

The Effects of Outdoor Air Pollution on Asthma Hospitalizations

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Introduction

It is widely accepted that there is a definite link between air pollution and asthma, a disease that the CDC estimates costs the U.S. Economy over \$80 billion per year (ATS, 2018). While there are many studies on short term and long term effects of pollution on asthma exacerbations, there were significantly less studies on intermediate time frame effects of pollution on asthma. To investigate the impact of such pollution on asthma, we study county-level data on air quality and asthma hospitalizations for the state of California from 2015 to 2018.

Methods

For our model, we used the following county-time fixed effects model:

$$\text{HospPerCapita} = \beta_0 + \beta_1 \text{Pol} + \beta_2 \text{PctOver65} + \beta_3 \text{PctUnder18} + \beta_4 \text{Income} + \beta_5 \text{PctAsian} + \beta_6 \text{PctBlack} + \beta_7 \text{PctHispanic} + C + Y + u$$

We use the county-times fixed effect model to eliminate omitted variable bias that occurs from variables that change across counties and over time.

Data

Our research uses panel data from 38 out of the 58 counties in California.

Sources:

California Health and Human Services Agency
Environmental Protection Agency
National Centers for Environmental Information
U.S. Census Bureau's American Community Survey
Centers for Disease Control and Prevention

Background

Asthma is a condition in which a person's airways temporarily close, resulting in shortness of breath, coughing, wheezing, and loss of consciousness (Mayoclinic, 2020). There is significant literature that suggests that asthma is worsened by inhaling outdoor pollutants (AAFA, 2015). Other factors influencing the prevalence of asthma exacerbations include temperature, age, race, and socioeconomic status (Forno & Celedon, 2015), (Ko et al. 2007), (Cockcroft, 1996).

Results

	(1)	(2)	(3)
CO	1.872*** (.511)	1.434*** (.478)	
NO ₂	-1.329*** (.293)		-1.261*** (.277)
PM _{2.5}	.533 (.517)		
PctAbove65	4.827 (3.27)	8.312** (3.646)	7.539** (2.904)
Income	-.409* (.225)	-.32* (.159)	-.335** (.157)
PctAsian	-3.606 (2.328)	-4.155** (1.823)	-4.041* (2.212)
PctHispanic	-3.899 (2.574)	-4.864** (1.993)	-5.325*** (1.821)
_cons	214.293 (206.149)	142.996 (128.972)	214.647 (158.167)
County Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Observations	90	104	126
R-squared	.878	.846	.82

Conclusion

We find that higher concentrations of carbon monoxide (CO) increase the number of hospitalizations due to asthma at the county level. Socioeconomic and demographic factors such as income, age, and race also affect hospitalizations.