

NURSES ON THE FRONTLINES

Unmasking the Influence of Air Pollution, Health Disparities, and Oil and Gas Development on COVID-19



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Introduction

The impact of environmental contamination on human health has been apparent for decades. As more research is connecting environmental pollution to harms to human health, we see that some communities bear a greater burden from environmental exposures and subsequent health effects. Communities located next to oil and gas fields, refineries, and other polluting industries are examples of communities that bear a disproportionate burden of health impacts from environmental contamination. For many of these communities, chronic exposure to pollution is compounded by other threats that can have a negative impact on their health, such as lack of access to healthcare, low-income, higher crime, and lack of access to healthy foods.

These stressors can make a community less resilient in the face of new threats, such as we see with the COVID-19 pandemic. Following the pattern of environmental exposures and disproportionate health impacts, several studies have shown that some communities of color and low-income communities are at higher risk of getting sick and dying from COVID-19.¹⁻³

This report reviews preliminary analyses into how air pollution may put some communities at greater risk of death (mortality) from COVID-19. We also describe the implications of the oil and gas industry on communities in three western states (Colorado, Montana, and New Mexico) that have experienced high COVID-19 morbidity (infection/illness) and mortality rates. We highlight nurses' stories in each state as they share their experience and insight on the intersection of the pandemic, air pollution, and oil and gas operations. Lastly, we provide recommendations on how addressing air pollution, such as that caused by the oil and gas industry, can help promote community resilience and is an important public health tool to lessen the most severe health impacts of the pandemic.



Air Pollution and COVID-19

Chronic exposure to air pollution is related to various health impacts. It may worsen many chronic diseases like diabetes, heart disease, and respiratory diseases such as asthma and chronic obstructive pulmonary disease (COPD). It is also linked to poor pregnancy outcomes such as stillbirth, preterm birth, and low birth weight.⁴ According to the American Lung Association's 2020 State of the Air Report, over 150 million people in the United States (US) live in counties with unhealthy levels of ozone or particulate matter (PM_{2.5}).⁵ Worldwide, air pollution is responsible for approximately 1 in every 10 deaths.⁶

Since the beginning of the COVID-19 pandemic, researchers have identified factors that may make some individuals more vulnerable to more severe health outcomes from the virus than others. These factors are pre-existing health conditions such as heart disease, chronic obstructive pulmonary disease (COPD), asthma, and diabetes; income level; race; education level; access to health care; and environmental exposures.^{3,7} This information can help public health and elected officials identify high-priority populations and reduce health risks for future pandemics.

The virus responsible for COVID-19 is the Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2). This virus is similar to the virus that caused the SARS epidemic in 2003. Research from the 2003 SARS epidemic in China found a relationship between chronic exposure to air pollution, such as ozone and PM_{2.5}, and the risk of death from SARS.⁸ The link between air pollution and the severity of the disease during the 2003 SARS epidemic has made air pollution a logical area to examine during the current pandemic.

Current evidence suggests a similar relationship between air quality and COVID-19. Several studies have found that the virus that causes COVID-19 spreads more quickly in areas with more air pollution, including particulate matter (PM_{2.5} and PM₁₀), nitrogen dioxide, carbon monoxide, and ozone.⁹⁻¹⁴ COVID-19 is transmitted through the air; therefore, air pollution, including the small particles from PM, could create a suitable environment to transport and be a carrier for COVID-19 to its human host.

Air pollution induces inflammation in lung cells. Air pollution exposure could increase the susceptibility and severity of COVID-19 patient symptoms as the lungs are particularly sensitive to damage from the virus.⁸

The first research to emerge on a possible link between COVID-19 severity and air pollution was from Italy, a country hit hard early in the pandemic. Looking at PM_{2.5} levels one month prior to the beginning of the outbreak, higher levels of PM_{2.5} were positively associated with increased number of COVID-19 cases and more severe forms of the disease requiring hospitalization.¹⁴ The mortality rate in these regions was double of regions with lower PM_{2.5} levels (14% versus 7%).

