

DengAI

Predicting Disease Spread

<https://www.drivendata.org/competitions/44/dengai-predicting-disease-spread/>

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Dengue Fever

- Disease
 - Fever, headache, pain, rashes, sometimes life-threatening bleeding
 - Incubation time of ca. 14 days
 - Length of 3-7 days
 - Not contagious between humans
- Transmitted by *Aedes Aegypti*
 - Egg: 2-6 days
 - Larva: >4 days
 - Pupae: 2 days
 - Adult: 14-28 days
- Total time between egglaying and fever outbreak: 3-4 weeks



Fig. 1: *Aedes aegypti*
[https://commons.wikimedia.org/wiki/
File:Aedes_aegypti.jpg](https://commons.wikimedia.org/wiki/File:Aedes_aegypti.jpg)

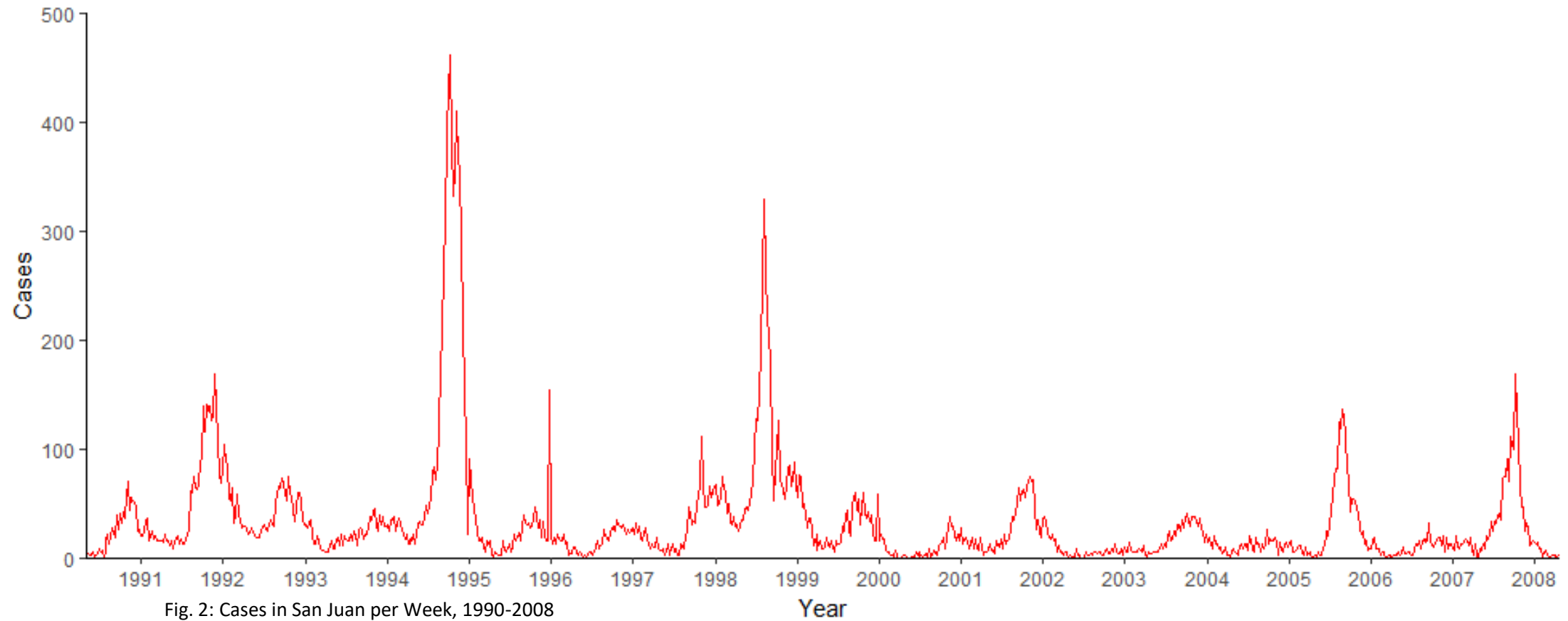
Data

- Weekly Data
 - 1455 usable observations
 - Weather Data (Temperature, Humidity, Rainfall)
 - Vegetation Data (NDVI)
 - Total Cases of Fever
- Two Cities:
 - San Juan, Puerto Rico, April 1990 – April 2008 (936 observations)
 - > Monsoon Climate, Northern Hemisphere
 - Iquitos, Peru, July 2000 – June 2010 (519 observations)
 - > Tropical Rainforest, Southern Hemisphere
- Goal: Predict number of cases for the following years : until 2013
- Evaluation: Mean Absolute Error (MAE)

