

BACK PAGE

Inhaler digital sensors help correlate reductions in power plant emissions and improvements in asthma

The “AIR Louisville” collaboration

“Coal-fired power plants are known to emit pollutants associated with adverse health effects, including increased asthma attacks, asthma-related emergency department visits and hospitalizations.”¹ In the United States, Kentucky “has historically ranked among the top five states for emissions due to power generation.”² “In addition, the city of Louisville has one of the highest rates of asthma in the US.”³

In 2012, the “AIR Louisville” public/private collaboration launched a pilot program involving approximately 1,200 Louisville residents who had asthma or COPD. Their inhalers were equipped with digital sensors (Propeller Health, Madison, WI, US) to capture data on medication use, symptoms and environmental factors and “gain insights into the impact of local air quality on the burden of respiratory disease in the community.”

Energy transitions provide research opportunity

Then, between 2013 and 2016, one coal-fired power plant in the Louisville, Kentucky area retired coal as an energy source. During the same period, three additional plants installed stricter sulfur dioxide (SO₂) emission controls, in order to comply with regulations from the United States Environmental Protection Agency (EPA). The energy transition created an opportunity for researchers “to



Emissions from a coal-burning power plant (stock photo).

analyze the impact of the coal-fired power plant energy transitions on residents’ respiratory health.” A study of 207 people in Jefferson County (which includes Louisville) evaluated the frequency of asthma rescue medication usage and the total number of asthma-related emergency room visits and hospitalizations per ZIP code.

Findings showed that energy transitions in the spring of 2015 resulted in three fewer hospitalizations and emergency department visits per ZIP code per quarter in the following year, when compared to areas of high coal-fired power plant emission exposure prior to the transition. Those results translated to nearly 400 avoided emergency department visits and hospitalizations each year across Jefferson County.

Further, a sulfur dioxide scrubber installed at the Mill Creek power plant (in the greater Louisville area) in June 2016 was associated with a 17% immediate reduction in rescue medication use, which continued to be maintained. The study also found the odds of having high rescue medication use throughout a month (on average more than four puffs per day) was reduced by 32% following the June 2016 energy transition.

“This study was unique in its ability to measure asthma morbidity based on both hospitalizations and daily symptoms, and to leverage an abrupt change in environmental exposure to more directly attribute changes in asthma exacerbation to changes in coal-fired power plant emissions,” said Joan Casey, PhD, lead author of the paper and assistant professor of

environmental health sciences at Columbia University Mailman School of Public Health.

Toward cleaner power to improve public health

“We hope this evidence will encourage government officials to support stricter standards when regulating coal-fired power plants and encourage us towards cleaner power options, thereby protecting the health of the people who live near these facilities,” said Meredith Barrett, PhD, head of population health research for Propeller Health.

“AIR Louisville brought together local government, public and private partners and residents for a common mission: to leverage local data to make our city better and more breathable,” explained Louisville Mayor Greg Fischer. “We are still seeing the results of AIR Louisville in this research, which demonstrates the public health impact of retiring coal as an energy source or further controlling coal-fired emissions.”

The study was conducted by Columbia University Mailman School of Public Health, Propeller Health, University of California Berkeley, Harvard T.H. Chan School of Public Health, University of Texas Austin, Colorado State University, Louisville Metro Department of Public Health and Wellness, Louisville Metro Office of Civic Innovation and Technology, the Christina Lee Brown Envirome Institute and Family Allergy & Asthma.

Study results were published in *Nature Energy*⁴ and announced in a joint news release from Columbia University Mailman School of Public Health and Propeller Health.

References

Content for this article was based on and excerpted from:

1. Zheng X-y, et al. Association between air pollutants and asthma emergency room visits and hospital admissions in time series

studies: A systematic review and meta-analysis. *PLoS One* 10, e0138146 (2015).

2. United States Environmental Protection Agency. National Emissions Inventory. (2011) <https://www.epa.gov/air-emissions-inventories/2011-national-emissions-inventory-nei-data>.

3. AIR Louisville. <https://www.airlouisville.com>.

4. Casey JA, Su JG, Henneman LRF, et al. Improved asthma outcomes observed in the vicinity of coal power plant retirement, retrofit and conversion to natural gas. *Nature Energy* (2020). <https://doi.org/10.1038/s41560-020-0600-2>.

Associated Press. Business Wire. Asthma hospitalizations dropped after Louisville power plants retired coal or installed better emission controls. April 13, 2020. <https://apnews.com/Business%20Wire/981e73c6c70e48d69d658bae60f0dad1>.

Courier Journal. Inside Climate News. A coal-fired power plant closed. Another cleaned up. What happened next to asthma attacks. April 18, 2020. <https://www.courier-journal.com/story/news/2020/04/18/after-coal-fired-power-plants-were-targeted-asthma-attacks-dropped/5150857002>.

Physician’s Briefing. HealthDay News. Reduced power plant emissions tied to better asthma measures. April 20, 2020. <https://www.physiciansbriefing.com/pulmonology-17/asthma-news-47/reduced-power-plant-emissions-tied-to-better-asthma-measures-756743.html>.