

A Regional Analysis of Air Quality and Respiratory Health Outcomes in the Northwest Indiana and Chicagoland Area

Elizabeth Sullivan, Baraka Muvuka
Indiana University School of Medicine - Northwest (IUSM-NW)

Background: Northwest Indiana (NWI) houses three of seven coal-based steel factories in the US and other major industries that contribute to air pollution in NWI and Chicagoland. Pollutants such as ozone, PM_{2.5}, and PM₁₀ are associated with respiratory disease onset and exacerbation. The American Lung Association has assigned failing air pollution grades to most NWI and Chicagoland counties. While respiratory diseases are prevalent locally, there is limited research on air pollution's role. This study investigated air pollution exposures and associations with respiratory outcomes in NWI and Chicagoland.

Methods: This retrospective study analyzed data from the Chicago Multiethnic Prevention and Surveillance Study (COMPASS), with social determinants of health, demographic, and environmental data for adults from 2013-2023. Additional air quality data were obtained from the Environmental Protection Agency and Washington University in St. Louis. Descriptive, bivariate (Chi-Square; Mann Whitney U, Kruskal Wallis, Spearman Rank), and multivariate (Binary Logistic Regression; Linear Regression, $p < 0.05$) analyses were conducted using SPSS 31.0 ($p < 0.05$). This study was IRB-exempt (Indiana University IRB #27779).

Results: This study included 2,971 participants with respiratory conditions including asthma (94.4%), COPD (6.5%), chronic bronchitis (7.4%), and lung cancer (1.0%), with 8.5% residing near a pollution source. Among participants with respiratory conditions, exposure to one pollution source was associated with fewer hospitalizations ($B = -.823$), while clinic visits predicted more hospitalizations ($B = .749$). For asthma, less than high school education ($OR = 2.4$), some college education ($OR = 3.3$), exposure to one ($OR = 2.1$) and multiple pollution sources ($OR = 2.7$) increased the odds of ED visits. Contrastingly, exposure to one pollution source ($B = -.830$, $p = .003$) was associated with fewer hospitalizations. Former smoking was associated with older age ($B = 7.620$) of asthma diagnosis.

Conclusion: Air pollution and SDOH were associated with increased ED utilization for asthma, reflecting their combined impact. NWI is heavily industrialized but underrepresented in environmental research, warranting further environmental justice research and interventions.