Here in the US, Wu et al. have done the most robust analysis of air pollution impacts on COVID-19 severity to date.¹⁵ Utilizing COVID-19 data through June 18, 2020 the researchers found that for every 1mcg/m³ increase of average long-term PM_{2.5} exposure there was an 11% increase in a county's COVID-19 mortality rate. Other factors that impact severity are factors common to many communities facing the highest exposure levels from polluting industries, such as median household income, percentage of the adult population without a high school education, rates of owner-occupied houses, and percentage of Black residents. While the factors that can impact COVID-19 severity are complex, this study provides important information that policymakers can use to guide decision making and support community resilience, such as prioritizing health services and personal protective equipment needs.

Exposure to high levels of PM_{2.5} has also been associated with the risk of testing positive for COVID-19 among non-White males who have not completed high school.¹⁶ Blacks living in densely populated communities with poor air quality had twice as many COVID-19 cases and deaths than Whites residing nearby.¹⁷

Race and Health Disparities

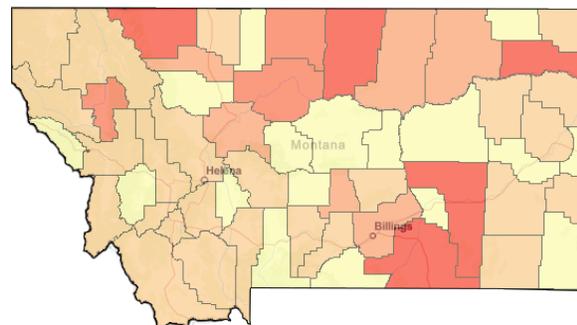
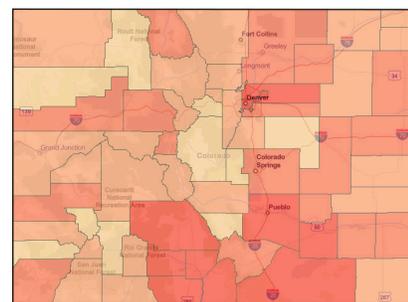
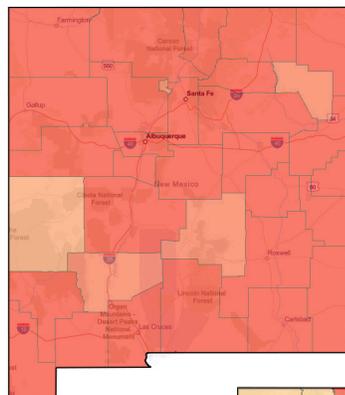
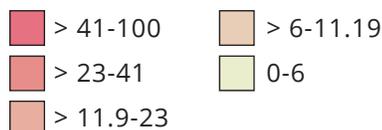
The US has a long history of structural racism that has negatively impacted non-White Americans. Black, Latino, Indigenous, and immigrant people in the US have been excluded from many of the opportunities that their White counterparts receive. This can be seen in health outcomes for US non-White groups, and many of these outcomes can be linked to the social determinants of health. Social determinants of health are the social factors or opportunities that people have. Unfortunately, the opportunities are not evenly distributed throughout the US population. Poor educational opportunities, low-income, limited access to health care, discrimination, and stigma with the resulting mistrust of health information and health providers can lead to a lack of access to essential health services. Much of this results from historical and systemic racism within the medical system that has harmed communities of color, contributing to misinformation and late access to prevention and management of health care, influencing health outcomes. COVID-19 has amplified the disparities that have always been part of the US health measures landscape. Figure 1 shows the percentage of minority populations in New Mexico, Colorado, and Montana.¹⁸

Early on in the US's pandemic, high income, White Americans were most likely to be infected and die

from COVID-19. However, over time low-income and communities of color become more vulnerable to the ravages of the pandemic, with 3.22 times more deaths per million than “less vulnerable communities.”¹⁹ When compared to White counties with large White populations, counties with large Asian American and African American residents had greater COVID-19 mortality.²⁰ For American Indian and Alaska Natives, COVID-19 infection rates have been reported to be 594/100,000 compared to White 169/100,000. Another study found higher death rates in low-income communities of color that led to 658 deaths/1,000,000 among Whites and 1981 deaths/1,000,000 among Blacks.²¹ The authors attributed this to access to health care, poor nutrition, and pre-existing health conditions such as high blood pressure, heart disease, and diabetes. The relationship between race and COVID-19 prevalence and mortality has been found in other studies as well.^{16,22,23} Within Black, Latino, and Native American communities, there is a lack of understanding of the risk of COVID-19 within their community.^{24,25} This knowledge gap is attributed to poor educational opportunities from structural racism, mistrust of the health care system, fewer resources from low-income, chronic stress from constant racial discrimination, and environmental risks.^{20,21,24,26}

