### Background
A person with asthma may experience decreased respiratory function, coughing, wheezing, and other measurable pulmonary function indicators, triggered by indoor and outdoor particulate matter (Ogilvie et al., 2004). Levels of PM_{2.5} vary throughout the year but tend to be high during the winter months when strong temperature inversions are most likely (NPI, 2010). Inversions occur when a layer of cool air becomes trapped at the earth’s surface beneath a layer of warm air, which acts as a lid to trap pollutants at the earth’s surface. A study by Wallace et al. correlated airway inflammation among asthmatics with inversions, measuring sperm cell counts (2015). Our study examines asthma ED visits in association with inversions and PM_{2.5} concentrations.

### Objectives
To assess the risk of ED visits for asthma associated with winter inversions and corresponding increased levels of PM_{2.5} in Salt Lake County, Utah.

### Methods
This study used ED records of visits for asthma, as identified by ICD-9 primary diagnosis codes beginning with “493.0-497.3” recorded for residents of Salt Lake County during December-February, 2006-2007 and 2007-2008. Daily 24-hour averages of PM_{2.5} were obtained from the Environmental Protection Agency (EPA, 2009), as well as daily measurements for CO, SO_2, NO_2, PM_{10}, and O_3 to account for possible confounding. Inversion days, as well as data on temperature and humidity, were identified and provided by the National Weather Service.

We used a time-stratified case-crossover design to identify index and reference days for each asthma visit (Layton et al., 2006; Lamy and Lay 2005). We used conditional logistic regression adjusted for temperature, NO_2, SO_2, and O_3 to derive odds ratios for ED visits for asthma due to inversions and PM_{2.5}.

### Results
The odds of an ED visit for asthma during the 5th-7th day of a continuous inversion were 1.42 (1.02-1.96) times the odds of an ED visit for asthma on a day when there was no inversion (Table 1). After adjustments for temperature and air pollutants (NO_2, SO_2, O_3), an ED visit with a primary diagnosis of asthma showed a significant association with increases in ambient PM_{2.5}, including up to three days lag time.

### Conclusions
We found no association between ambient PM_{2.5}, and ED visits for asthma. Salt Lake County residents are more likely to go to the ED for asthma during prolonged inversions lasting 3-7 days. Prolonged exposure to air pollutants during a lengthy inversion may have a cumulative effect on one’s asthma.

### References
- PM_2.5 data provided by the Utah Department of Environmental Quality (Utah DEQ) 2016. World Data Center for Geoscience Data (WDC-GD) 2016, University of Colorado, Boulder, CO.

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