PMAC 2023, Bangkok, Thailand

Mapping Climate and Disaster Risks: Determining Provincial Health Risk from Climate and Disasters in the Philippines

BALADAD AK, MODINA CAE, FOWLER KC ET AL.

INTRODUCTION

The Philippines is vulnerable to the adverse effects of climate change.

This study aimed to assess and visualize climate- and disaster-related health risks of ten Philippine provinces using a spatio-temporal approach.

METHODS

Phase 1: A rapid review was conducted to review the global literature on the most burdensome diseases in the Philippines and their associations with temperature, rainfall, and extreme weather events (EWE).

Phase 2: Exposures from 2009-2019 monthly municipal mean, minimum and maximum temperature, relative humidity, total rainfall, windspeed, and annual normalized difference vegetation index (NDVI) were assessed. Health outcomes were measured as incidence rate (IR) and mortality rate (MR) per 100k population. Health insurance claims data were expressed as the sum of claims per municipality per month.

Generalized linear mixed models were produced with identity links, adjusted for lag times of months and years.

Phase 3: Choropleth mapping was used to visualize health risks. Global Moran's I test for spatial autocorrelation, and Anselin Local Moran's I Outlier and Getis-Ord Gi* Hotspot tests for local spatial autocorrelation were conducted to detect spatial distribution.

RESULTS

Based on literature, warm temperatures, and extremely high or low temperatures, humidity, or rainfall significantly affect multiple health outcomes.

For hospitalization, only monthly mean wind speed and ischemic stroke-related hospital claims showed a strong correlation.

For incidence, long-term changes in climate also have greater impacts on health compared to short-term or seasonal changes, particularly between annual **NDVI** and dengue, bronchitis, pneumonia, tuberculosis, hypertensive heart disease, and diabetes; and between **annual mean temperature** and acute bloody diarrhea, bronchitis, pneumonia, asthma, ischemic heart disease, ischemic stroke, and diabetes.

Spatial analysis showed that densely populated or urbanized cities tended to be spatial outliers or hotspots for high disease burden, even for non-infectious diseases. Dengue, typhoid fever, and diabetes showed the most evidence of municipal clustering.

DISCUSSION

We recommend the inclusion of 14 diseases as health impact indicators in comprehensive Climate and a Disaster Risk Analysis (CDRA) or other risk assessment activities.

Spatial epidemiology approaches should also be used in planning, to identify municipalities or other areas that may be outliers for high disease burden. Conversely, spatial outliers for low disease burden may be examined for best practices in maintaining minimal health impacts in the midst of similar climate exposures.

Corresponding Author
Anne Kathlyn Baladad (aabaladad@up.edu.ph)

