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# Global influenza surveillance with Laplacian multidimensional scaling

**Key words:** Surveillance gap, Influenza, Spatial-transmission model

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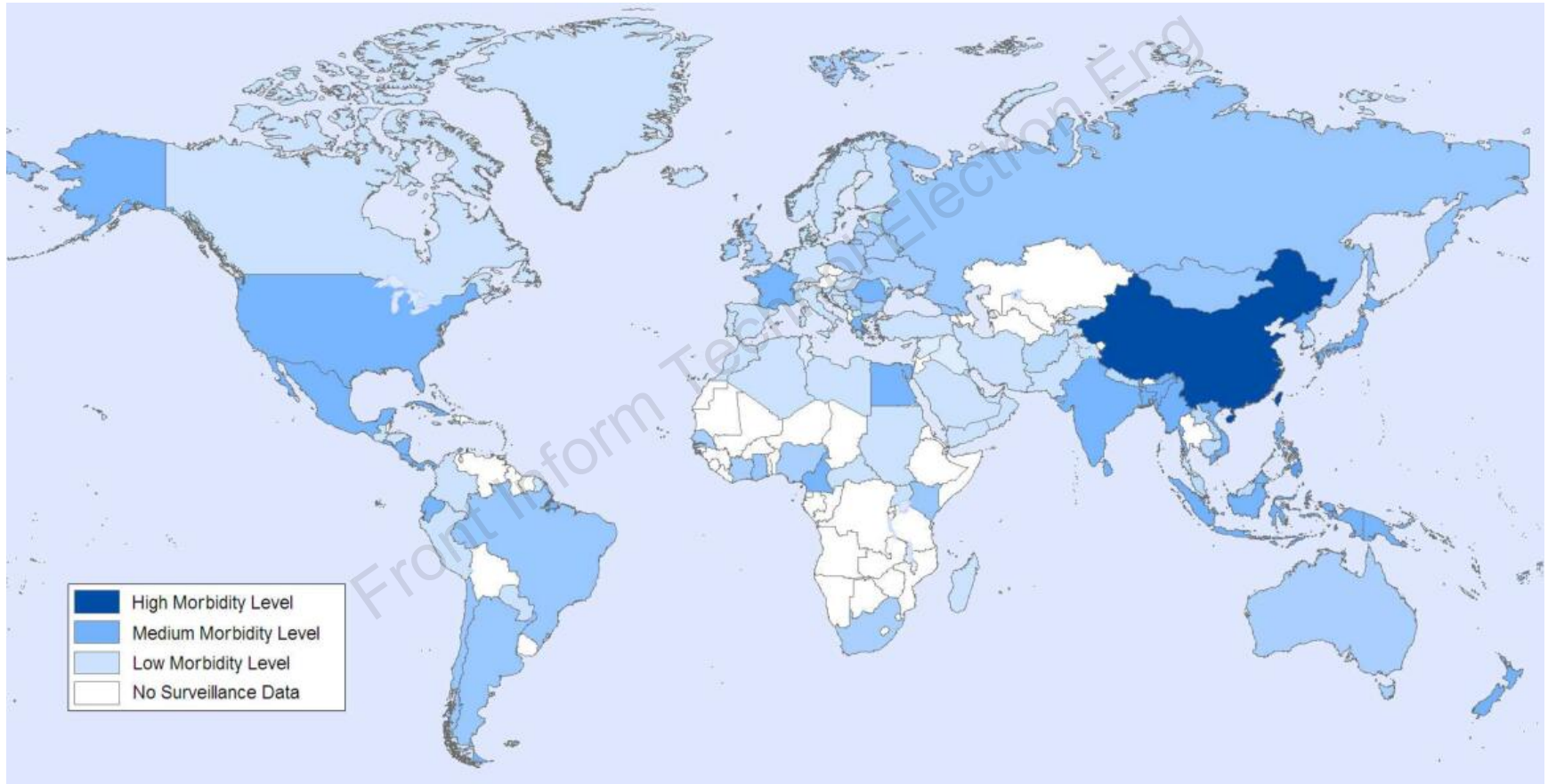
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# Introduction

