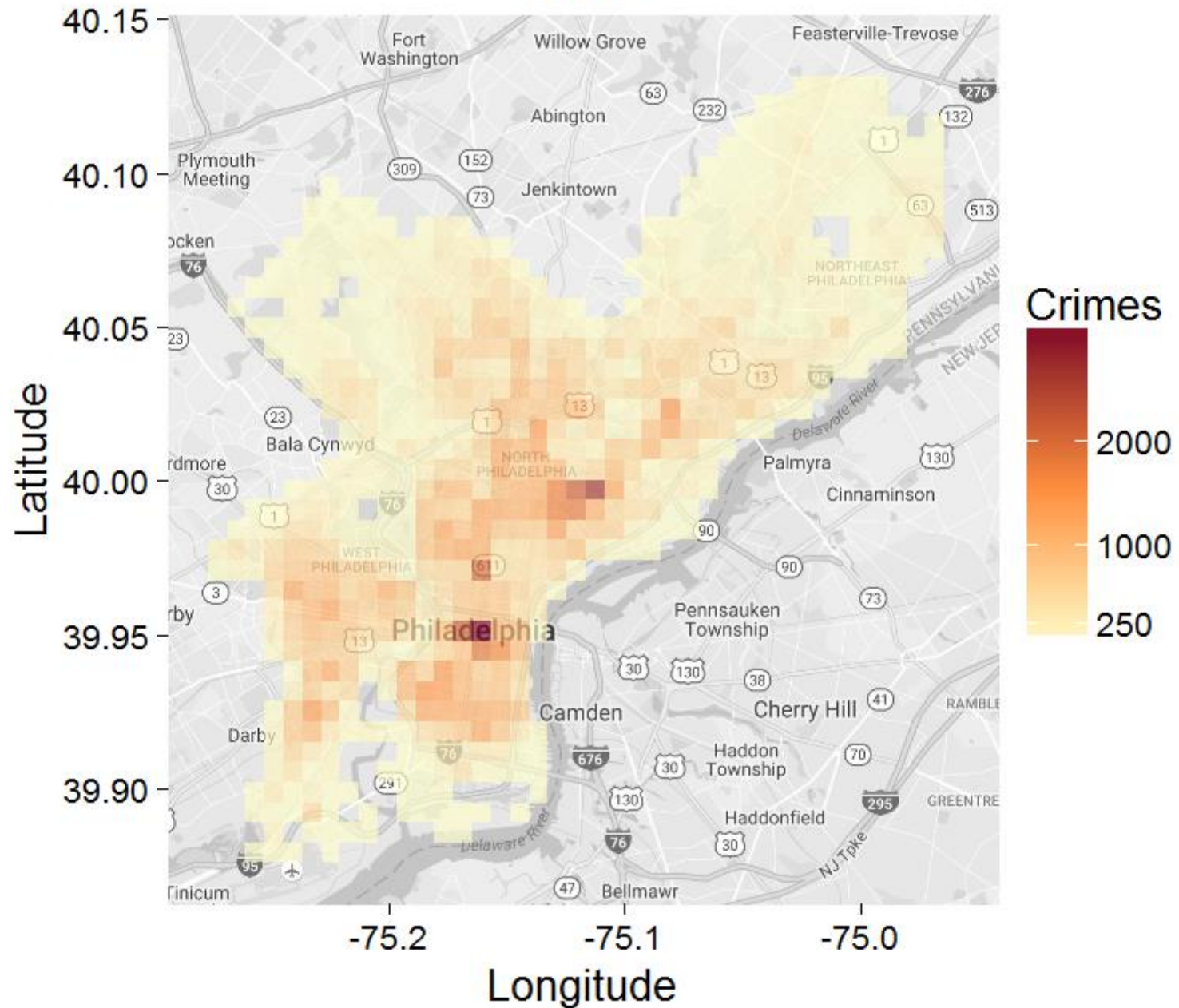
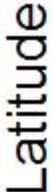