FIGURE 1:
Minority Population
by County: New Mexico,
Colorado, Montana

PCT. Minority Population



The maps were created using EJSSCREEN Tool (EPA)

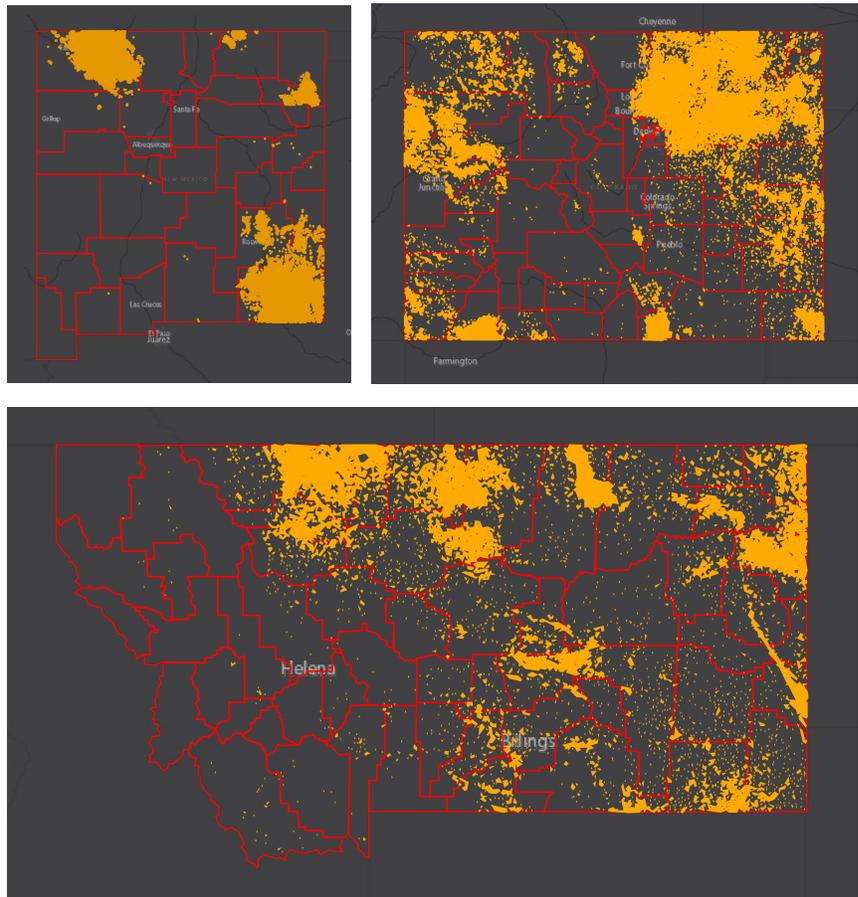
Oil and Gas Impacts on the Community

Oil and gas development (OGD) most significantly impacts the health of the people living near the operations. Figure 2 shows the distribution of OGD facilities in Colorado, New Mexico, and Montana.²⁷ Many areas of OGD are rural, and the amount and density of OGD has overwhelmed rural communities. Pennsylvania residents who lived in areas of highly developed natural gas wells (by well density) reported more health symptoms than those who had less gas development.²⁸ Health problems reported by residents who live close to OGD are more respiratory symptoms such as coughing, wheezing, bronchitis, and nasal congestion than those who do not live close by.²⁹ Air quality and water quality is also affected by OGD. Air pollution from natural gas extraction includes known carcinogens such as benzene, hexane, formaldehyde, and hydrogen sulfide.³⁰ Groundwater contamination in areas of gas development has also been reported (total dissolved solids and chloride).^{31,32}

