Global Disease Outbreaks and El Niño

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Abstract

Interannual climate variability patterns associated with the El Niño-Southern Oscillation phenomenon result in climate and environmental anomaly conditions in specific regions worldwide that directly favour outbreaks and/or amplification of variety of diseases of public health concern including chikungunya, hantavirus, Rift Valley fever, cholera, plague, and Zika.

The study analysed patterns of some disease outbreaks during the strong 2015–2016 El Niño event in relation to climate anomalies derived from satellite measurements. Disease outbreaks in multiple El Niño-connected regions worldwide (including Southeast Asia, Tanzania, western US, and Brazil) followed shifts in rainfall, temperature, and vegetation in which both drought and flooding occurred in excess (14–81% precipitation departures from normal). These shifts favoured ecological conditions appropriate for pathogens and their vectors to emerge and propagate clusters of diseases activity in these regions.

The analysis indicates that intensity of disease activity in some ENSO-teleconnected regions were approximately 2.5–28% higher during years with El Niño events than those without. Plague in Colorado and New Mexico as well as cholera in Tanzania were significantly associated with above normal rainfall (p < 0.05); while dengue in Brazil and southeast Asia were significantly associated with above normal land surface temperature (p < 0.05).

Routine and ongoing global satellite monitoring of key climate variable anomalies calibrated to specific regions could identify regions at risk for emergence and propagation of disease vectors. Such information can provide sufficient lead-time for outbreak prevention and potentially reduce the burden and spread of ecologically coupled diseases.

Comment

The study used early warning alerts reported through ProMED. The study is further discussed in Science Today, highlighting that "knowledge of the linkages between El Niño events and these important human and animal diseases generated by this study is critical to disease control and prevention, which will also mitigate globalization," said co-author Kenneth Linthicum, USDA center director at an entomology laboratory in Gainesville, Florida. He noted these data were used in 2016 to avert a Rift Valley fever outbreak in East Africa. "By vaccinating livestock, they likely prevented thousands of human cases and animal deaths.”

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