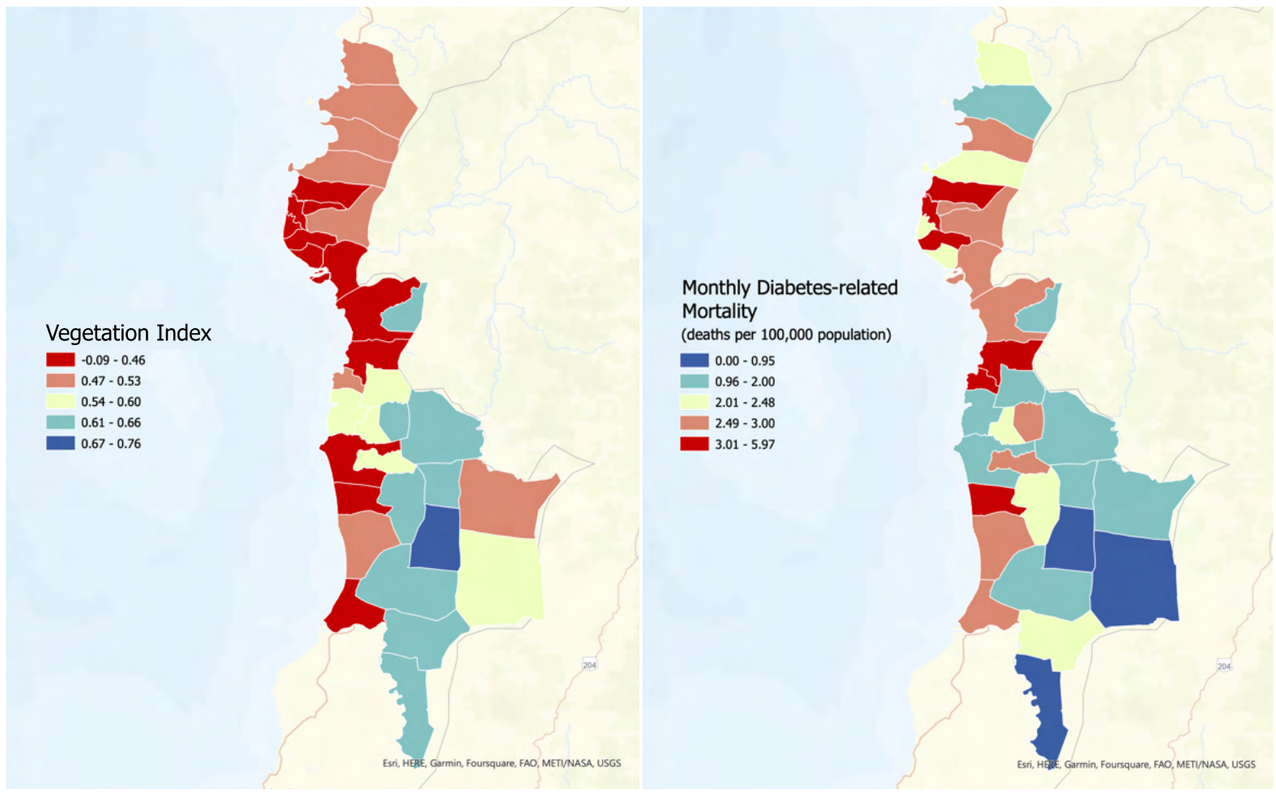

Figure 1. Areas with less vegetation tend to have higher diabetes-related mortality

NOTE. *All map movies showing monthly changes in municipal incidence rate, mortality rate, and total claims can be viewed through https://bit.ly/EMPHR_MapMovies.*

