Coupled Dynamics of Tourism and Mosquito-Borne Disease Transmission in the Americas

Climate change and globalization have led to a rising threat of mosquito-borne diseases such as Zika, dengue, and chikungunya viruses, with profound implications for international tourism.

Key Facts

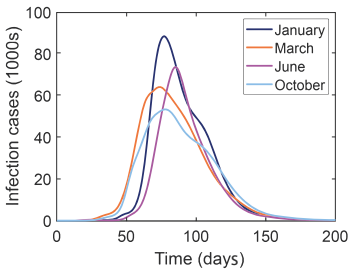
Every year, hundreds of millions of people are infected by mosquito-borne illnesses, and more than half the world's human population is at risk of exposure.

Climate change and globalization have extended the reach of diseases that were once confined to tropical regions including Africa, Asia, and Latin America, now making them prevalent as far north as Texas and Florida.

Aedes aegypti, the main mosquito carrier of Zika, dengue, and chikungunya viruses, thrives in urban areas with standing water, often due to poor sanitation or water storage.

The Zika virus epidemic of 2016 affected over four million people in 68 countries and territories, with up to $3.5 billion in economic costs in Latin America.

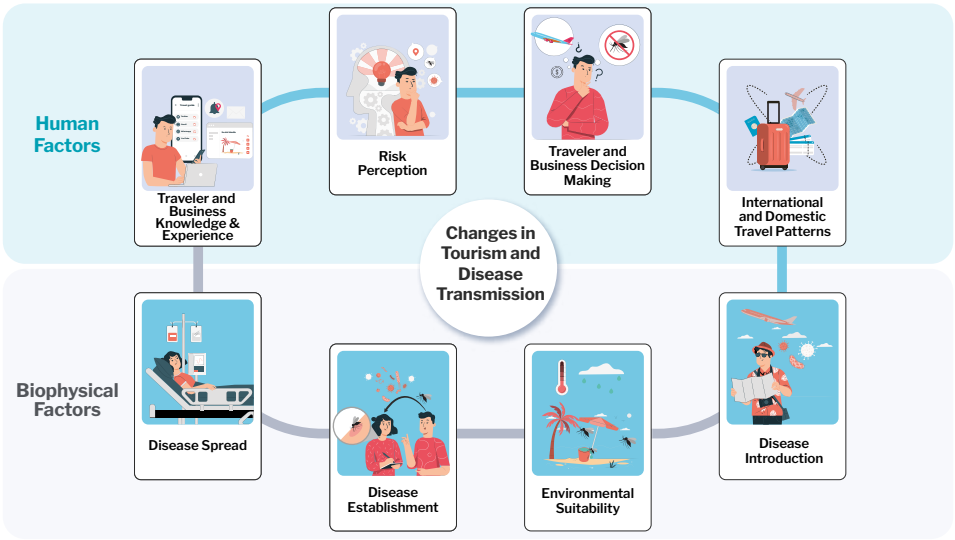
Novel techniques in epidemiology and network science may help predict and abate future outbreaks.



A simulation of the 2015-2016 Zika virus epidemic in Colombia if it had started in different months.

Coupled Natural-Human Systems

The interactions between mosquito-borne diseases, travel, and the tourism industry are an example of a Coupled Natural-Human (CNH) system. When a disease epidemic emerges in a certain region, government agencies and the media issue health advisories. This can affect people's perceptions of risk and travel decisions, often negatively impacting the tourism economy for that region. The reduced flow of people slows the spread of the disease and may cause the epidemic to end sooner, which will be reported to the public and continue the cycle.



Seasonal Variability

In tropical locations like Colombia, the annual cycles of wet and dry seasons overlap with peak- and low-season periods. *Aedes* mosquitoes may thrive in dry seasons, leading to increased Zika virus transmission. Epidemics spread faster during peak tourism times due to heightened human mobility and interaction. Zika, initially detected in Colombia in October 2015 during a wet low-season month, could have infected 60% more people if it had emerged during a dry peak tourism month like January.

Epidemiology and Network Science

The spread of epidemics can be simulated by computer models that consider human populations as networks, where each point represents a city and the connections between them represent roads, air travel, and sea routes. Modern simulation techniques and advanced computing can model these epidemics down to the city block, predicting exactly where diseases emerge. Government agencies can prevent outbreaks before they happen and direct their resources to communities that need them most.

Risk Perceptions of Tourism

Social scientific methods, such as semi-structured interviews, surveys, and content analysis, can be employed to improve our understanding of the relationship between mosquito-borne diseases and tourism. This information can be used in mitigation and management strategies to better deal with future epidemics and their impacts on the tourism industry.

THE UNIVERSITY OF MAINE
1865
UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN