

Hospitalizations down once power plants retired coal or installed better emission controls

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After four Louisville, Kentucky, coal-fired power plants either retired coal as their energy source or installed stricter emissions controls, local residents' asthma symptoms and asthma-related hospitalizations and emergency department (ED) visits dropped dramatically, according to research published in *Nature Energy* this week by Columbia University Mailman School of Public Health, Propeller Health, University of California Berkeley, Harvard TH 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.

Coal-fired [power plants](#) are known to emit pollutants associated with adverse health effects, including increased asthma attacks, asthma-related ED visits and hospitalizations.¹⁻⁵ In 2014, coal-fired [power](#) plants accounted for 63% of

economy-wide emissions of sulfur dioxide (SO₂) in the U.S.⁶ Historically, Kentucky has ranked among the top five states in the U.S. for emissions from power generation.⁷

Starting with a pilot in 2012, the city of Louisville embarked on a project called AIR Louisville, which aimed to use data from Propeller Health's digital inhaler sensors to gain insights into the impact of local air quality on the burden of respiratory disease in the community. The public-private collaboration equipped more than 1,200 Louisville residents with asthma and COPD with Propeller sensors, which attach to patients' existing inhalers and deliver insights on medication use, symptoms and [environmental factors](#) to the Propeller app on their smartphone.

"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," said 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."

Between 2013 and 2016, one coal-fired power plant in the Louisville area retired coal as an energy source, and three others installed stricter emission controls to comply with regulations from the U.S. Environmental Protection Agency. Researchers took advantage of these circumstances to analyze the impact of the coal-fired power plant energy transitions on residents' respiratory health, using data from Propeller and local hospitals to assess how asthma-related symptoms, ED visits and hospitalizations changed over time.

The study looked at the frequency of the total

number of asthma-related ED visits and hospitalizations per ZIP code in Jefferson County, as well as the frequency of asthma rescue medication use among 207 people. Data on rescue medication use for asthma was used as a proxy for patients' symptoms, as patients use their rescue medication for acute relief from symptoms such as coughing and shortness of breath.

"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, Ph.D., lead author of the paper and assistant professor of environmental health sciences at Columbia University Mailman School of Public Health.

The researchers found that energy transitions in the spring of 2015 resulted in three fewer hospitalizations and ED visits per ZIP code per quarter in the following year, when comparing areas that had high coal-fired power plant emission exposure prior to the transition to those with lower levels. This translates into nearly 400 avoided hospitalizations and ED visits each year across Jefferson County.

At the individual level, the Mill Creek SO₂ scrubber installed in June 2016 was associated with a 17% immediate reduction in rescue medication use, which was maintained thereafter. The study also found the odds of having high rescue use throughout a month (on average more than four puffs per day) was reduced by 32% following the June 2016 energy transition.

"This is the first study to use digital inhaler sensors to understand the health effects of reducing emissions from coal-fired power plants," said study author Meredith Barrett, Ph.D., head of population health research for Propeller 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."

More information: Improved asthma outcomes observed in the vicinity of coal power plant retirement, retrofit and conversion to natural gas, *Nature Energy* (2020). DOI: [10.1038/s41560-020-0600-2](https://doi.org/10.1038/s41560-020-0600-2), [nature.com/articles/s41560-020-0600-2](https://www.nature.com/articles/s41560-020-0600-2)

Provided by Columbia University's Mailman School of Public Health

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