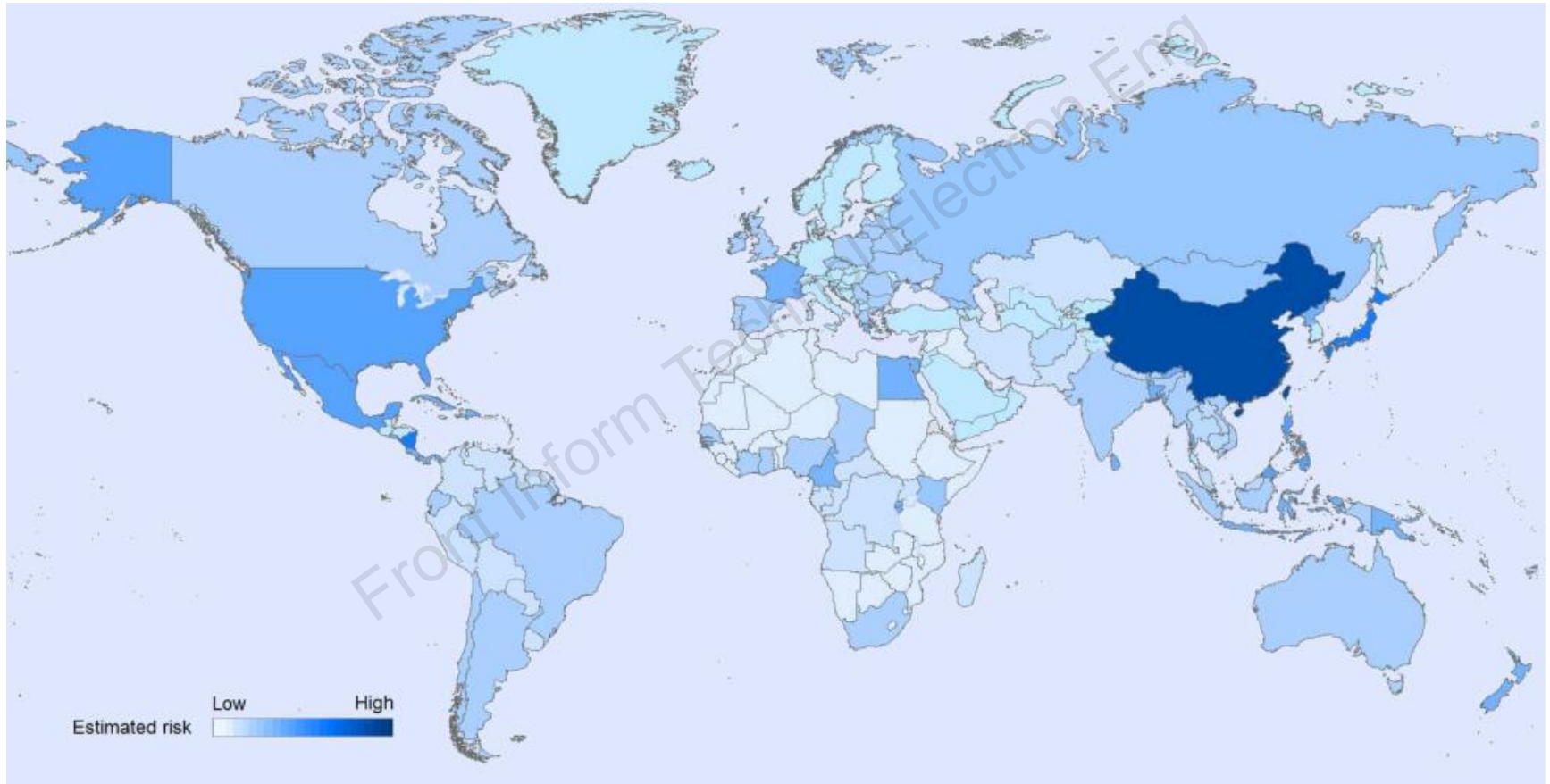
- The Global Influenza Surveillance Network (GISN) of the World Health Organization (WHO) is an essential foundation for monitoring and managing an influenza pandemic. The GISN system has proven to be valuable, but it leaves severe spatial gap, principally in Asia and Africa.
- Our work attempts to map the influenza epidemic risk of different countries at the global scale.
- Our method is designed to estimate the epidemic risks by preserving both global variations and regional similarities in disease transmission.

