Discussion for "Inference"

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Paleoclimate Reconstruction

Paleoclimatology provides insight into how the Earth system behaves over long time scales and is crucial to understand the dynamics of climate change.

- **Proxies: imprints of climate, such as tree rings, ice cores, lake sediment, corral, speleothem, etc. – *Different spatial and temporal scale***
- **Forcings: Volcanism, Solar irradiance, Greenhouse gases**
- **Observations: Instrumental temperatures**
- **Other useful information: Climate model output**

Paleoclimate Reconstruction

This subject raises many statistical questions as all the observations involved contain substantial amount of noise and thus tend to mask the essence of true physical phenomena.

- Integration of information from various sources
- Quantification of uncertainties corresponding to the reconstruction
- Measurement error in proxies, forcings, observations
- Large data computation for spatial reconstruction
- Identifiability issue in multivariate reconstruction

Assessment of Climate Change on Human Health

- One of the growing interests in scientific community
- Require to integrate meteorological observations, pollution data, climate model output, health databases and other related datasets
- Quantify uncertainties in the estimation and prediction
- Statistical issues: *spatial misalignment, missing data, multivariate correlation, space-time dependency etc.*

Example: Impact of Heat Waves on Human Health

Impact of Heat Waves on Human Health

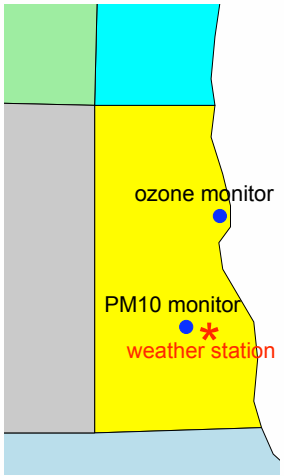
- Hospital inpatient discharge data
- Daily Meteorological data: max/min temperature and max/min Relative Humidity
- Global climate model output (time slice experiments of GFDL GAMDT 2004)
- Pollution data: daily ozone and PM10 at every 5 to 6 days
- Socioeconomic data: House Value, House income, Poverty Status, Race distribution

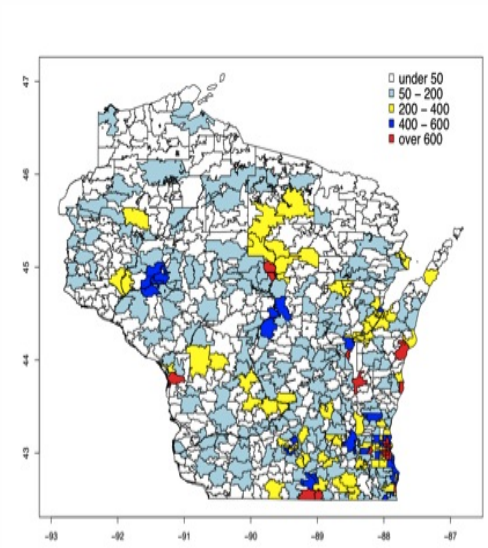
Q: The relationship between morbidity and heat stress

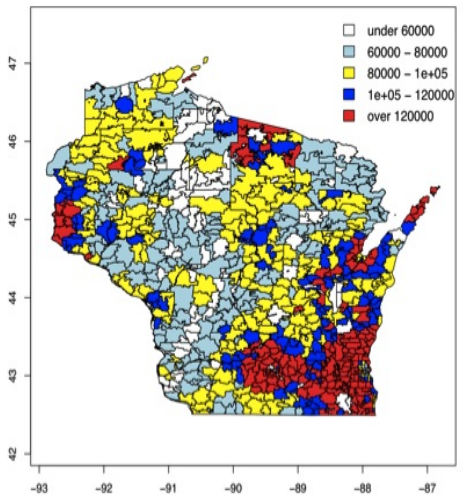
Further Q: Assess the future impact of climate change on hospital admissions

Sample of Data

(a) (b) (c)







(a) Map of the weather station, the ozone monitor and the PM10 monitor in Milwaukee, WI

(b) Annual average inpatients by zipcodes in WI

(c) House value by 2000 Census