

Weather Inversions and Asthma Outcomes

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Background

- **Weather inversions increase concentrations of particulate matter.**
- **Established correlation between increased P.M. and asthma exacerbation, but lack of inversion-specific literature for Montana events.**

Challenges

- **Medicaid data restrictions**
 - **Non-representative**
 - **Demographic restrictions**
- **Confounders**
 - **Past health history**
 - **Reason for claim: emergency vs prescription**
 - **Other asthma factors**

Solutions

- **Focus on extreme outcomes**
 - ER/Hospitalization : Pope (1991), Schwartz (1993), Slaughter (2004), etc.
- **Focus on extreme triggers**
 - Utah DH: Inversion P.M. affects sensitive groups 35-55 $\mu\text{g}/\text{m}^3$, unhealthy for all above 55 $\mu\text{g}/\text{m}^3$

Summary Statistics

Variable	Mean
Asthma Primary	0.06
COPD Primary	0.25
Respiratory Primary	0.75
Inversion Today	0.01
ER/Ambulance	0.09
White	0.87
Black	0.02
Native American	0.11
Male	0.40
Age	31.3

Full Preliminary Results

- **Full data set including all respiratory Medicaid claims for all claim locations (ER, Office, Home, etc.)**
- **Inversion effect is insignificant both in correlation and logistic regression across inversion specifications**
 - **We expect this based on earlier concerns**

Revised Design

- **Isolate inversion effect by focusing on identifiable triggers**
 - **Control for prescription/check-up claims use only ER and Ambulance claims where asthma or COPD is primary diagnosis**
 - **Identify same-day inversion as P.M. > $40\mu\text{g}/\text{m}^3$**
- **Control for demographics, location fixed effects, year, and month**

Dependent Variables

- **Asthma as Primary Diagnosis**
 - Code 493
- **COPD as Primary Diagnosis**
 - Code 490-496
- **General Respiratory as Primary Diagnosis**
 - Code 460-519

Variable of Interest

- **Inversion Event**
 - **Extensive Measure:** If there was an inversion event today, what is the likelihood of an ER/Ambulance claim occurs today?
- **Amount of P.M. over the inversion threshold**
 - **Intensive Measure:** How much higher is the likelihood of an ER/Ambulance claim for each unit of P.M. over the inversion threshold

General Respiratory Results

Odds Ratios

Inversion Today	
Effect	OR
Inversion	1.37
Black	0.99
Native American	1.27**
Male	0.89*
Age	0.99**

P.M. Over Inversion	
Effect	OR
P.M. Over Inversion	1.01
Black	0.99
Native American	1.27**
Male	0.82*
Age	0.99**

* = $p < 0.10$, ** = $p < 0.05$, *** = $p < 0.01$

COPD Results

Odds Ratios

Inversion Today	
Effect	OR
Inversion	1.76
Black	0.49
Native American	1.03
Male	0.91
Age	1.06***

P.M. Over Inversion	
Effect	OR
P.M. Over Inversion	1.08*
Black	0.49
Native American	1.03
Male	0.91
Age	1.06***

* = $p < 0.10$, ** = $p < 0.05$, *** = $p < 0.01$

Asthma Results

Odds Ratios

Inversion Today	
Effect	OR
Inversion	2.67*
Black	0.53
Native American	1.12
Male	0.89
Age	1.09***

P.M. Over Inversion	
Effect	OR
P.M. Over Inversion	1.11**
Black	0.53
Native American	1.12
Male	0.89
Age	1.09***

* = $p < 0.10$, ** = $p < 0.05$, *** = $p < 0.01$

Implications

- **Significance and magnitude increase with the sensitivity of affliction**
- **The severity of the inversion is important**
- **Inversions are relatively important for emergency claims**

Future Work

- **Incorporate weather controls**
- **Analyze aggregate data to exploit variance in total claims**
- **Further exploit lagged effects**

Questions?