Living within proximity to well site activity also influences birth outcomes. When pregnant women live within three miles of a well site nightly flaring (the burning off of excess natural gas), they had a 50% higher odds of delivering early, having a premature baby or having a child born with low birth weight.^{33,34} A child born prematurely or with low birth weight is at greater risk of learning, hearing, and vision problems and chronic disease in later life. Proximity to oil and gas development is a health concern for many Americans; in 2012 in Colorado alone, 378,000 people lived within one mile of an active oil and gas well.³⁵ Community members have noted that the oil and gas industry holds a great deal of power in their community, and frequently their needs are not considered.³⁶ In many cases where urban drilling is occurring, the residents were not aware that drilling was happening near them.³⁷

FIGURE 2:
Oil & Gas Development:
New Mexico, Colorado,
Montana

 Oil & Gas Locations



The maps were created by the FracTracker Alliance.

Nurses on the Frontline: Colorado



Dr. Darci Martinez, DNP, FNP, is a family nurse practitioner in Commerce City, CO, with a range of experience that spans adults, pediatrics, and military nursing. Most recently, she cared for patients impacted by the novel coronavirus.

Dr. Martinez has lived in Colorado for nearly 20 years, briefly moving away to serve in the military, and has witnessed the change in landscape from one of stunning mountain ranges to one now dominated by drills and fracking. She lives about 5 miles from the Suncor refinery, considered one of the state's largest polluters, which emits more than 800,000 tons of hazardous air pollutants, such as volatile organic compounds, particulates, and sulfur dioxide.³⁸ In 2020, the Colorado Department of Public Health and the Environment reached a \$9 million settlement with the Suncor refinery for State and Federal air pollution violations.³⁹

Air quality has always been a big concern for Martinez as both her son and mother have asthma. She checks the air quality daily to know whether it is safe for her son to go outdoors that day. It has been particularly challenging with the pandemic and the rash of wildfires in the state. In 2020, Colorado experienced its largest wildfire in the state's history. Martinez describes the smoke from the wildfires at times being so thick that you couldn't even see down the block.

Living in a community with a prominent gasoline and diesel fuel refinery brings additional concerns relating to poor air quality. Martinez explains, "When you drive by the refinery, ... sometimes there is a perfectly white cloud of smoke coming from it and you can just imagine tons of chemicals climbing to the upper levels of sky and then falling on our heads." Martinez adds that the refinery never closes even when the air quality is poor, like it was during the 2020 wildfires. "The pollution gets stuck in the air as it has nowhere to go with the fires. The smoke is so thick and the heat is hampering it down", Martinez remarks.

In the summer of 2020, Martinez was hired as a temporary school nurse at a local school in Commerce City to prepare for reopening and operating the school during the pandemic. As many students have chronic health conditions such as asthma and obesity, they are considered at high risk for complications if they contract the virus. Martinez explains one of the Department of Education's recommendations to reduce the spread of COVID-19 is to increase building ventilation. Unfortunately, after an assessment by a local HVAC company, it was determined that it would be unsafe to increase ventilation because of the amount of volatile organic compounds (VOCs) in the air surrounding the school. VOCs are gases emitted in the air from sources such as oil and gas development and have known human health effects ranging from minor respiratory irritation to cancer. Increasing ventilation would increase the amounts of these dangerous pollutants in the air inside the school. The school is located less than one mile from the Suncor refinery and near two major highways.

Prior to COVID-19, Martinez mentions that asthma rates in Commerce City were already higher than the national average. She adds, "When the fires start, and the smoke fills the city, we do see more pediatric patients coming into the hospital – especially families that aren't able to afford all the medications to appropriately manage their child's asthma." Martinez has similar concerns regarding the management of her son's asthma. In August 2020, she was laid off along with many of her nursing colleagues, as the hospital

she worked at made cuts due to financial concerns. Now uninsured, she is trying her best to conserve her son's asthma medication – counting meds, using them sparingly, and avoiding going outdoors on bad air days to prevent an asthma exacerbation that would require using up the whole supply and possibly a trip to the emergency room. “I never thought I'd have to make these kinds of decisions”, Martinez says about choosing between getting her family outdoors for

their mental and physical health and keeping her son's asthma controlled.