Forecasting Philadelphia Crime

Heat Map of Crimes 2006



2007



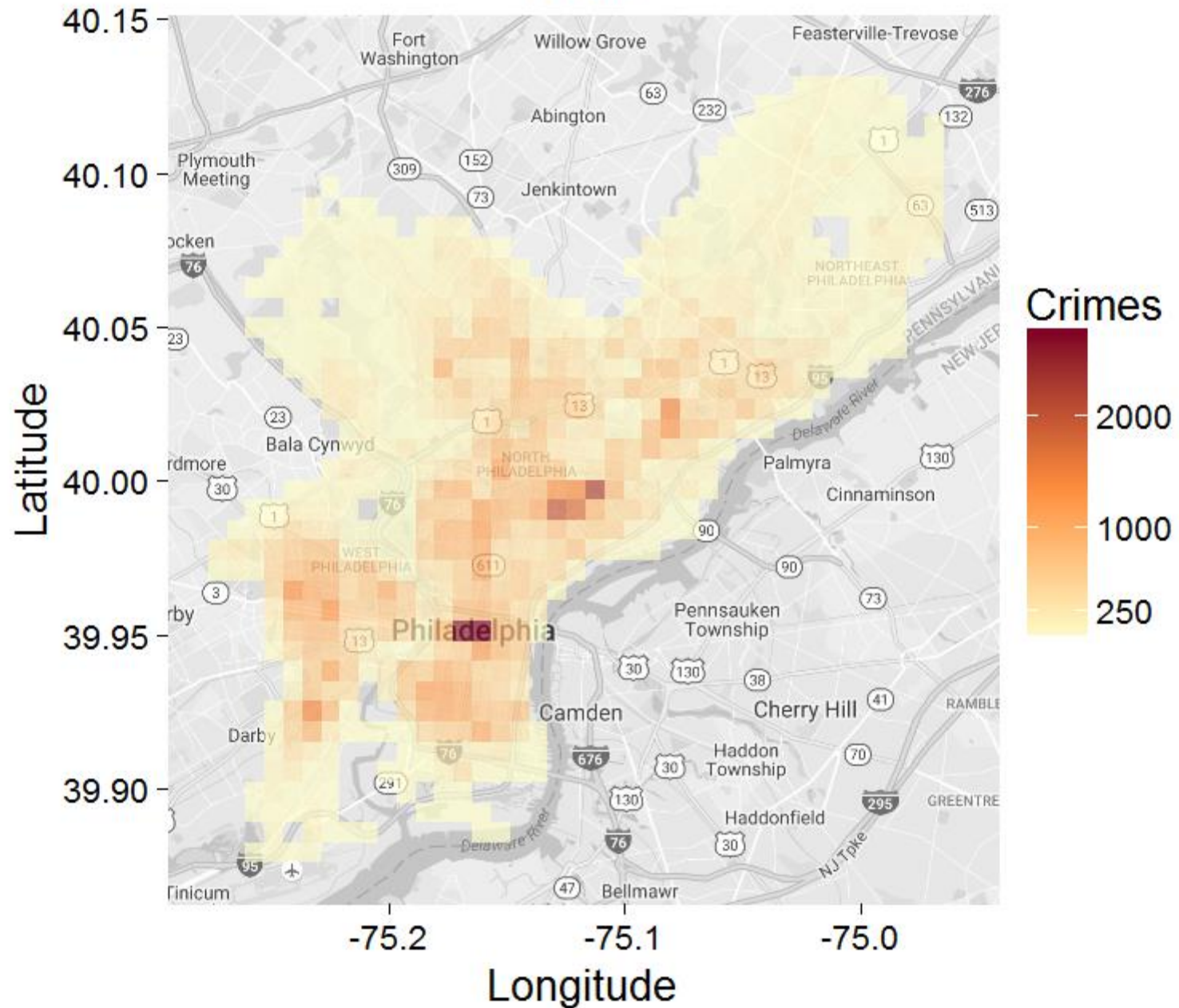
2008



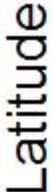
2009