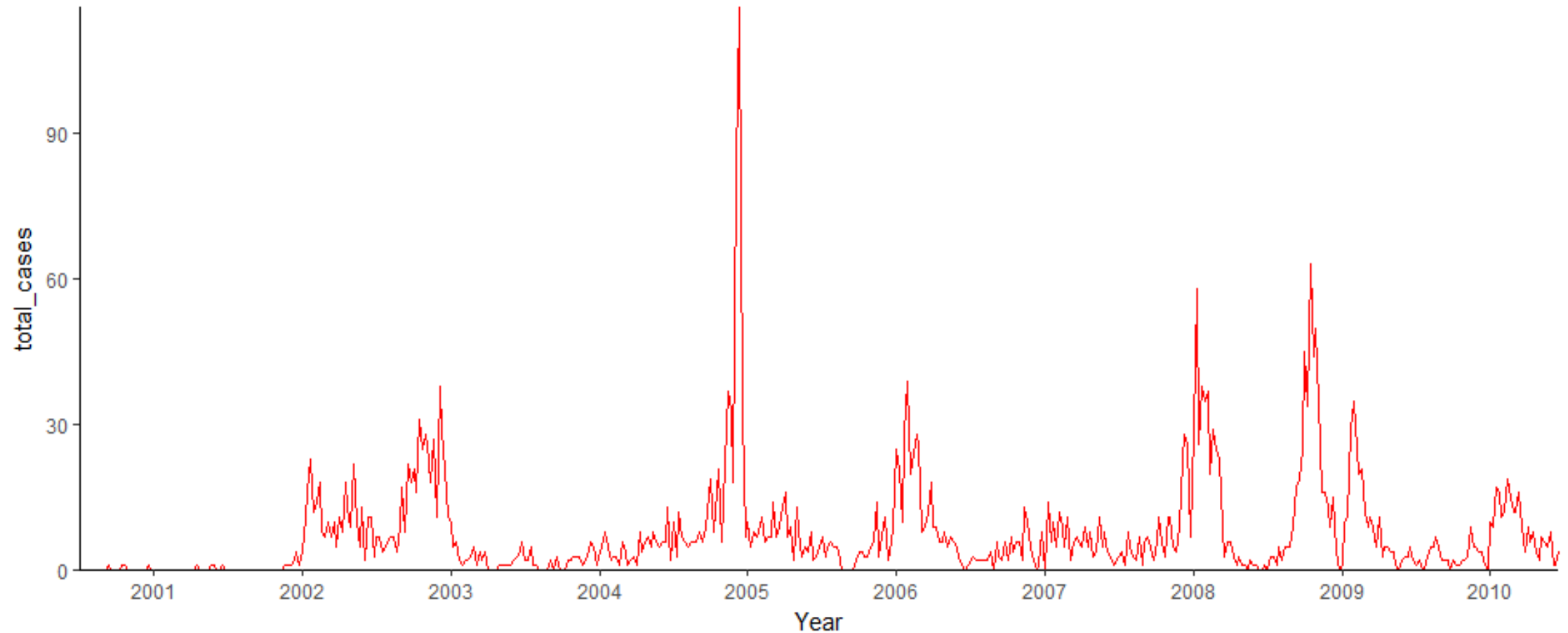
Data

- Strong yearly seasonality
- Strong difference between the two cities

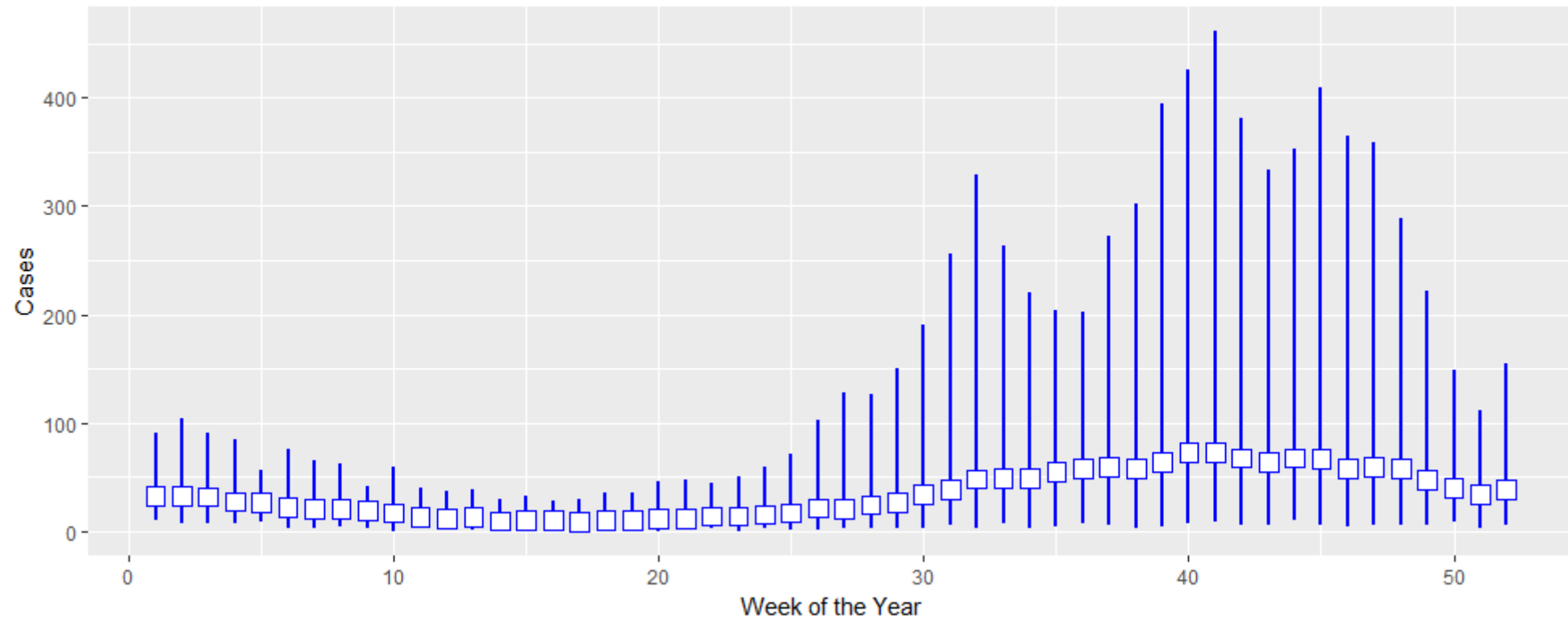
Descriptives (San Juan)