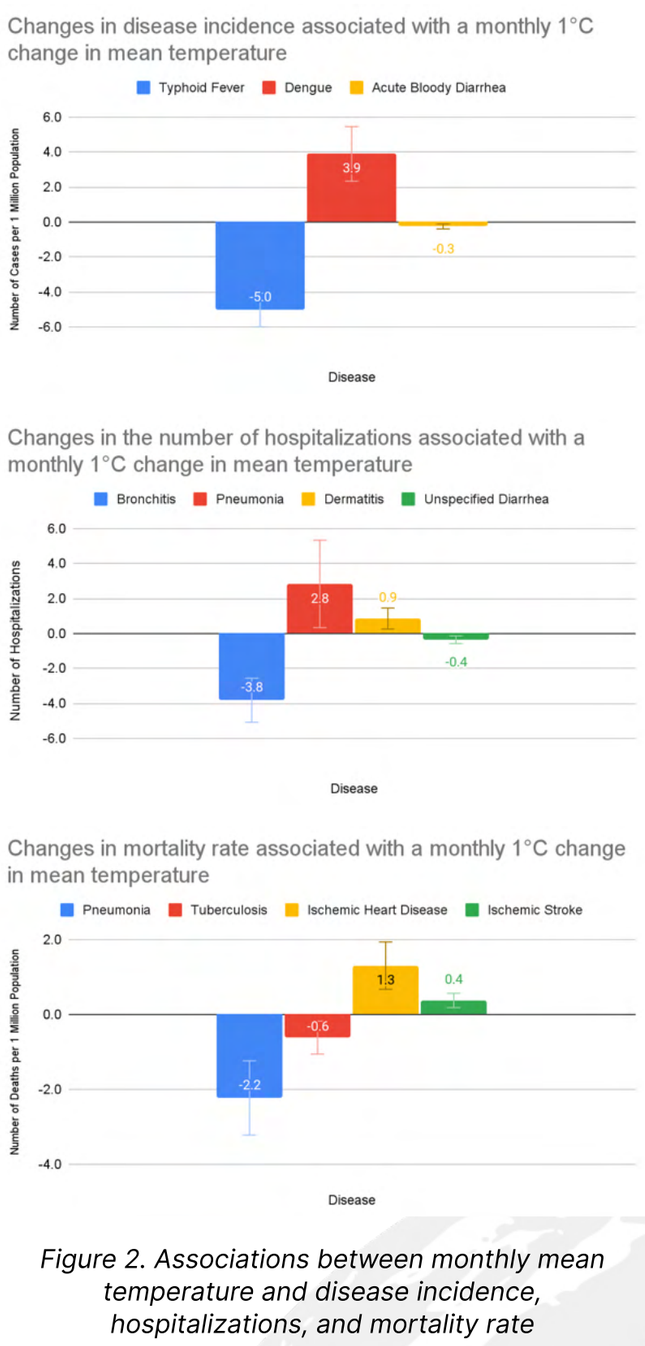

Figure 2. Associations between monthly mean temperature and disease incidence, hospitalizations, and mortality rate

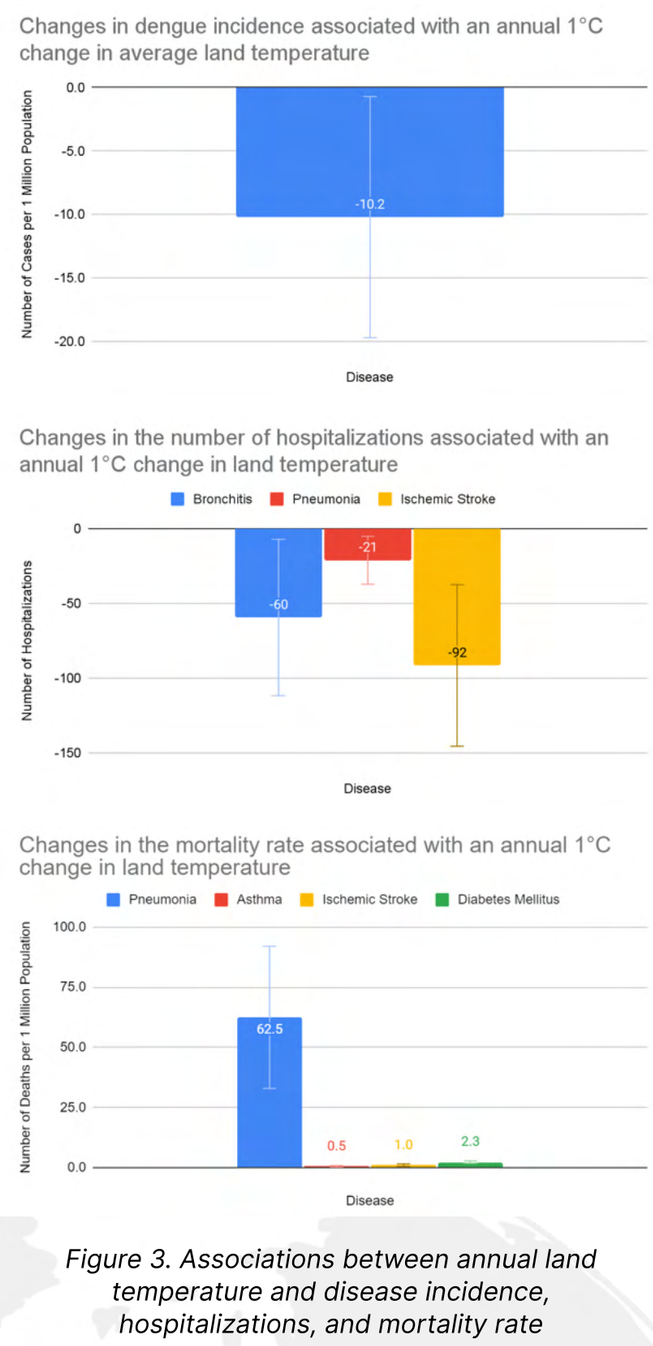

Figure 3. Associations between annual land temperature and disease incidence, hospitalizations, and mortality rate