Heat Map of Crimes 2010



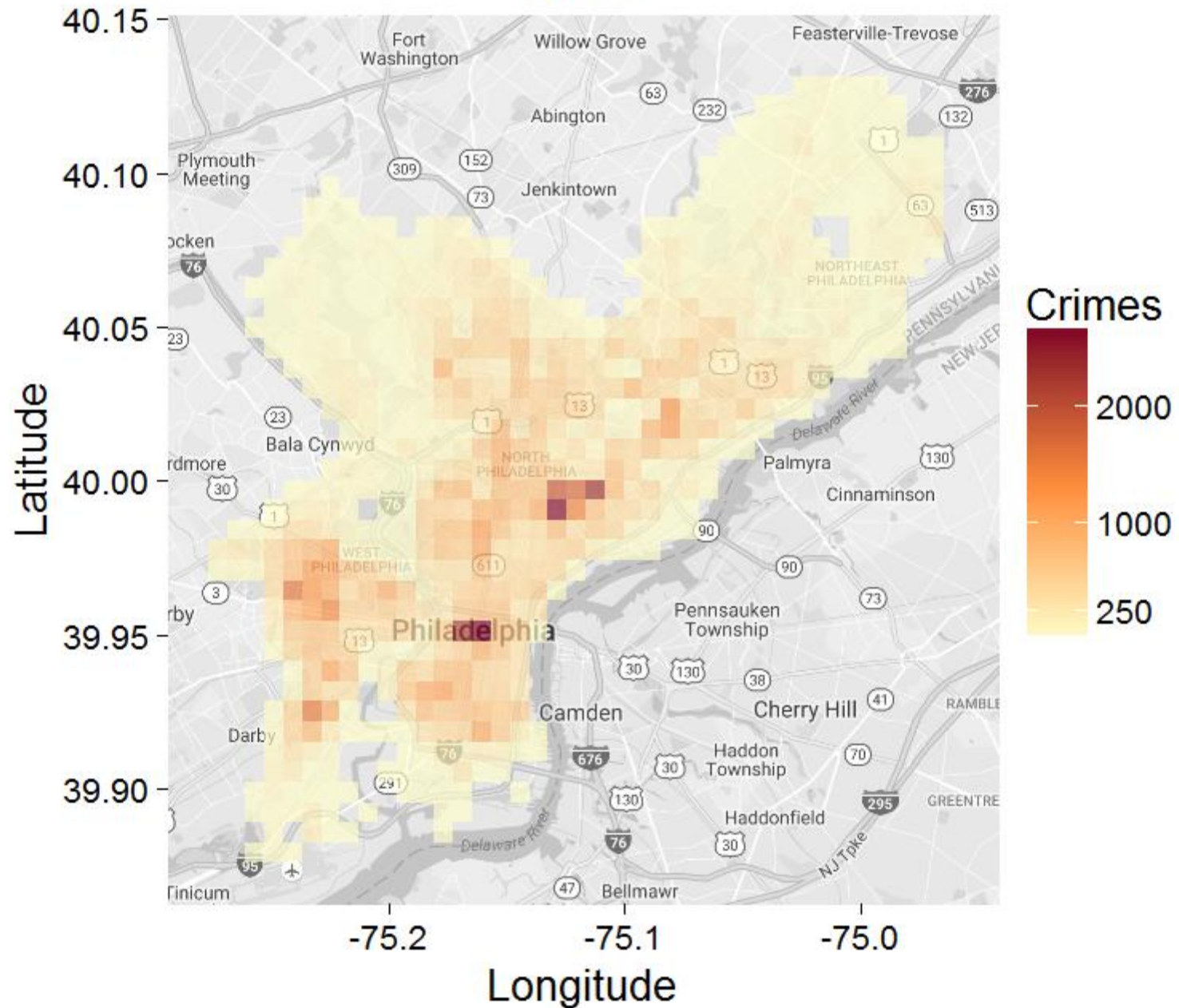
2011



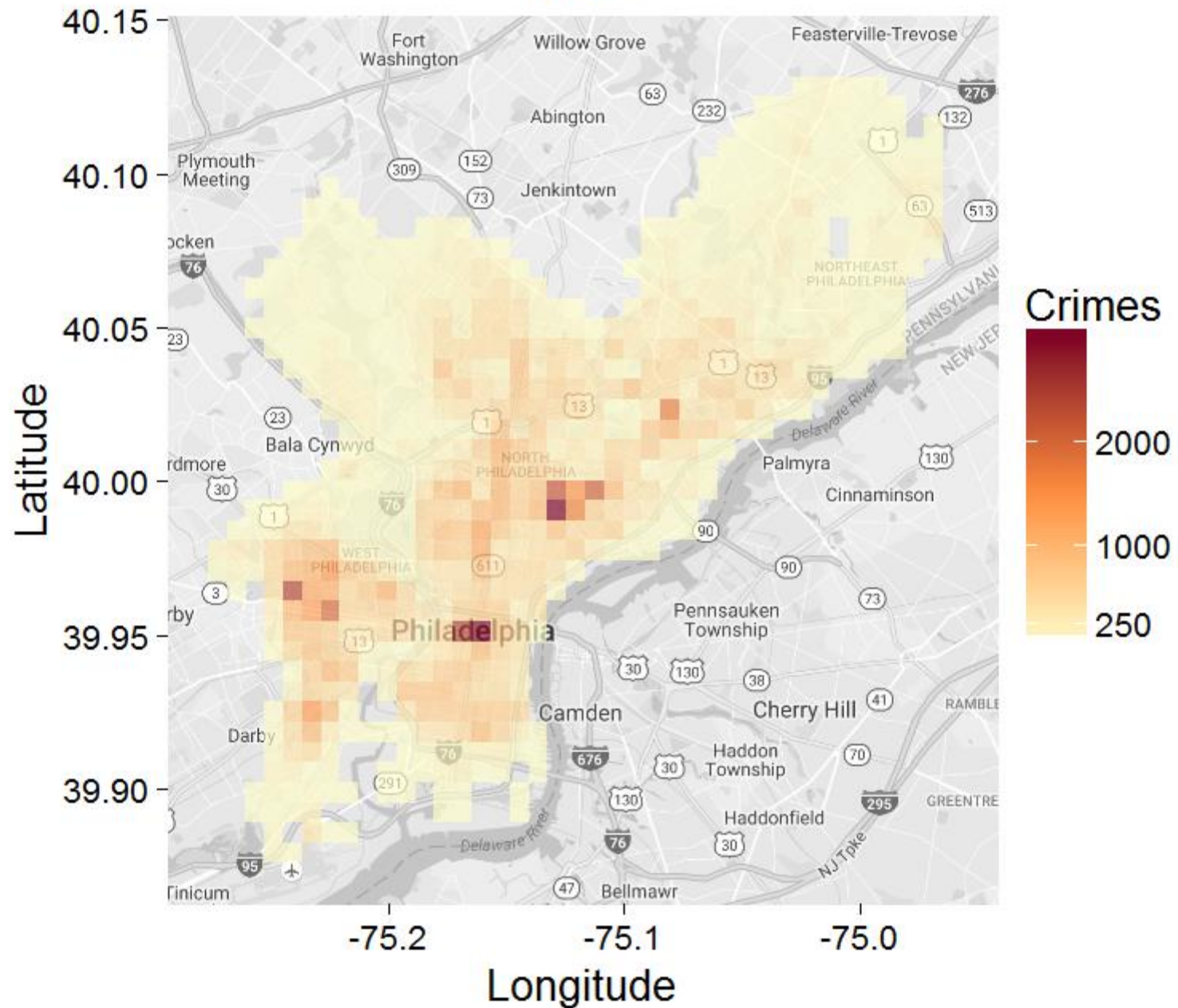
2012



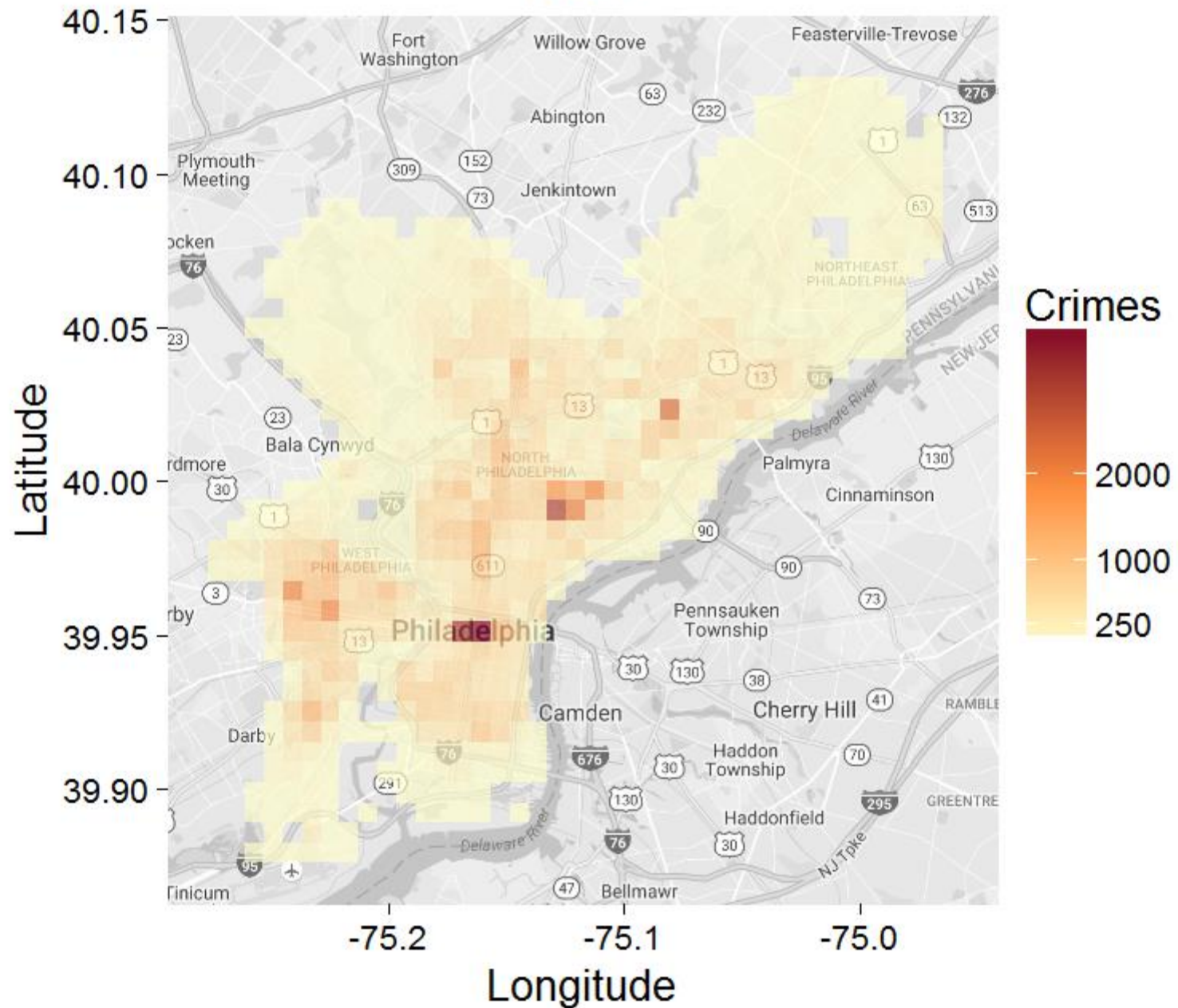
