1.235 Changes in air pollution-related mortality in the United States since 1990.

Presenting Author:
J. Jason West, University of North Carolina, jjwest@email.unc.edu

Co-Authors:
Yuqiang Zhang, Duke University
Omar Nawaz, University of North Carolina
Daniel Tong, George Mason University
Aaron van Donkelaar, Dalhousie University
Randall Martin, Dalhousie University

Abstract:

Concentrations of ozone and fine particulate matter ($PM_{2.5}$) have decreased across most of the United States since 1990, as a result of air pollution standards, regulations, and shifts in energy resources and technologies. Annual average $PM_{2.5}$, averaged over EPA monitoring sites, decreased by 42% from 2000 to 2016, and the maximum daily 8-hr average ozone decreased by 22% from 1990 to 2016. Here we use three different concentration datasets to estimate air pollution-related deaths annually from 1990 to 2016. These datasets include a self-consistent simulation of air quality using CMAQ (1990-2010), the North American Chemical Reanalysis project that used CMAQ and assimilation of satellite and surface observations (2007-2016), and a combination of satellite AOD observations with surface observations and a model for $PM_{2.5}$ for North America (1999-2011). We also use annual county-level population and baseline mortality data from the Centers for Disease Control. We attribute the overall mortality trends to changes in three factors: concentration, population, and baseline mortality rates. We find that $PM_{2.5}$-related deaths have decreased significantly since 1990, despite population growth. Ozone-related deaths have remained roughly constant, but would have likely increased without ozone concentration reductions due to increases in deaths from respiratory diseases. Inter-annual variability is greater for ozone-related than $PM_{2.5}$-related deaths, driven by the greater variability in concentration. Reductions in air pollutant concentrations in the US have very likely decreased the burden of air pollution on premature mortality.