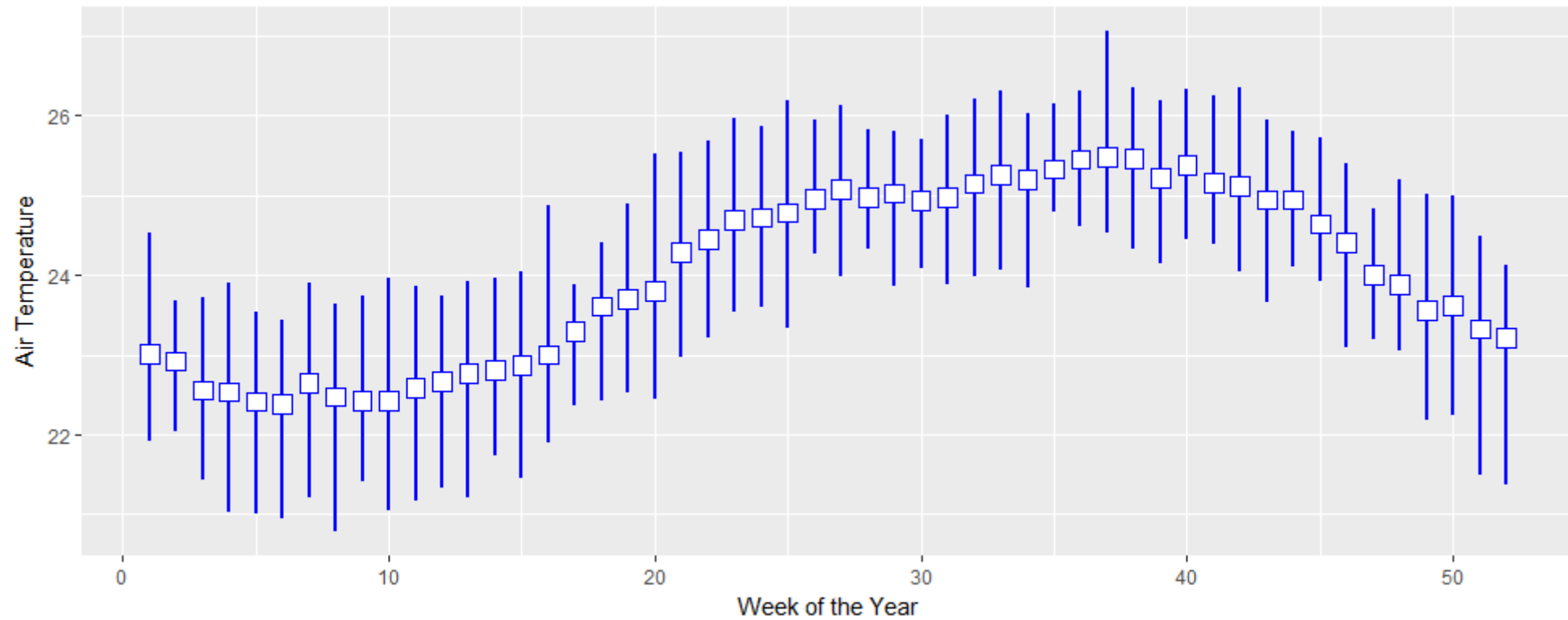
Descriptives (Iquitos)