Heat Map of Crimes 2013



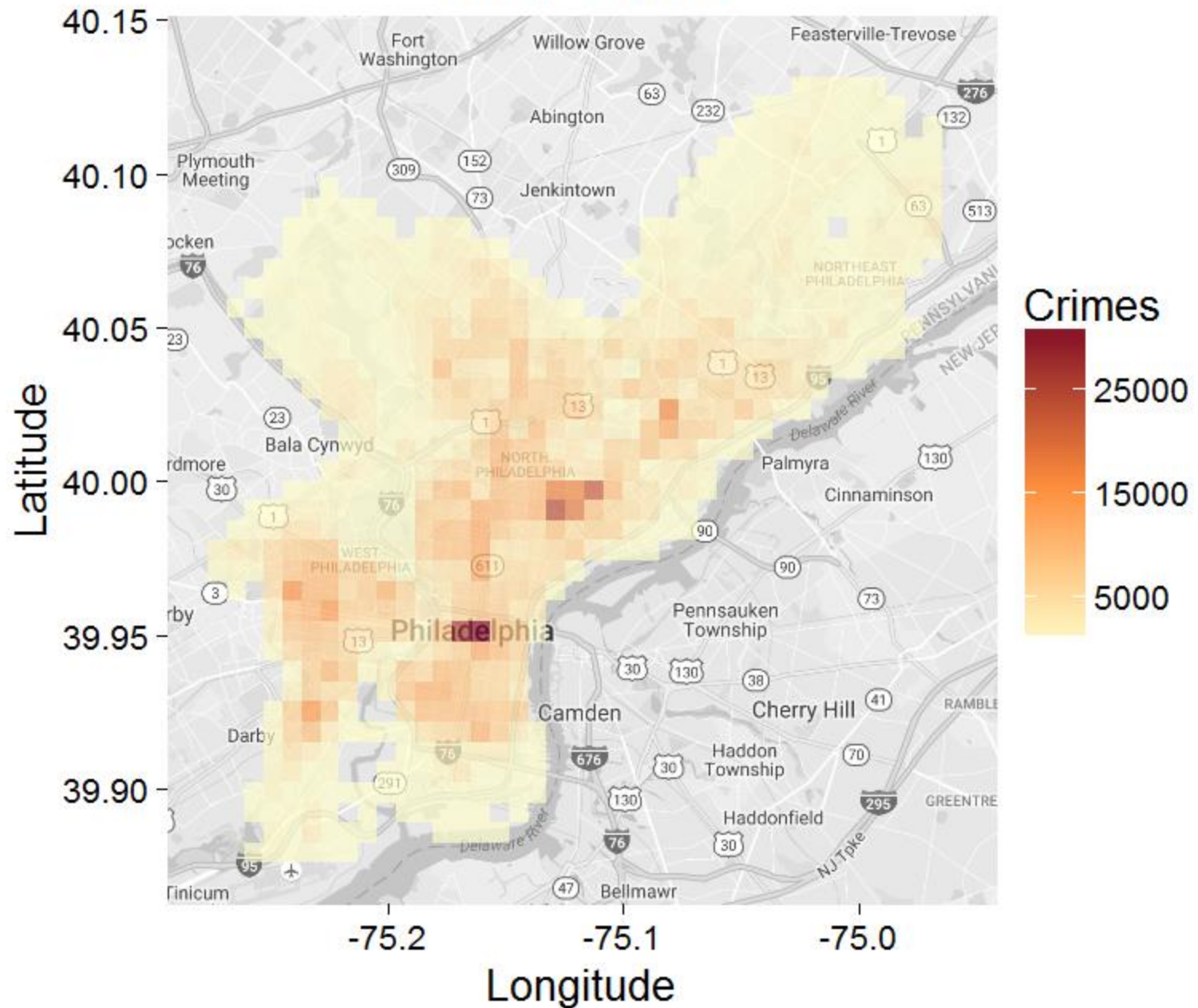
Heat Map of Crimes 2014



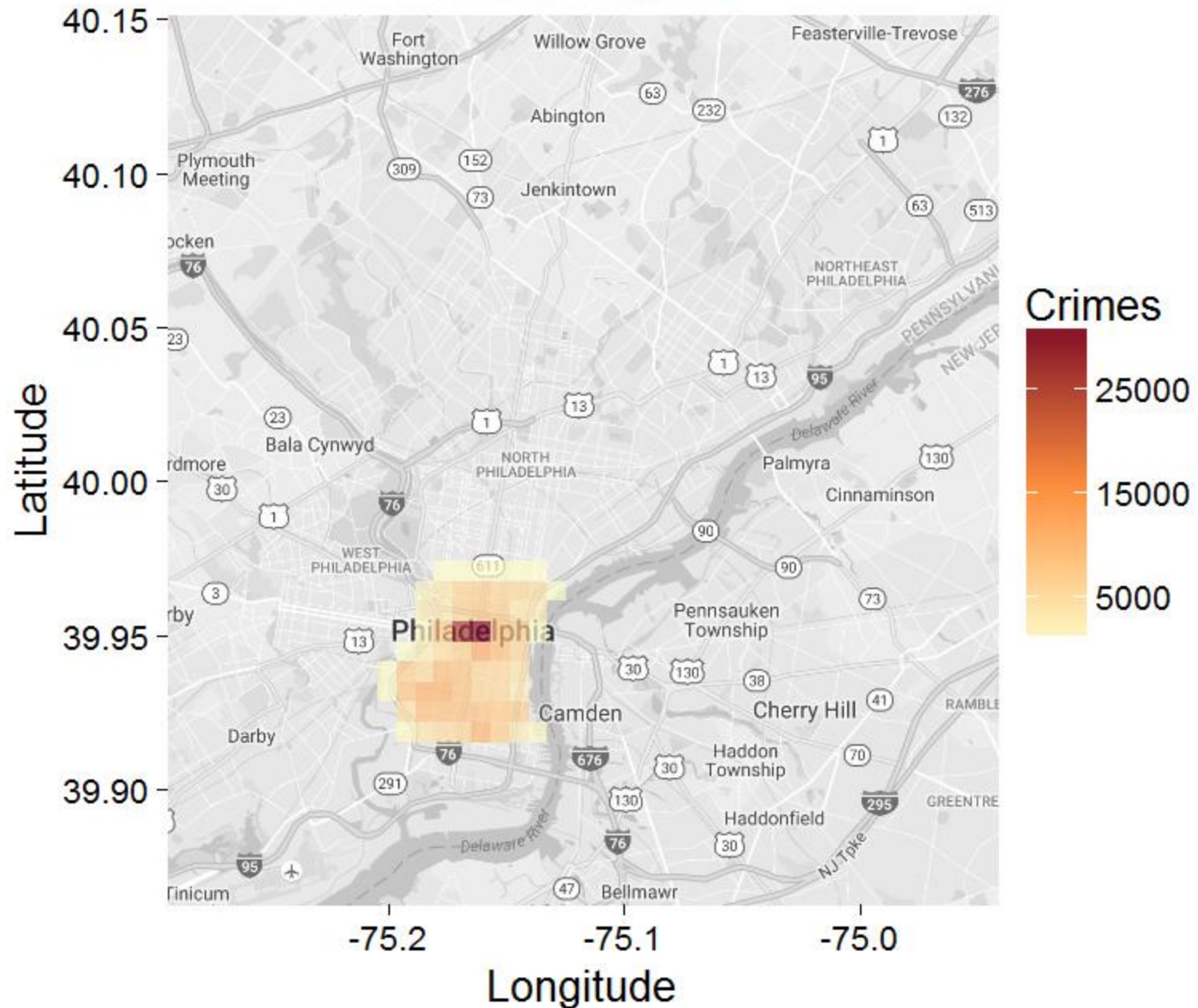
Heat Map of Crimes 2015



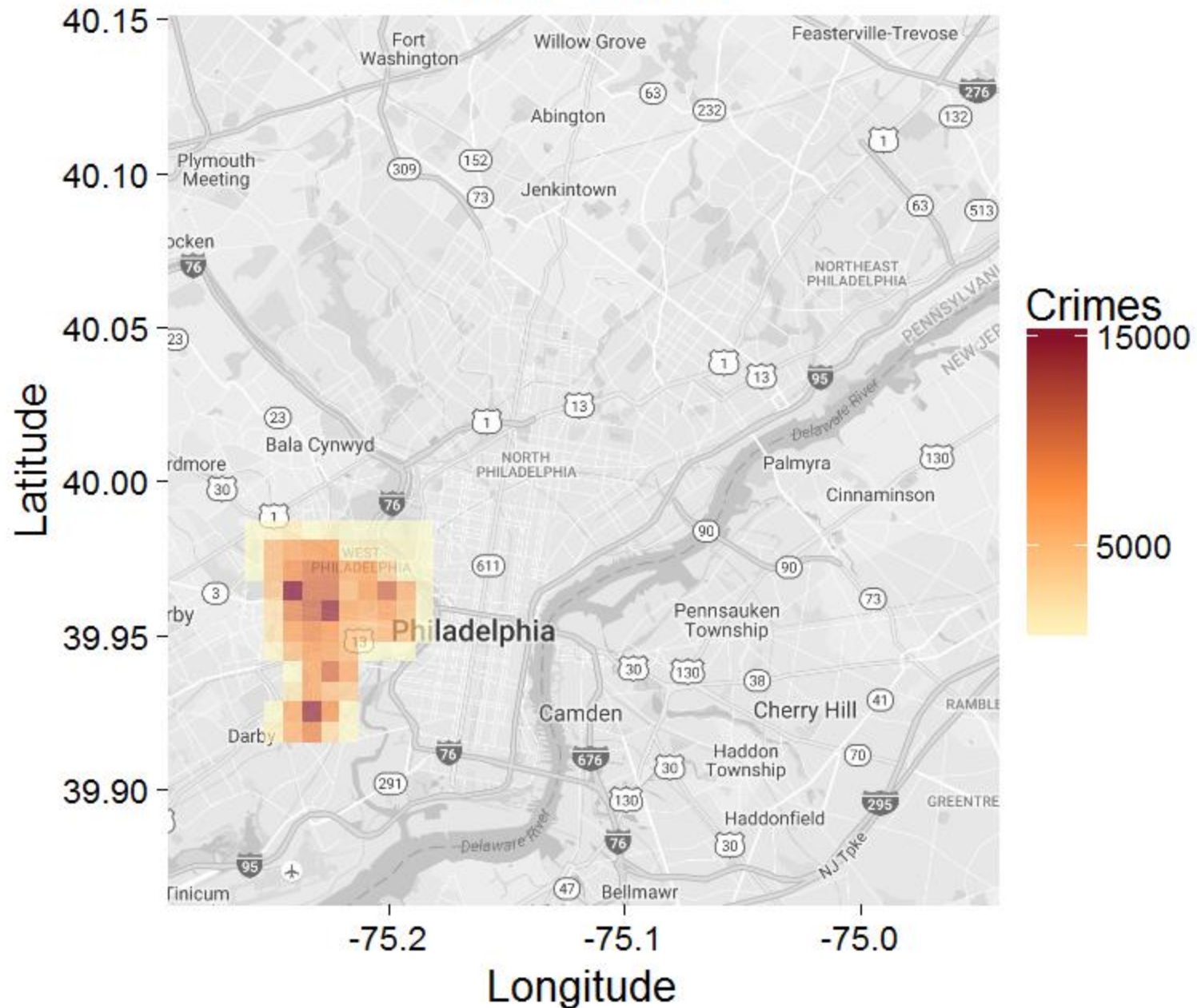
Heat Map of Crimes 2006 - 2016



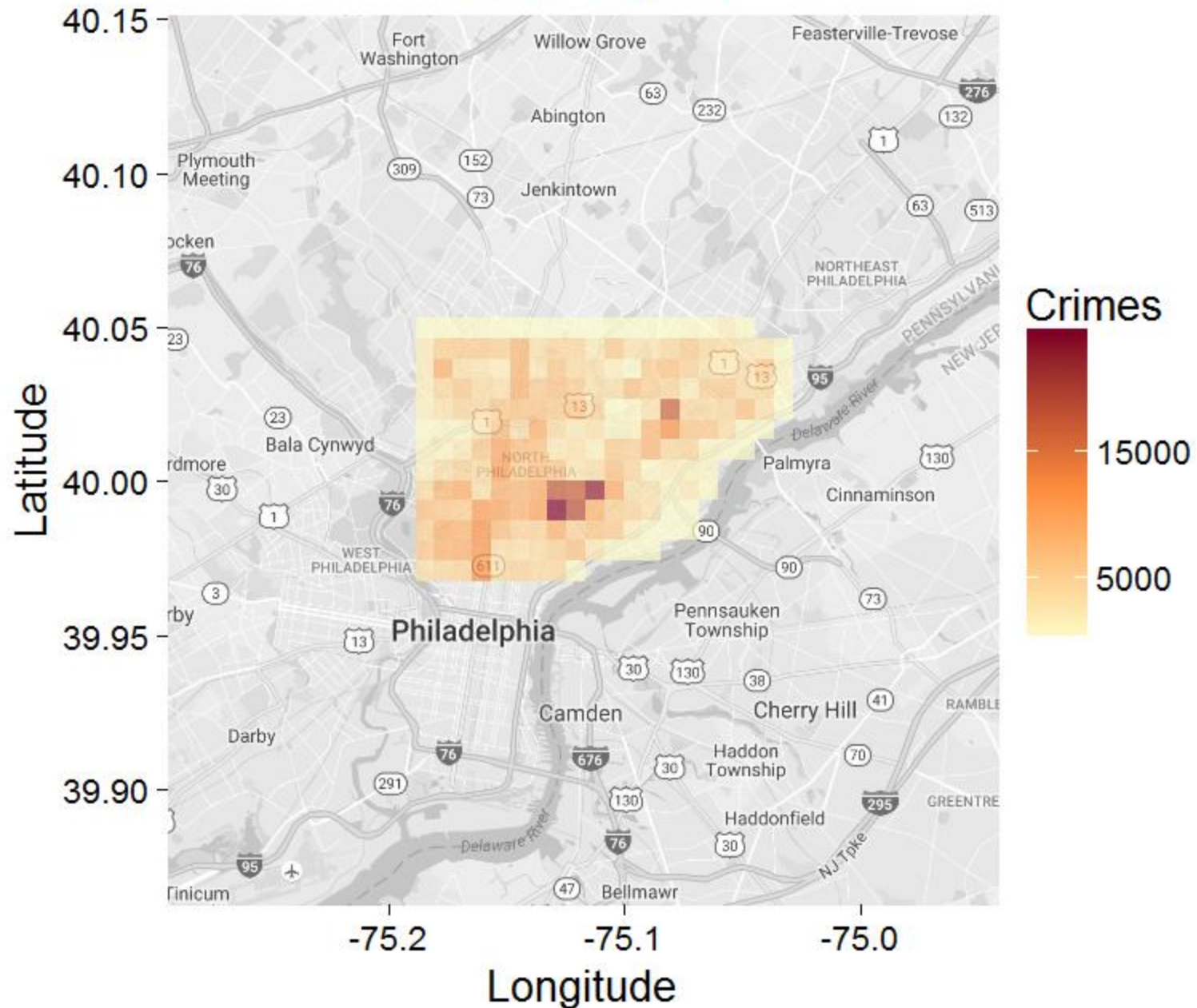
Heat Map of Central Philly Crimes 2006 - 2016



