ASSOCIATIONS BETWEEN AMBIENT AIR POLLUTION CONCENTRATIONS AND RESPIRATORY EMERGENCY DEPARTMENT VISITS AMONG ALL AGE GROUPS IN THE U.S.

Matt Strickland, PhD MPH
Associate Professor
School of Community Health Sciences
University of Nevada, Reno
mstrickland@unr.edu

University of Nevada, Reno

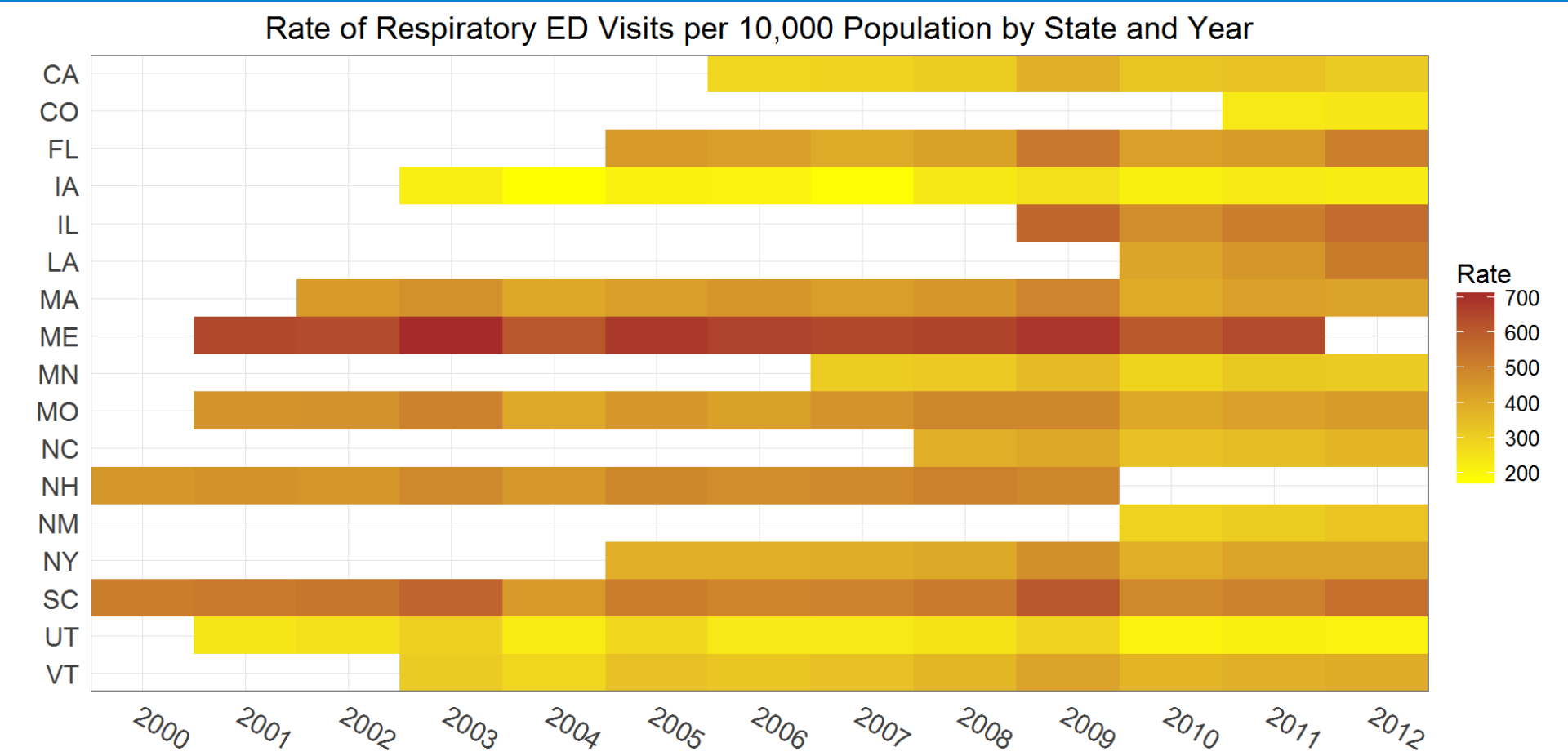
Background

Heather Strosnider, who works at CDC's Environmental Public Health Tracking Program, has collected daily, county-level emergency department (ED) data from 17 states during various years (2001-2012):

