

Seasonal Influenza's Association with Specific Humidity in Three Tropical Central American Countries: Honduras, Nicaragua and Costa Rica

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1. INTRODUCTION

Annual Burden of Seasonal Influenza Worldwide

500,000 deaths • 3 - 5 million severe illnesses • 1 billion infections • Children and elderly are among high-risk groups^a

Influenza and Weather Association

	T	H	RF	Sun	ENSO
Virus Survival		I, α			
Transmission		I, α	α		α
Host Susceptibility					

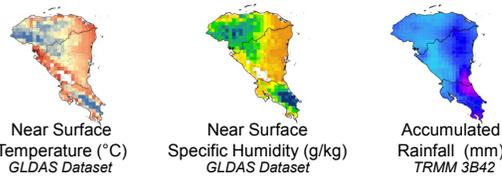
Direction of association: α = Proportional, I = Inversely proportional; T = Temperature; H = Humidity; RF = Rainfall; Sun = Solar Radiation; ENSO = El Niño Southern Oscillation

2. DATA

Virological Data

Respiratory samples from patients with Influenza-Like-Illness (ILI) & Severe Acute Respiratory Infection (SARI) were tested with RT-PCR & Immunofluorescence for influenza, RSV, parainfluenza and adenoviruses. These data (2008-2013) were obtained from each country's National Influenza Center.

Meteorological Parameters



GLDAS: Global Land Data Assimilation System; TRMM: Tropical Rainfall Measuring Mission; These data were obtained through NASA Giovanni System^b

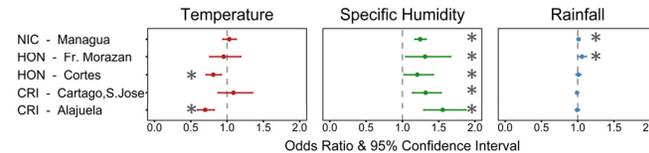
REFERENCES

- [a] WHO. 2012. Influenza (Seasonal) – Factsheet No. 211
 [b] Acker & Leptoukh. 2007. EOS Trans. AGU 88(2): 14-17
 [c] Huang and Wu. 1999. Rev. Geophys 46(RG2006)

3. BINOMIAL REGRESSION ANALYSIS

Proportional Association with Specific Humidity

Influenza positive proportion was associated ($p < 0.05$) with specific humidity in all locations. Associations with temperature and rainfall were location-dependent.

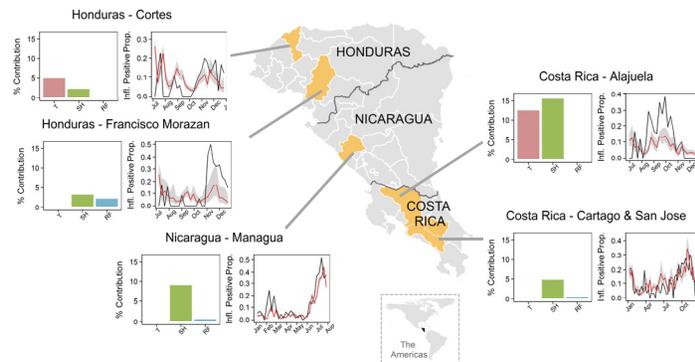


Odds ratios for influenza positive proportion (with 95% CI). The model was adjusted for other co-circulating viruses (RSV, parainfluenza and adenoviruses), seasonality, possible nonlinear relationships and autocorrelation. * Indicates significance ($p < 0.05$)

Influenza Prediction

Predicted the final year (or 6 months) of the data, which was not used in training the model.

— Observation
 — Prediction
 ■ 95% CI



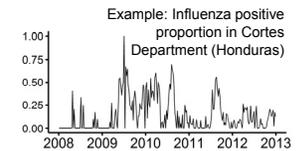
Estimated Contribution of Meteorological Parameters

% contribution of meteorological parameters in the model.

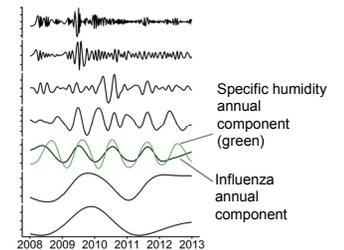
■ (T) Temperature
 ■ (SH) Specific Humidity
 ■ (RF) Rainfall

4. FREQUENCY ANALYSIS – Preliminary Results

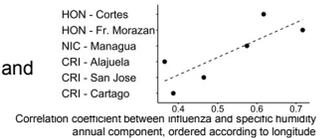
Decompose influenza and meteorological signals into their oscillatory modes, called Intrinsic Mode Function (IMF) using Empirical Mode Decomposition^c



Extracted annual component of each signal, and calculated the correlation coefficients between influenza and the meteorological parameters.



Correlation with specific humidity ($p < 0.05$) was observed in all locations, whereas with temperature and rainfall were location-dependent.



5. CONCLUSIONS

- Specific humidity was proportionally associated ($p < 0.05$) with influenza activity in all locations
- Association with temperature and rainfall were location-dependent
- The regression models that incorporate meteorological variables can be used to estimate influenza activity

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