Study is first to examine pollution sources between urban and rural air in the Midwest

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University of Iowa researchers report Iowa's air falls within federal guidelines for fine pollutants, considered especially dangerous to human health. Credit: Sondra Cue, University of Iowa

With warmer weather, it's time to get outdoors. And now you can breathe easy about it: A new study from the University of Iowa reports Iowa's air quality falls within government guidelines for cleanliness.

The UI researchers analyzed air quality and pollution data compiled by

state and county agencies over nearly three years at five sites spread statewide—urban areas Cedar Rapids, Davenport and Des Moines and rural locations in Montgomery county in southwest Iowa and Van Buren county in the southeast. The result: The air, as measured by a class of fine particulate pollutants at those locations and based on an annual average, fell within federal cleanliness guidelines.

The study also is the first to examine differences in air quality and pollution sources between urban and rural areas in the Midwest. This is an important distinction, because a higher percentage of the population in the Midwest lives in rural areas, when compared with other regions in the U.S., the researchers note. In Iowa, 44 percent of residents live in the country.

"In general, our air in Iowa is pretty good," says Betsy Stone, assistant professor in chemistry at the UI and lead author of the study, published in the Royal Society of Chemistry journal *Environmental Science: Processes & Impacts*.

The researchers analyzed data gathered from April 2009 to December 2012 from monitors run by the Iowa Department of Natural Resources and the health departments in Linn and Polk counties. Using that information, the researchers found that fine particle levels during that time span at the urban and rural locations were below the newest yearly-average National Ambient Air Quality Standards, set by the U.S. Environmental Protection Agency.

Stone and Shuvashish Kundu, a former post-doctoral researcher at the UI now at Hokkaido University in Japan and the paper's first author, looked at particulates with an airborne diameter of roughly 2.5 microns. These particles come from various sources, ranging from campfires and leaf burning, to vehicle exhaust and power-plant emissions. No matter the source, they pose a health threat to people, because they are small

enough to bypass the respiratory system's natural defenses and get lodged in the deepest recesses of the lungs.

"Respirable particles are a danger to human health, and acute exposure have been linked to respiratory illness and even death," Stone notes.

The EPA regulates the particulates, known as PM2.5. The agency also regulates coarser particles, those with an airborne diameter of roughly 10 microns, which were not part of this study. In 2012, the EPA lowered the primary standard for the annual average concentration of PM2.5 particulates considered safe, as more information became known about their prevalence and danger to human health.

In general, the UI researchers found that the concentration of PM2.5 particulates was higher at the urban monitoring sites than the rural locations. This was true especially for particles associated with exhaust from gasoline- and diesel-powered vehicles. Diesel combustion, in particular, was 230 percent higher in urban areas than rural, the study found.

The rural sites had slightly higher concentrations of secondary nitrates—which form by chemical reactions in the atmosphere and are most prevalent in wintertime—according to the data.

Another particulate, secondary sulfates (formed in the atmosphere from emissions, such as those from coal-fired power plants), had the highest concentration (between 30 and 44 percent) of all pollutants at urban and rural sites, with readings being mostly uniform across locations.

"In general, we see most (urban and rural monitoring) sites have comparable levels of sulfates," notes Stone, a native Iowan. "That suggests it's a regional phenomenon affecting all of Iowa."

Other pollution impacts, such as particulates from cars and diesel vehicles, were more local, which is what the researchers expected.

Of the monitoring sites, Davenport had the highest PM2.5 concentration—although within federal air-quality standards—with the highest iron, zinc, and lead concentrations, the data showed. The cause appears to be attributable mostly to localized industrial activity and could also be accentuated by vehicular exhaust and diesel-powered barge traffic on the Mississippi River, the researchers say.

While Iowa's air is generally clean, the state could use the study's findings to make it even healthier. "I would say this tells us quite a lot about the sources of air pollution," Stone says. "Yet, I don't want to send the message that we shouldn't be concerned about air quality in Iowa. Even low levels of pollutants can have negative health impacts."

Provided by University of Iowa

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