- 40 million respiratory ED visits
- All ages

Table: Number of E.D. Visits by Age and Outcome (Millions)

	ICD-9-CM	All	0-<19	19-<65	65+
All	460 – 519	40.0	16.1	16.4	5.9
ARI	460 – 466.0	18.1	9.5	7.2	0.7
Asthma	493	5.8	2.3	2.7	0.4
COPD	491,492,496	2.4	NA	0.9	1.3
Pneumonia	480 – 486	4.7	1.3	1.4	1.7


Rate of Respiratory ED Visits per 10,000 Population by State and Year
CA
CO
FL
IA
IL
LA
MA
ME
MN
MO
NC
NH
NM
NY
SC
UT
VT
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Rate
700
600
500
400
300
200

HAQAST project

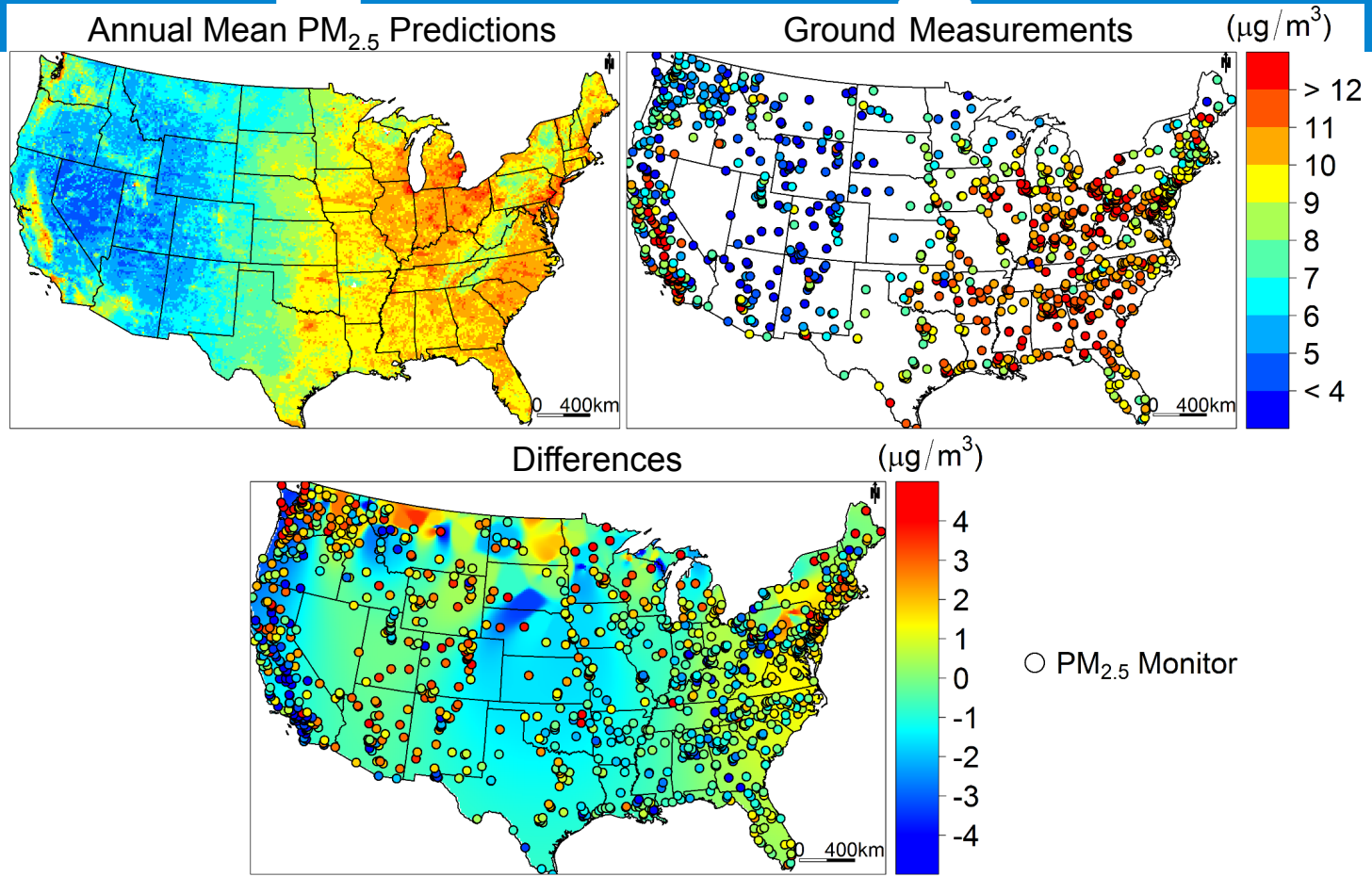
Project goal: Develop a fusion model (NASA earth observations, WRF-CMAQ, ground observations) to be used in conjunction with emergency department data to perform epidemiologic analyses

