

Animal production responsible for vast majority of air quality-related health impacts from US food

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Poor air quality caused by food production in the United States is estimated to result in 16,000 deaths annually, 80 percent of which are

related to animal production, according to a new study led by researchers at the University of Minnesota. The research also found there are measures farmers and consumers alike can take to reduce the air quality-related health impacts of the food we eat.

In a paper published in the journal *Proceedings of the National Academy of Sciences*, researchers measured how the production of various foods affects air quality, discovering that [animal production](#) is overwhelmingly responsible for agriculture's air quality-related health impacts. The study—the first [food](#)-by-food accounting of the damage to air quality caused by agriculture—also shows how improving animal and crop management practices, as well as how eating more plant-rich diets, can substantially reduce mortality from food-related air pollution.

"Discussions on the environmental impacts of different foods typically focus on their [greenhouse gas emissions](#), land and water use, and biodiversity impacts, but little is known about how different foods affect air quality. Our research allows for this important piece of the puzzle to be included in the conversation," said Nina Domingo, a doctoral candidate in the Department of Bioproducts and Biosystems Engineering in the University of Minnesota's College of Food, Agricultural and Natural Resource Sciences and College of Science and Engineering.

The authors estimated how much agriculture increased levels of fine particulate matter, or PM2.5, in the air. Chronic exposure to PM2.5 increases the risk of heart disease, cancer, and stroke. Farming activities such as plowing land, fertilizing crops, and storing and spreading manure all release pollution that increases PM2.5 levels.

Animal-based foods tend to have higher air quality-related human health damages than plant-based foods because of pollution released from the manure of animals themselves and from fertilizer use and tillage of land when growing the crops—primarily corn, hay and soybeans—that they

eat. Of particular concern is ammonia, which is released in large quantities from nitrogen fertilizers and manure, as it reacts with other pollutants to form PM_{2.5}.

The study shows that, per serving, the average air quality-related harm of red meat to human health is two times greater than that of eggs, three times greater than those of dairy products, seven times greater than those of poultry, 10 times greater than those of nuts and seeds, and at least 15 times greater than the average of other plant-based foods.

"Air quality-related mortality from the U.S. food system is comparable to that of other sources of air pollution, such as motor vehicles and electricity production. Nevertheless, food-related emissions are lightly regulated and less studied compared to these other sectors," said Jason Hill, professor in the Department of Bioproducts and Biosystems Engineering. "Fortunately, air quality-related mortality of food can be reduced by improving fertilizer and manure management practices, and by shifting to diets that contain greater portions of fruits, vegetables, legumes, whole grains and other plant-based foods."

The paper also finds that many of the things that farmers and consumers can do to reduce pollution from food have many benefits beyond improving air quality, such as reducing greenhouse gas emissions, reducing water pollution, and preventing species extinctions. Furthermore, these actions can improve farm profitability and contribute to better health through healthier diets.

"There are many available solutions that can improve air quality-related health outcomes," said Domingo. "Meaningful changes will require coordinated efforts of farmers, food-producing companies, consumers and policymakers."

More information: Nina G. G. Domingo et al., "Air quality-related

health damages of food," *PNAS* (2021).

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