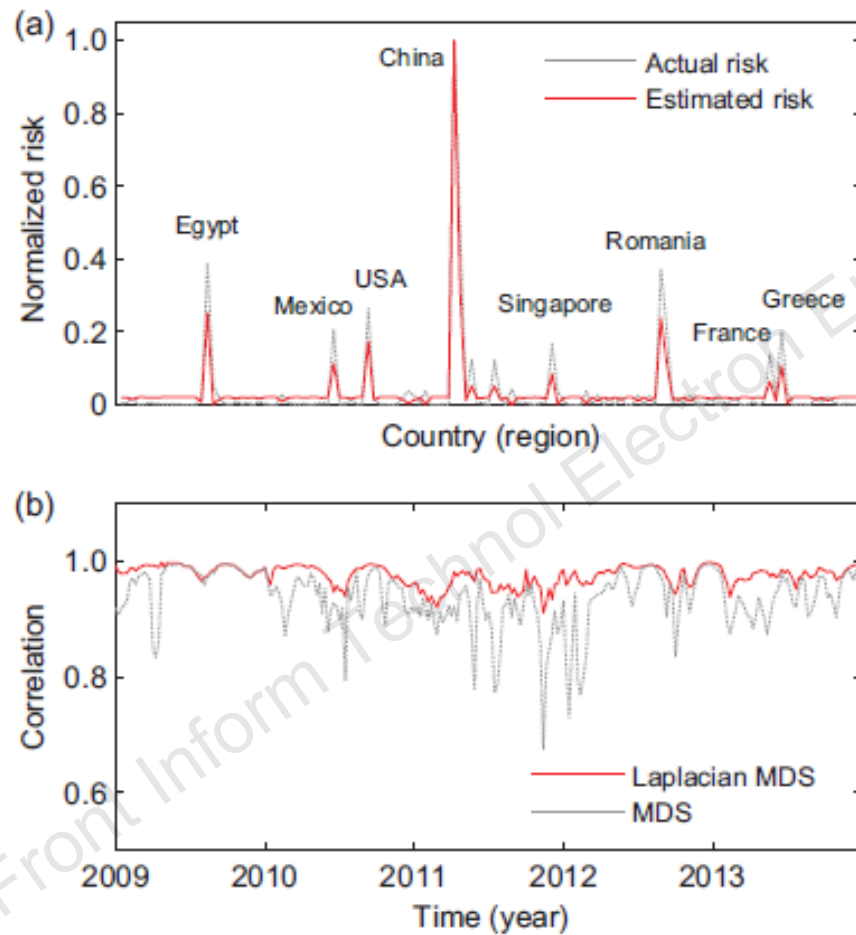
# Global influenza morbidity levels reported by the WHO in February 2010