Methods

Random Forests

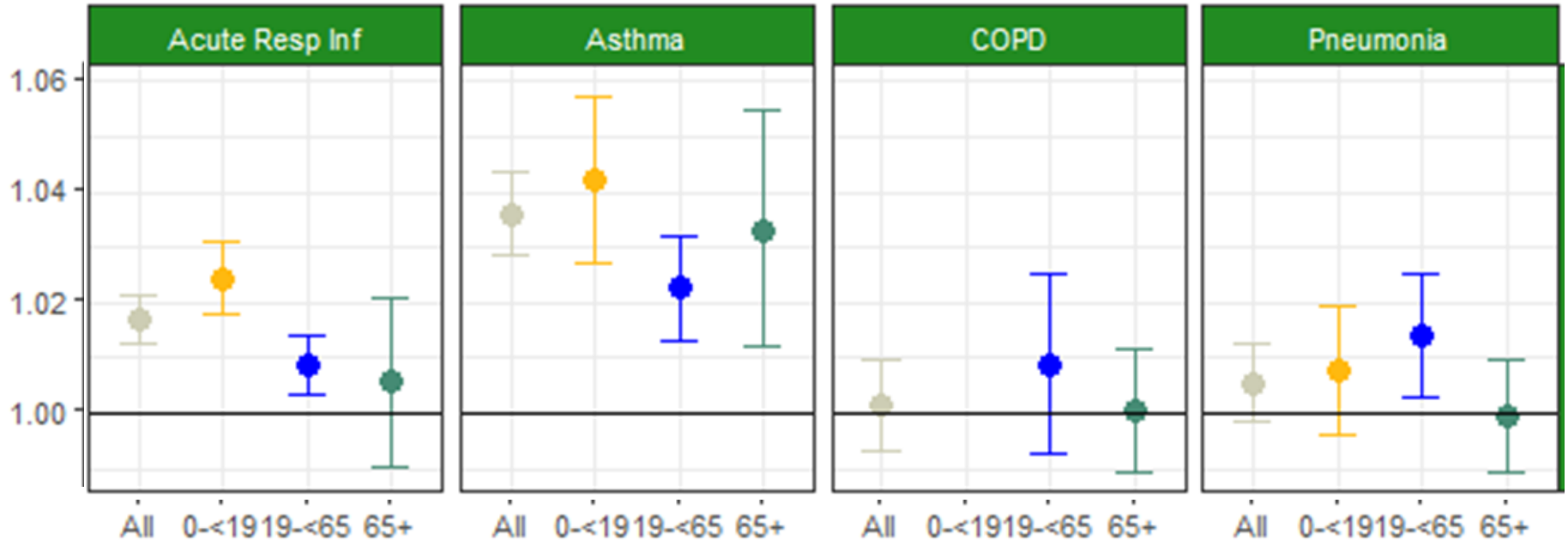
An ensemble learning method that provides multivariate, non-parametric, non-linear regression and classification based on a training dataset and generates predictions with high accuracy and interpretability

- 10-fold cross validation
- Importance measures for predictor variables
  - Increase of mean square errors (MSE) of predictors
  - Increase in node purities



Our results achieve an overall cross validation (CV) R^2 value of 0.80. Mean prediction error (MPE) and root mean squared prediction error (RMSPE) for daily predictions are 1.78 and 2.83 μg/m³, respectively.

Rate ratios and 95% CI per 10 μg/m^3 increase in lag 0-6 $PM_{2.5}$ concentrations (controlling for ozone)



Team members

Emory

Yang Liu

Howard Chang

University of Nevada, Reno

Matthew Strickland

Heather Holmes