Heat Map of West Philly Crimes 2006 - 2016



Heat Map of North Philly Crimes 2006 - 2016



Central Philly Forecasting

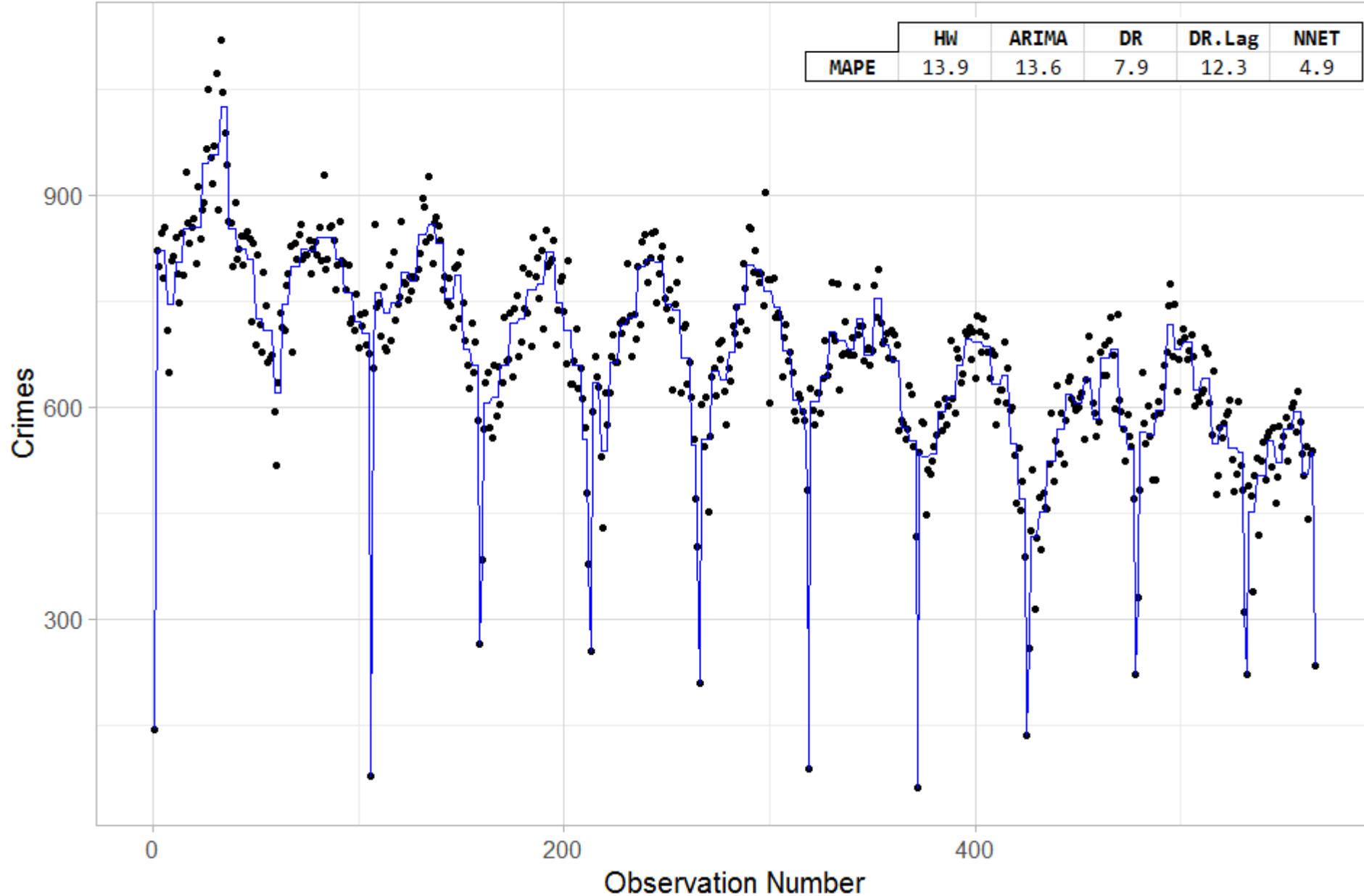
- Holt-Winters
 - Tested 51,715 models to find best fit
 - Tested 34,478 models to find best forecast
- ARIMA
 - Tested 48 models to find best fit
 - Tested 24 models to find best forecast
- Dynamic Regression
 - Tested 37 models to find best fit
 - Tested 33 models to find best forecast
- Dynamic Regression (Lagged Regressors)
 - Tested 21 models to find best fit
 - Tested 21 models to find best forecast
- Neural Network
 - Tested 125 models to find best fit
 - Tested 125 models to find best forecast

