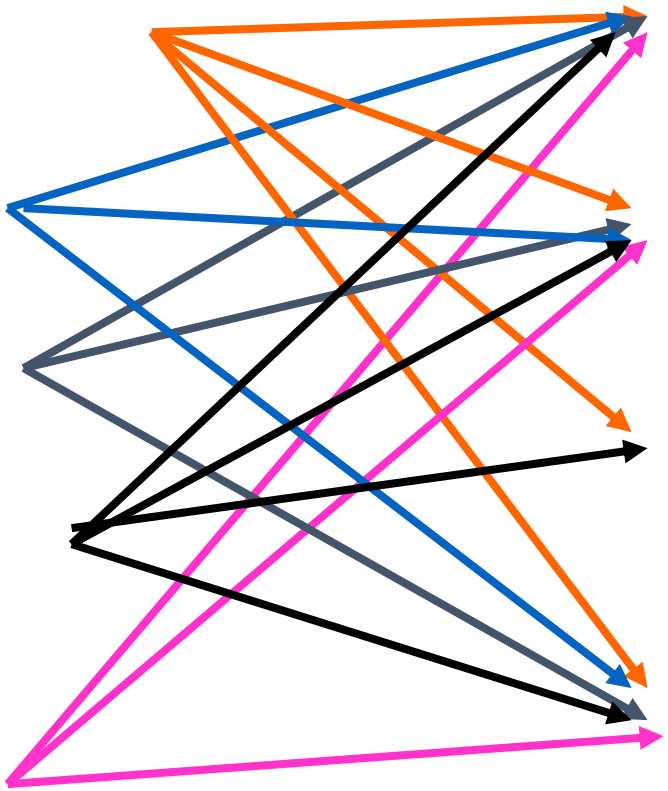
Temperature

Rainfall

Humidity

Variability

Extreme Events



Vector survival

Presence of reservoir hosts

Pathogen transmission

Opportunities for human exposure

Difficulty to predict how bad WNV transmission will be in future years

Infection of reservoir hosts

Disease of human hosts

Am. J. Trop. Med. Hyg., 108(2), 2023, pp. 366–376
doi:10.4269/ajtmh.21-1086

Multi-Year Comparison of Community- and Species-Level West Nile Virus Antibody Prevalence in Birds from Atlanta, Georgia and Chicago, Illinois, 2005–2016

Joseph R. McMillan,[1] Gabriel L. Hamer,[2] Rebecca S. Levine,[1] Daniel G. Mead,[3] Lance A. Waller,[1,4] Tony L. Goldberg,[5] Edward D. Walker,[6] Jeffrey D. Brawn,[7] Marilyn O. Ruiz,[8]† Uriel Kitron,[1,9] and Gonzalo Vazquez-Prokopec[1,9]*

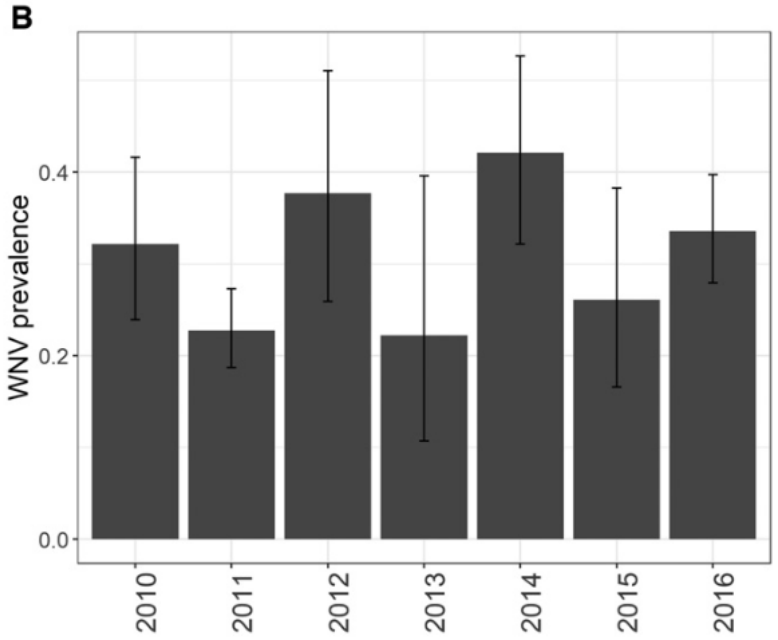


FIGURE 3. (**A**) Estimated WNV seroprevalence in birds by sampling location in Atlanta, Georgia, 2010–2016. (**B**) Estimated WNV seroprev-

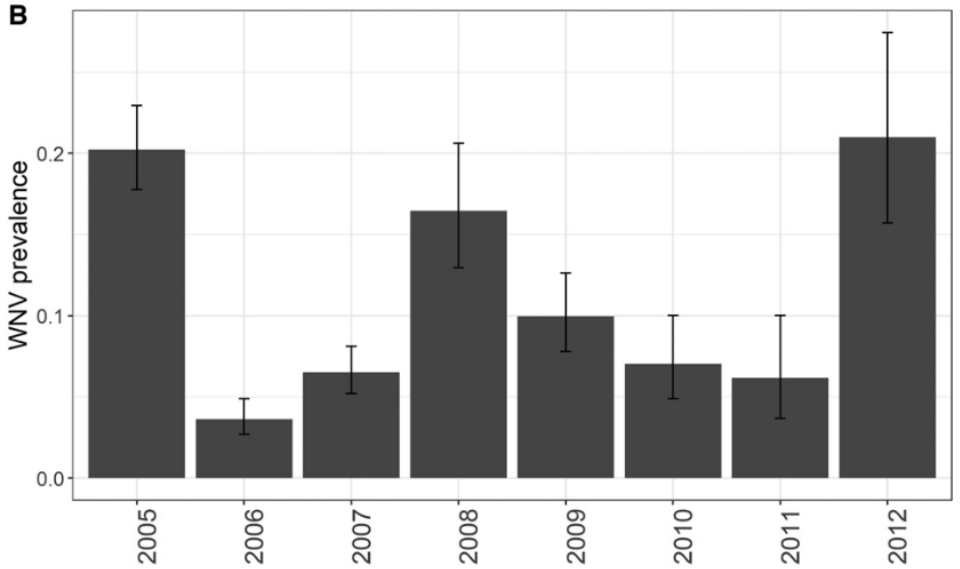


FIGURE 4. (**A**) Estimated WNV seroprevalence in birds by location in Chicago, Illinois, 2005–2012. (**B**) Estimated WNV seroprevalence in birds by year in Chicago, Illinois, 2005–2012. Bars represent the estimate; lines represent the 95% CI of the estimate. Sampling location maps and descrip-

- Bird seroprevalence (% birds w/WNV antibodies) varies by year and location.
- Poor predictability of susceptibility and the intensity of WNV transmission.

Conclusions

- In an increasingly globalized world, vector-borne disease **(re)emergence will be more common**.
- When vector-human-environments are suitable, malaria introductions will lead **to localized transmission**: need to ascertain case and understand vector ecology and control options.
- Travelers and clinicians need to be better educated about post-travel behavior: **use repellent to prevent pathogen introductions!**
- **West Nile virus is endemic in the US**. Cycles or increases in transmission in geographic areas are likely due to reduction in immunity in avian reservoirs. Humans are colliding with a heterogeneous transmission cycle.