West Nile virus forecast model submission form
Email completed form to vbd-predict@cdc.gov

Team name
NCSU M&M's

Team leader

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Other team members

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Model description
Provide a brief summary of the model methods with sufficient detail for another modeler to understand the approach being applied. If multiple models are used, describe each model and how they were combined.

For our explanatory variables, we took data from the 2010 U.S. census, the Center for Disease Control's social vulnerability index (SVI), and NOAA's National Climatic Data Center (NCDC). The SVI and population from the census was assumed to be static across the 20 years of the study. The minimum daily temperatures were obtained from NOAA's NCDC for all recording sites and were aggregated for each county. A smoothed function for the minimum daily temperature throughout the year was fit to the data for each county, with the values of the smoothed function used for prediction of West Nile Virus Cases. Counties that had data missing, for any variable, had values replaced with the state-wide average.

We developed a system of difference equations to model the number of susceptible and infected individuals in a particular county from 2000 to 2018 on a weekly basis. The rate of transition from the susceptible to infected classes was determined by a transition rate parameter, β. Using the covariates of interest, we performed a log transformed linear regression for this transition rate parameter using a Delayed Rejection Adaptive Metropolis (DRAM) algorithm. Then, we estimated covariate values for each county across 2020 and forward simulated the model using the posterior distributions from the regression analysis to obtain case count projections.

Variables
List each variable used and its temporal relationship to the forecast. If multiple models are used, specify which enter into each model.

1. Social Vulnerability Index - Static

2. Minimum Weekly Temp - Weekly
3. County Population Size - Static
4.
5.
6.
7.
8.
9.
10.

Computational resources

Describe the programming languages and software tools that were used to write and execute the forecasts.

Code was developed in R version 3.5.3. We utilized the FME and ggmcmc packages to implement Delayed Rejection Adaptive Metropolis for our parameter estimation.

Code was run on a HPC.

Publications

Note whether the model was derived from previously published work and, if so, provide references.

Participation agreement

By submitting these forecasts, the team agrees to abide by the project rules and data use agreements.

Team lead name	Date
Marco Hamins-Puertolas	4/30/20