Air pollution from oil and gas production responsible for $77 billion in annual US health damages, study finds

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Despite global efforts to transition from fossil fuels to clean energy, oil and gas (O&G) production is nearing record levels in the United States,

posing concern among health experts about what this O&G growth means for air quality and human health. These health impacts affected communities in states with high oil and gas production, as well as states with limited or no gas activity, underlining the need for comprehensive regulatory action to protect Americans from the pollutants generated by this sector.

While there is extensive research on the climate effects of O&G-produced methane—a key contributor to air pollution—few studies have measured the health effects of the air pollution that O&G activity generates.

A new study led by Boston University School of Public Health (BUSPH), the University of North Carolina Institute for the Environment (UNC-IE), PSE Healthy Energy, and Environmental Defense Fund fills this gap.

Published in the journal *Environmental Research: Health*, the study found that air pollution from the oil and gas sector in the United States has substantial adverse impacts on air quality, human health, and health costs.

The findings show that the pollutants nitrogen oxide (NO_2), fine particulate matter ($PM_{2.5}$) and ozone (O_3) from U.S. oil and gas production contributed to 7,500 excess deaths, 410,000 asthma attacks, and 2,200 new cases of childhood asthma across the U.S. in 2016. Factoring in related respiratory and cardiovascular-related hospitalizations, adverse pregnancy outcomes, and other health challenges, oil and gas production was responsible for $77 billion in annual health costs. Comparatively, this total is three times the estimated climate impact costs of methane emissions from oil and gas operations.

These impacts were largely concentrated in areas with significant oil and

gas production, such as southwest Pennsylvania, Texas, and Eastern Colorado. But the health effects also extended into densely populated cities with little or no gas activity, such as Chicago, New York City, Baltimore, Washington, D.C., and Orlando.

The study results suggest that O&G emissions reduction policies, such as the forthcoming EPA methane regulations, may produce immediate and significant air quality benefits to human health along with significant climate benefits. The researchers urge policymakers to consider these "co-benefits" in future emissions reduction strategies. They also stress that strategies that focus on end-of-pipe pollution controls during combustion—such as in power plants, vehicles, buildings, and industry—are only addressing part of the problem.

"These substantial impacts from oil and gas production show that there are serious consequences across the full life cycle of oil and gas, from 'well to wheels,' 'well to power plant,' and 'well to furnace,'" says study corresponding author Jonathan Buonocore, assistant professor of environmental health at BUSPH. "The health impacts are not just from the combustion of oil and gas. In order for energy, air quality, and decarbonization policies to successfully protect health, they need to incorporate health impacts across this full life cycle."

The five states with the highest impacts from O&G pollution were Texas, Pennsylvania, Ohio, Oklahoma, and Louisiana were those with significant oil and gas activity. However, Illinois and New York—states that produce very little O&G—still landed in the sixth and eighth spots.

"The fact that air pollution and health impacts cross state boundaries indicates a strong need for regional to nationwide coordination," says study senior author Saravanan Arunachalam, research professor at UNC-IE. "States that have the highest emissions are not necessarily always the ones with the highest health risk due to these emissions, although Texas

ranks first in both."

A novelty of this modeling framework is the inclusion of health impacts of NO_2, and the use of an advanced model that better captures the chemistry of emissions from the oil & gas sector. Among the three pollutants, NO_2 was the highest contributor to the overall health impacts, producing 37% of these effects, followed by ozone at 35%, and $PM_{2.5}$ at 28%. The vast majority of these effects pertained to mortality.

NO_2 contributes to the formation of $PM_{2.5}$ and ozone, so strategies to reduce O&G-produced NO_2 could be effective in reducing health impacts. State regulations addressing precursor NO_2 emissions from the oil and gas sector could help mitigate childhood asthma cases for communities living in proximity to the emission sources, and provide secondary ozone and $PM_{2.5}$ health benefits in downwind areas.

"Curbing oil and gas emissions is one of the fastest, most cost-effective ways to reduce methane and other air pollutants, which improves air quality, protects public health and slows climate change," says study co-author Ananya Roy, senior health scientist at EDF.

"It's critical that the U.S. Environmental Protection Agency strengthen and finalize its proposed oil and gas methane rules as quickly as possible. These proposed rules should build from leading state approaches in Colorado and New Mexico and go further to end pollution from the practice of routine flaring."

The authors say future studies should focus on learning more about health impacts across the full life cycle of O&G production, as well as the benefits of additional O&G pollution control strategies.

"There are technologies and strategies to reduce methane leaks, emissions from compressor stations, or emissions from other sources,

such as ponds and dehydrators," Buonocore says. "Each of these strategies will have different effects on the levels of different pollutants that get emitted."

There is also more work to be done to quantify the health impacts of emissions that the study did not examine, such as benzene and formaldehyde, Arunachalam notes. "Exposure to these pollutants which have been detected near oil and gas wells can cause cancer and several other adverse health impacts, and quantifying them will demonstrate even higher public health benefits of controlling emissions from this sector."

More information: Air Pollution and Health Impacts of Oil & Gas Production in the United States, *Environmental Research: Health* (2023). dx.doi.org/10.1088/2752-5309/acc886

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