Crimes Per Week: Central Philly

Neural Network: Variables = MONTH, DAYS, UNEMPLOYMENT, UTILITY.GAS

Hidden Nodes = 30, Max Iterations = 2000, Decay Rate = 0

	HW	ARIMA	DR	DR.Lag	NNET
MAPE	13.9	13.6	7.9	12.3	4.9

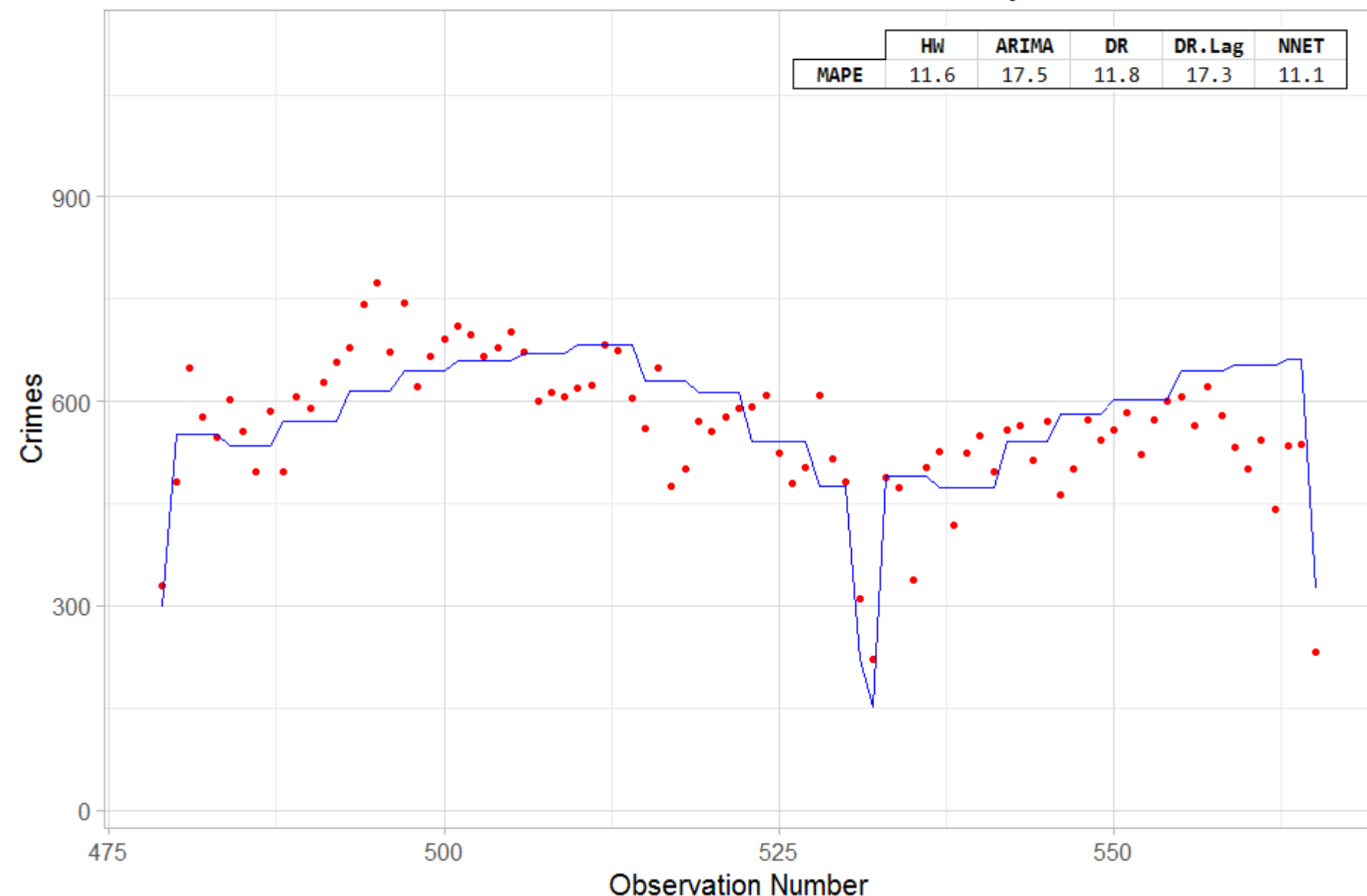


Crimes Per Week: Central Philly

Neural Network: Variables = MONTH, DAYS, UNEMPLOYMENT, UTILITY.GAS

Hidden Nodes = 20, Max Iterations = 1500, Decay Rate = 0.05

	HW	ARIMA	DR	DR.Lag	NNET
MAPE	11.6	17.5	11.8	17.3	11.1



West Philly Forecasting

■ Holt-Winters

- Tested 49,063 models to find best fit
- Tested 67,628 models to find best forecast

■ ARIMA

- Tested 49 models to find best fit
- Tested 25 models to find best forecast

■ Dynamic Regression

- Tested 25 models to find best fit
- Tested 25 models to find best forecast

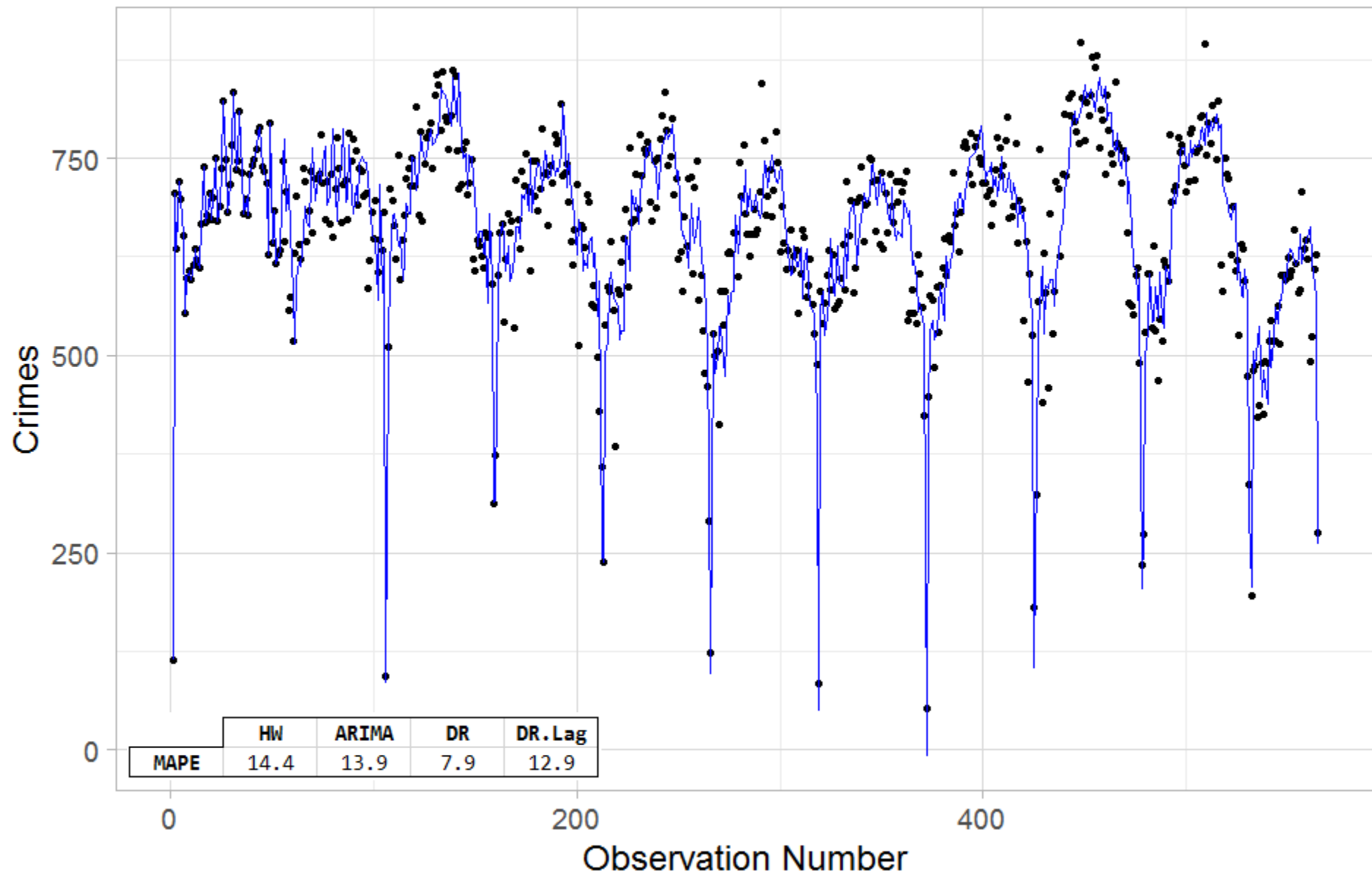
■ Dynamic Regression (Lagged Regressors)

