What Should the Public Health Policy Response Be to Harmful Exposure to Oil and Gas Development?

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It is estimated that 17.6 million people in the United States live within one mile of oil and gas development. In Canada, the province of British Columbia alone currently houses 35 000 oil and gas wells, of which approximately one third are unconventional wells. Unconventional wells use hydraulic fracturing, which involves vertical and horizontal drilling for several kilometers under fresh and saline water aquifers. Unconventional oil and gas extraction has been rapidly expanding in both countries over the past decade: hydraulically fractured wells now produce between 65% and 80% of US natural gas and crude oil. In northeastern British Columbia, residents can live with up to 368 unconventional wells within 10 kilometers of their home, which makes us ask how "unconventional" the practice truly is.

Hydraulic fracturing is a well stimulation technique that injects pressurized fluid to fracture rock formations to extract fossil fuels such as natural gas. The wastewaters generated during this process contain a variety of toxic compounds, including chemicals used in the hydraulic fracturing fluid (biocides, friction reducers, scale inhibitors, surfactants, acids, corrosion inhibitors, gelling agents, etc.), heavy metals, volatile compounds, and radioactive elements naturally occurring in the rock formation,[1] potentially contaminating the environment through spills and wastewater evaporation. Oil and gas development can result in air pollutant emissions, including, for example, volatile organic compounds.[2,3] Other important emission sources include machinery and gas flaring.

Many chemicals used in the hydraulic fracturing fluid are known toxicants. Toxicological studies using human cells or rodents have shown deleterious effects, such as endocrine disruption, cytotoxicity, carcinogenicity, behavioral changes, and metabolic health disruptions. This evidence of "biological plausibility" is aligned with the growing epidemiological literature pointing to the various adverse health effects associated with living near oil and gas development.

Earlier this year, we published a review of 52 studies examining the health outcomes of people living close to unconventional wells, and the results are less than reassuring.[4] Perinatal outcomes were most often studied, and of these studies, the majority reported adverse neonatal outcomes among pregnant people living nearby these sites, including preterm birth, low birthweight, impaired fetal growth, and congenital malformations. Other studies found that living near these sites was associated with higher risk of asthma exacerbations, adverse cardiovascular outcomes, childhood cancers, and overall mortality, among other health issues.[4]

In the United States and Canada, there is also consistent evidence that unconventional oil and gas operations disproportionately affect systematically and structurally disadvantaged communities. A 2019 analysis of sociodemographic characteristics of people living close to drilling and hydraulic fracturing operations in the states of Colorado, Oklahoma, Pennsylvania, and Texas found strong evidence that minorities, especially African Americans, disproportionately live near unconventional wells.[5] Additionally, biomonitoring studies in northeastern British Columbia that our group has published demonstrate that exposure to trace elements and volatile organic compounds is higher among cohorts of pregnant individuals than among the general population; this exposure is also higher among Indigenous than non-Indigenous participants.[6–8]

In the September 2024 issue of *AJPH*, Willis et al. discuss their study in which

they recruited participants who answered questionnaires on their mental health (i.e., perceived stress, major depression symptoms, use of medications for anxiety, depression, and sleep disorders) and evaluated the associations between proximity and density of active oil and gas development sites within 20 kilometers of the participant's address during preconception (a critical window of vulnerability) and perceived stress, symptoms of depression, and the use of psychotropic medication in women living in the United States and Canada.[9] The study adds to the literature by using a large study across the United States and Canada that deployed social media to recruit a large sample of women during the preconception period. The authors used national oil and gas databases to assign each individual a series of exposure metrics based on the proximity and density of active or new oil and gas wells around their residence and at various preconception time windows. Willis et al. observed that oil and gas development intensity was associated with moderate to high perceived stress, moderate to severe depressive symptoms, and psychotropic medication use. Notably, associations with perceived stress and depressive symptoms were strongest among those living closest to oil and gas development sites, further highlighting the impact of oil and gas development on the health of local communities.

Hypothesized pathways for the observed associations include the documented increase in noise, vibrations, light pollution, traffic, crime, and stressed infrastructures, which may cause increased psychosocial stress and loss of community cohesion, as previously documented in regions undergoing oil and gas booms.[10,11] Community members may experience increased stress and anxiety related to concerns regarding the pollutants released from the oil and gas operations. A direct chemical effect is also plausible: air pollution, for example, has been linked with adverse mental health outcomes.[12] Furthermore, increased chronic stress before and during pregnancy is known to contribute to negative birth outcomes, such as low birth weight.

The study by Willis et al., along with the accumulating evidence from multiple other studies, generate an urgency to act. Just as Finkel and Law commented in the pages of this journal 11 years ago,[13] we must consider exercising the precautionary principle when it comes to this industry. US President Biden has announced a pause on the permitting of all new liquefied natural gas exports, which will help decrease the number of people exposed to these industrial activities, and this is a policy we encourage our Canadian government to emulate. However, there remain thousands of communities currently living near these developments that we must protect. We suggest that governments consider the following.

First, setbacks for homes, schools, and daycares need to be informed by the best available evidence. Setbacks are the minimum distances allowed between homes and an oil extraction site. In their publication, Willis et al. reported an association between adverse mental outcomes and residential distance to the industry of 2 to 18 kilometers.[9] They further highlighted the wide range of setbacks across jurisdictions from as low as 100 meters (as is the case in British Columbia) to up to 970 meters in California. Our current understanding indicates that setbacks need to be further defined by the number of active wells in a given spatial boundary in addition to the distance between a site and an infrastructure.

Second, the same evidence that informs setbacks needs to be uniformly adopted across states and provinces so that one area doesn't become a "sacrifice zone" for industry expansion owing to lower standards. Third, reporting of all chemicals in hydraulic fracturing fluid should be mandatory, without exceptions for trade secrets. Reporting the use of these chemicals should also not be limited to the hydraulic fracturing phase and needs to include all phases of the industrial process.

Finally, there should be mandated industry funding for credible and independent third-party environmental monitoring to prospectively measure the quality of air, water, soil, and human health outcomes of communities living near this industry. This process should include meaningful participation of the exposed communities in the monitoring process consistent with environmental justice principles. Likewise, the industry should fund remediation of significant pollution when identified.

Given the growing evidence of human harm associated with this industry including that which Willis et al. show, it is time for public health policymakers in all jurisdictions to work together to increase oversight, protect human health, and minimize environmental harm. AJPH

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CONFLICTS OF INTEREST

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