“The people I know that have died from COVID have had chronic conditions and lived in areas where the air quality is poor”, Martinez says. She is not able to tell if there is a direct connection between the air quality in the area and COVID outcomes, however, it is clear the combination is not helping matters.

Nurses on the Frontlines: Montana



Teresa Wicks, MSN, RNC, a nurse for over 40 years and specializing in nursing education and women's health, became more aware of how air quality impacts health when she was diagnosed with breast cancer over ten years ago.

In Billings, MT, there are two oil refineries - one

located 3 miles and another 15 miles from Wick's home. She mentions the refineries have been a staple in the community for years. Unfortunately, the refineries in Billings have experienced significant job losses due to the wells drying up to the south in Wyoming and to the east in the Bakken development in North Dakota.

In Lockwood, MT, where one of the refineries sits, residents often have concerns about air quality relating to the refineries' pollution. Wicks mentions that you can occasionally see a flare or big black clouds coming from the refinery, and at certain times of the year, you can even smell the pollution in the air. She explains that sitting within about 8-10 blocks of the refinery is a low-income community within Lockwood that experiences significant health disparities relating to poverty and homelessness.

Yellowstone county, where Billings is located, has the highest case counts and COVID deaths in the state, with cases on the rise. She mentions that Montana has a large population over 60 years old, and as she hears more about how air quality affects the immune system and respiratory function, she is becoming concerned that this combination is putting Montanans at a higher risk related to COVID. Wicks mentions the hospitals in Billings and surrounding rural areas are approaching capacity, threatening their ability to care for an influx of patients with COVID.

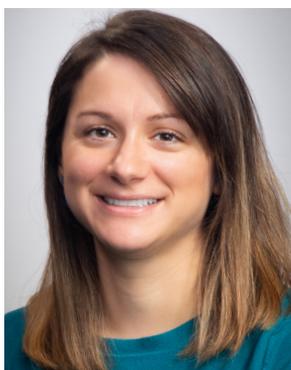
In Billings, Wicks notes that the state has experienced health impacts from living near oil and gas development. She explains that the Bakken oil industry has also contributed to a rise in human trafficking and substance abuse in the state.

Wicks adds that there has been talk of more oil and gas development, which has received mixed responses from residents. “In many ways, Montana is this beautiful wide-open space, and a lot of the topic is, do we want more development? Do we want to bring in that kind of development such as oil, gas, and mining?” Wicks shares. “If we do that, are we still going to have clean air and water as we've always had?”

Nurses on the Frontline: New Mexico



**Dr. Christine E. Kasper,
PhD, RN, FAAN, FACS**



**Dr. Katherine Zychowski,
Ph.D.**

For New Mexico, the connection between air pollution and COVID-19 risk has yet to be determined. However for areas already experiencing poor air quality related to oil and gas operations, this raises concerns. As an anchor institution in the area, Dr. Christine Kasper, nurse and Dean of the University of New Mexico (UNM) College of Nursing, and Dr. Katherine Zychowski, toxicology and environmental scientist, shared that UNM is working closely with health officials in responding to COVID-19.

Since the start of the pandemic, Kasper has been participating in a modeling analytics committee and medical advisory team run by the New Mexico Department of Health. She shares that there has been significant collaboration between government agencies, universities, and other stakeholders to map out predictive measures for COVID (such as when upcoming spikes might be) and coordinate the state's response.

Both Kasper and Zychowski emphasize that government leaders' quick response and coordination has been critical to managing the spread of COVID in the state. Kasper states, "All things considered, New Mexico has had a great response to COVID." This, she notes, is reflected in how the state has been able to assist with the response in surrounding states, "For example, we don't have as much hospital capacity as Arizona does, and we've been taking in patients from Arizona."

However, there are parts of the state that have struggled with controlling outbreaks. Some of the hardest-hit counties by the pandemic have been in the northwest part of the state in the San Juan Basin.⁴⁰ The state also includes part of the Navajo Nation, which has experienced high COVID-19 cases. Near the pandemic's peak in May 2020, Native Americans accounted for almost 60% of the COVID-19 cases in New Mexico, even though they only make up 11% of the state's population.