- Tested 21 models to find best fit
- Tested 17 models to find best forecast

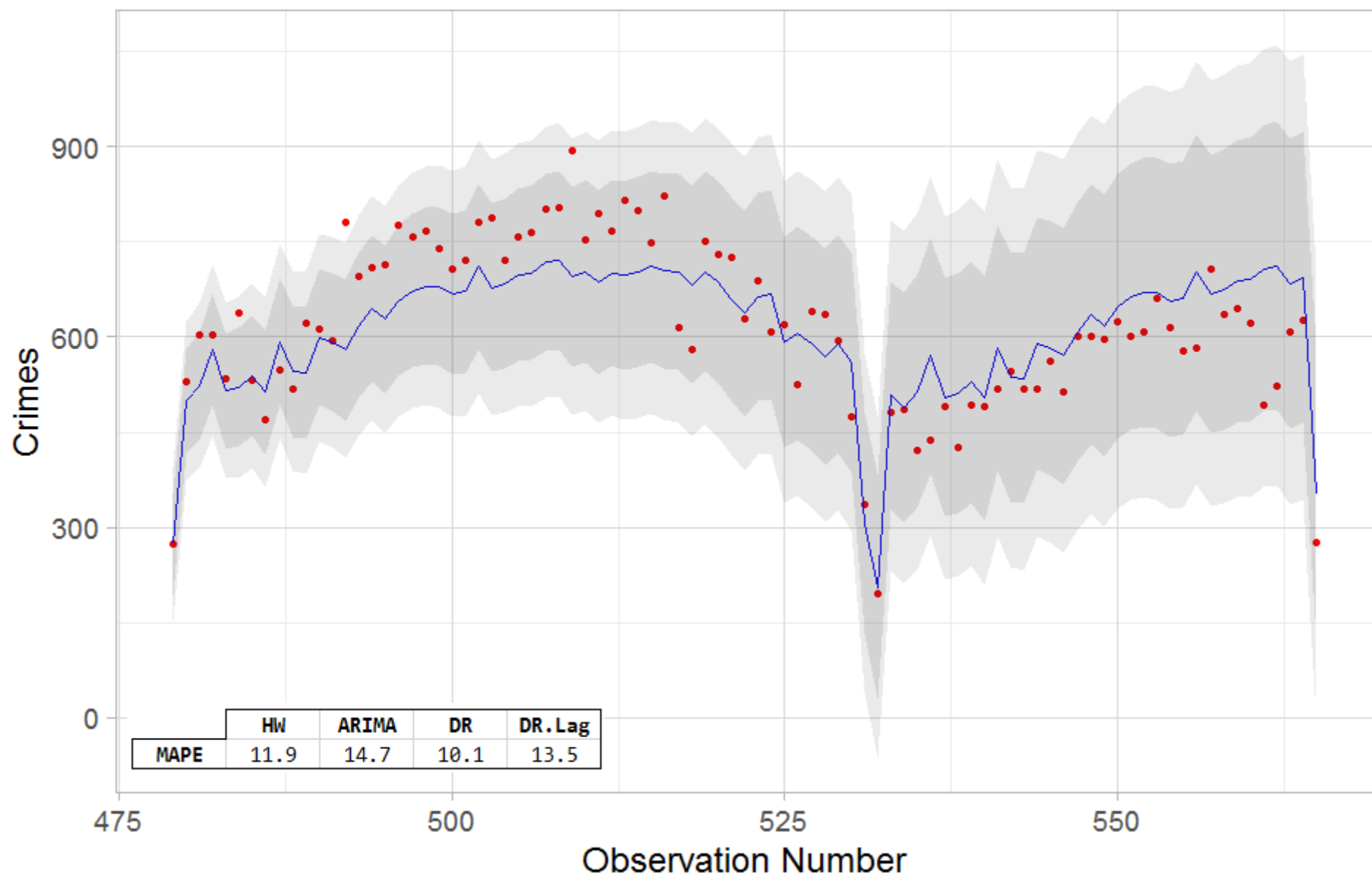
Crimes Per Week: West Philly

ARIMA(0, 1, 1)X(0, 1, 1)54

Regression Variables: 3.0 * SUMMER, 80.9 * DAYS



Crimes Per Week: West Philly
ARIMA(0, 1, 1)X(0, 1, 1)54
Regression Variable: $-4.9 * \text{SUMMER}$, $81.4 * \text{DAYS}$



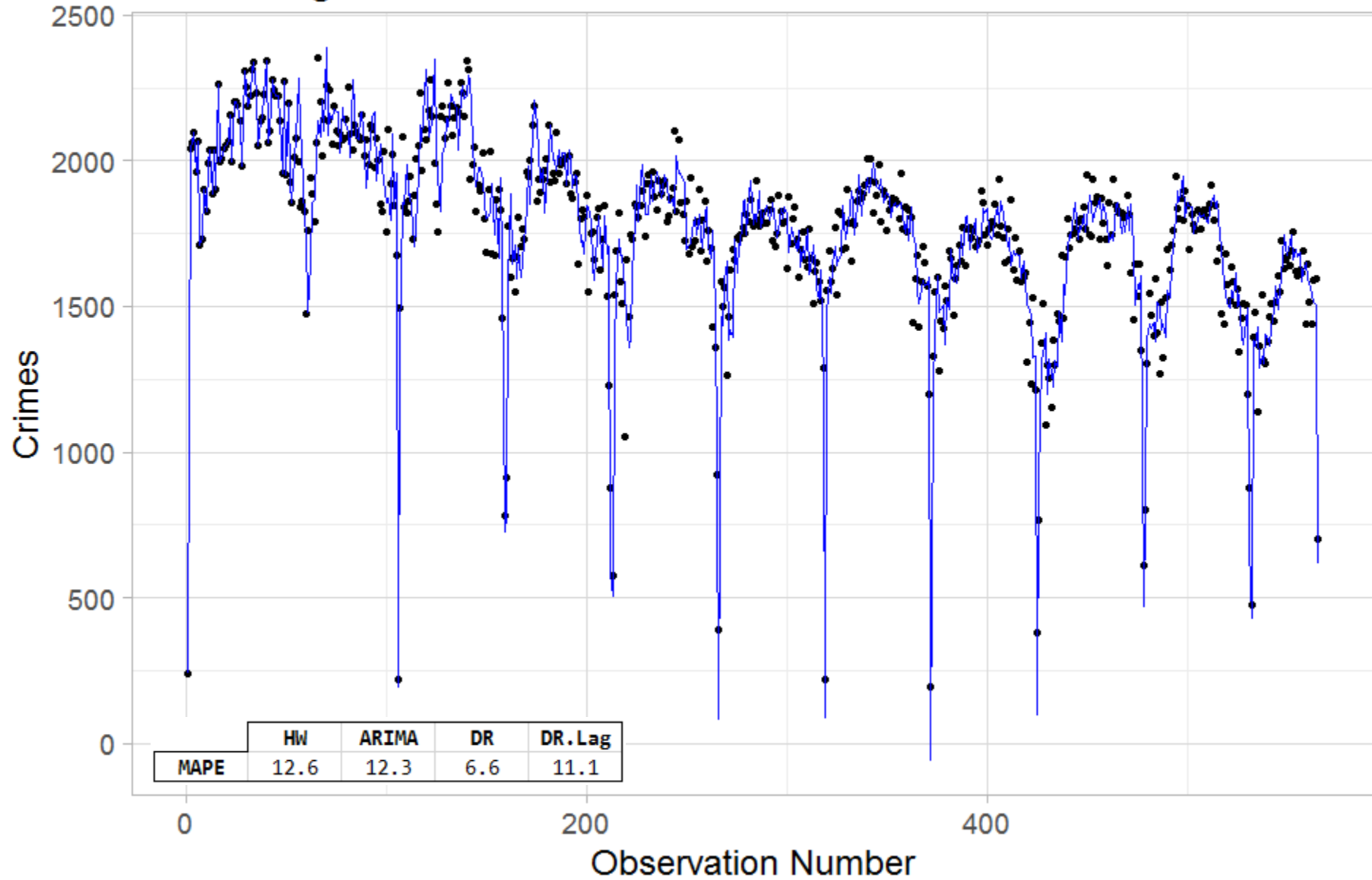
North Philly Forecasting

- Holt-Winters
 - Tested 50,389 models to find best fit
 - Tested 45,086 models to find best forecast
- ARIMA
 - Tested 49 models to find best fit
 - Tested 48 models to find best forecast
- Dynamic Regression
 - Tested 33 models to find best fit
 - Tested 33 models to find best forecast
- Dynamic Regression (Lagged Regressors)
 - Tested 21 models to find best fit
 - Tested 17 models to find best forecast

Crimes Per Week: North Philly

ARIMA(2, 1, 0)X(0, 1, 1)54

Regression Variables: $7.6 * \text{SUMMER}$, $234.9 * \text{DAYS}$



Crimes Per Week: North Philly

ARIMA(1, 1, 1)X(0, 1, 1)54

Regression Variable: $0.19 * \text{SUMMER}$, $232.8 * \text{DAYS}$