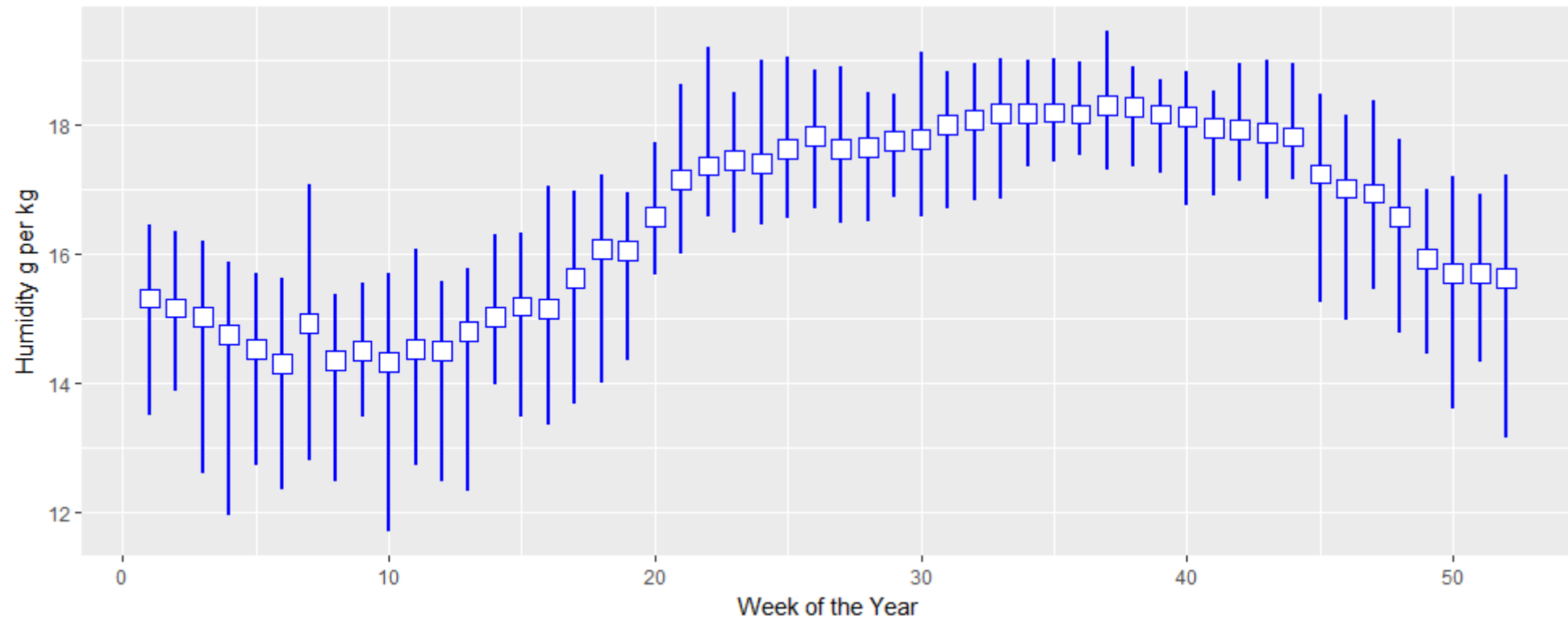
Descriptives: Cases in San Juan



Descriptives: Air Temperature in San Juan

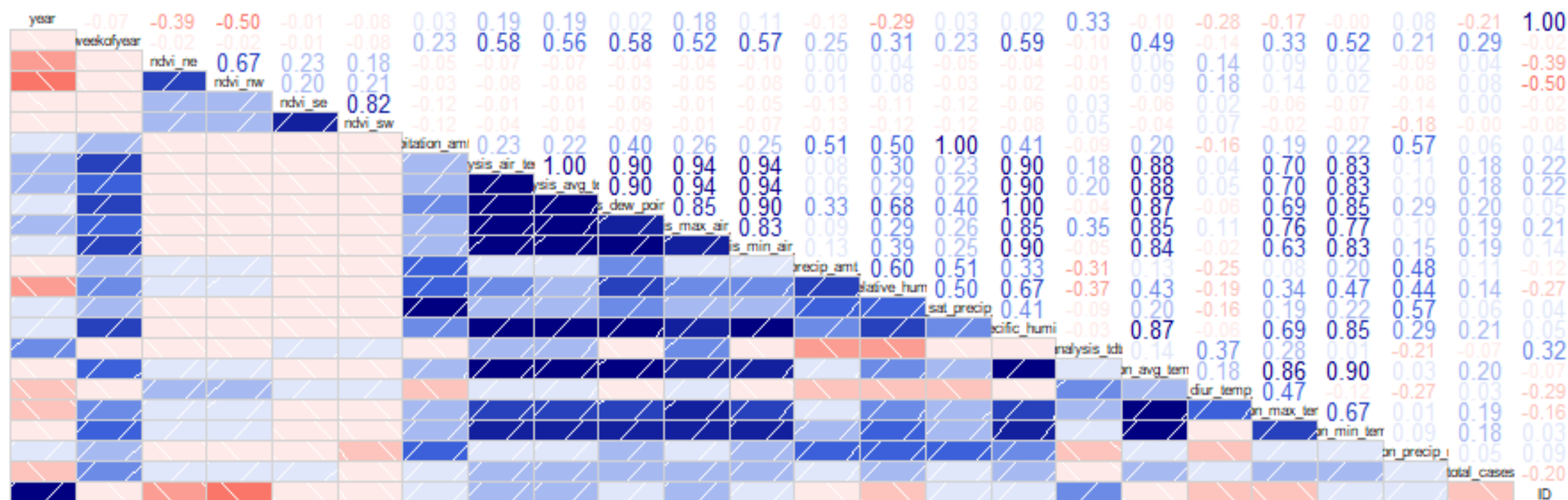


Descriptives: Humidity in San Juan



Correlogram

San Juan



First tries

- Some simple Poisson-& Negative Binomial/models on all the data
- ARIMA on the total cases
 - Univariate
 - Stationary
 - Good at approximating historical patterns
 - Improvement: climate variables as external regressor

Issues

- Missing values
- Small dataset with (some) redundant information
- Unobserved factors?
- Lag (Mosquito Lifespan, Incubation Time)