The northwest area of the state has long struggled with health disparities relating to environmental pollution. Over 20,000 oil and gas production facilities are located in the four northwest New Mexico counties that the San Juan Basin encompasses. In 2019, a community-focused Health Impact Assessment looked at air pollution from oil and gas operations for those living in the Greater Chaco area of northwest New Mexico and found elevated levels of particulate matter in the region.⁴¹

There are also a number of abandoned uranium mines that have contributed to a legacy of toxic contamination in the state, with most of the abandoned uranium mines throughout the Southwestern United States, including the western part of the San Juan Basin. Much of Zychowski's work and research activities at the UNM have focused on the persistent negative health impacts of abandoned uranium mines in that region.

Kasper mentions a research group is looking at various environmental exposures, pre-existing conditions, and COVID-19 risk, but cautions that it will take time to gain a full understanding among the scientific community of how these connect.

Recommendations

While the link between COVID-19 risk and mortality and air pollution exposure, specifically in proximity to oil and gas wells and infrastructure, is not known, there remains a large body of evidence indicating harm to human health from ozone and particle pollution. Both ozone and particle pollution from oil and gas operations create health risks, particularly for those living close to infrastructure. Further, methane pollution from the oil and gas industry is a significant contributor to climate change, contributing to more intense and longer wildfire seasons. To support the health and resilience in communities, there are key priority actions that can provide immediate and long-term protections. Nurses need to be included in these policy discussions as they are in every community and can clearly identify environmental factors that can impact health. Recommended priority actions include:

- Include areas with historical elevated air pollution exposure, especially $PM_{2.5}$, in prioritization of COVID-19 response, preparedness and recovery interventions, such as prevention outreach, testing, vaccination programs, planning for hospital surges and capacity, and other public health interventions.
- Prioritize the advancement of health equity and elimination of health disparities from environmental exposures across all government levels.
- Uphold the Clean Air Act and strengthen existing air quality standards supported by science, including setting stricter National Ambient Air Quality Standards for particle pollution and ozone. Place limits on methane pollution on new and existing sources from the oil and gas industry, and institute policies that reduce carbon emissions and other air pollutants from power plants and other fossil fuel sources. For $PM_{2.5}$ and ozone specifically, EPA must immediately initiate a new and robust review of the NAAQS and set a health protective standard in alignment with the scientific evidence.
- Allocate robust and sustained funding to support public health infrastructure and workforce at the state, local, territorial, and tribal levels.
- Restore and increase funding for public health programs, research, and regulatory actions to prevent environmental exposures and protect those at risk of harm from exposures, including the CDC's Climate and Health program and the Environmental Protection Agency.
- Incorporate an environmental justice analysis and utilization of a Health and Equity in All Policies approach to local, state, and federal policymaking.
- Incorporate a cumulative-impacts assessment in environmental impact assessments and prior to approving new permits for building out new industrial development so that communities already burdened by pollution are not sites for additional polluting facilities.
- Stop the build-out of new fossil fuel infrastructure, phase out existing infrastructure, and support a just and equitable transition to clean and renewable forms of energy, such as wind and solar. A just transition must include communities burdened by fossil fuel pollution and those that face challenges in the transition to 100% clean energy, such as workers or communities economically dependent on fossil fuels in all phases of the process: planning, decision making, implementation, and oversight.
- Promote translational research and study of programs and methods to improve health outcomes and reduce exposure to hazardous air pollutants and other harms from oil gas pollution.

CONCLUSION

Our communities are unfairly burdened by poor air and water quality to provide energy for the nation. COVID-19 has unmasked the additional burden for people of color living in communities with poor air quality and oil and gas development. Policy and public health monitoring and interventions must consider the connection between air pollution exposure from oil and gas development and other sources and COVID-19, and institute the most health protective measures that prevent undue harm to communities most impacted.

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The Alliance of Nurses for Healthy Environments is the only national nursing organization focused solely on the intersection of health and the environment.

The mission of the Alliance is to promote healthy people and healthy environments by educating and leading the nursing profession, advancing research, incorporating evidence-based practice, and influencing policy.

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