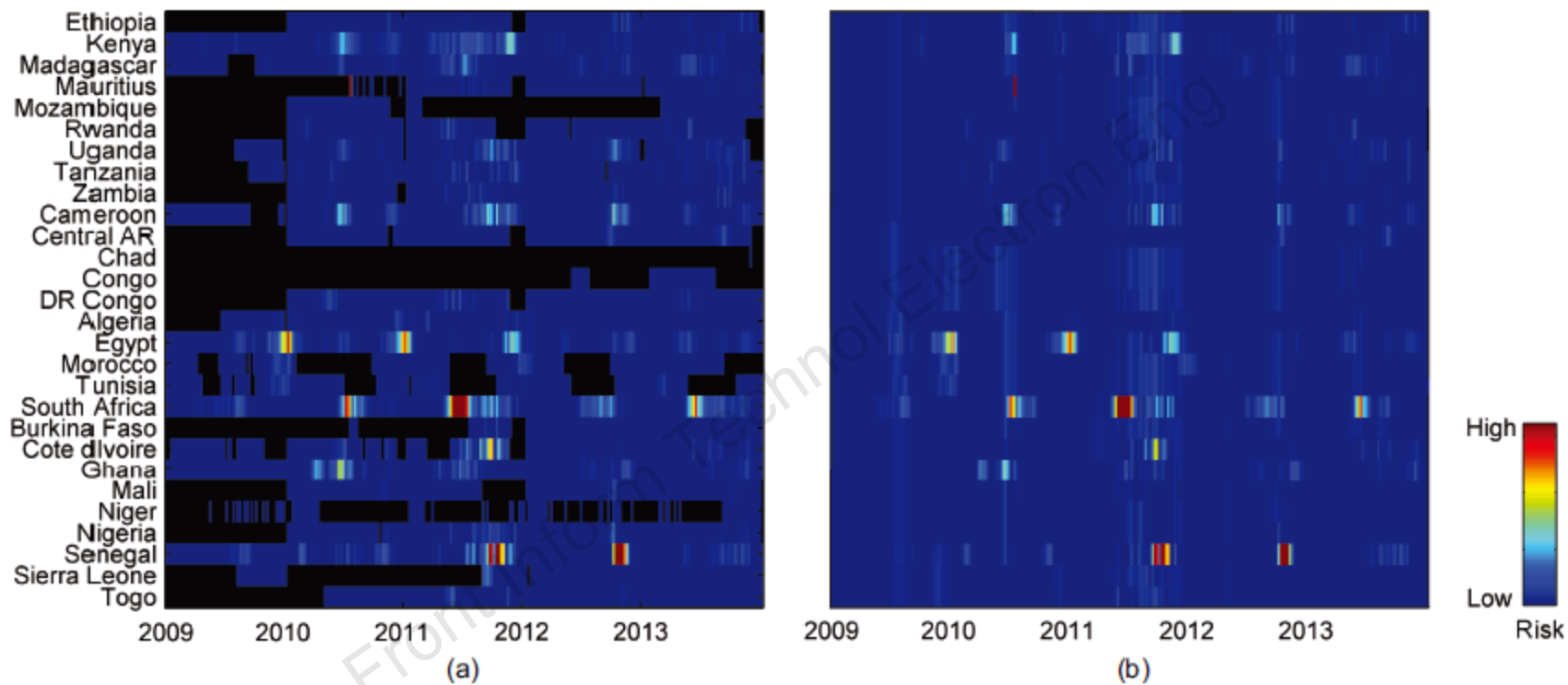
No surveillance data were available for the countries in white

# The estimated influenza epidemic risks in the February 2010





**Fig. 3 Results for the countries covered by the GISN: (a) comparison of the estimated risk and the actual risk measurement in the 8th week of 2010; (b) the correlation between the estimated risks and the actual risk measurements of different countries for all the examined weeks from Jan. 2009 to Dec. 2013**



**Fig. 5** The actual risk measurement (a) and the estimated risk (b) for all African countries of five influenza transmission zones

# Conclusions

- Experiments show that the estimated risks were strongly correlated with the actual influenza epidemic risk in general, which could provide early warnings of potential influenza epidemics in countries lacking the infrastructure required for traditional surveillance.
- Moreover, for the countries with incomplete surveillance data, the proposed method could continuously provide weekly epidemic risk estimates.