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Communities in Flux

FRACKING AND HEALTH IMPACTS: THE LIVED EXPERIENCE

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1. Introduction

In 2020, the Canadian Association of Physicians for the Environment (CAPE) released the report *Fractures in the Bridge*. The report was comprised of a literature review focused on the environmental and health impacts of unconventional gas operations, which included hydraulic fracturing techniques – commonly referred to as ‘fracking.’ The experience of people living near well sites with unconventional oil and gas (UOG) operations was a noted gap of the report.

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community and public health. As such, the objective of the study reported herein was to highlight the localized experience of living near UOG operations in Northeastern British Columbia (B.C.).

Despite overall increasing research related to the health impacts of UOG development, there is limited research in Canada. Several factors limit research – including recent increases in fracking activity, varying characteristics of wells and the chemicals used, difficulty identifying the impact of fracking, and confounding factors including other pollutants (Macfarlane & Perrotta, 2020). The research gap has also been attributed to the relative erasure of Indigenous and remote rural populations by mainstream environmental epidemiological and other research compared to settler populations exposed to fracking.

This report focuses on local, qualitative data generated through interviews with people residing in Northeastern British Columbia near well sites with UOG extraction, connecting lived experience with health effects reported from research in Canada and internationally.¹



FRACKING OPERATION
IN FARMINGTON, B.C.

¹ Analysis conducted by the Pembina Institute in 2018 indicates that while there are differences in regulation of UOG operations including hydraulic fracturing at the regional level, broadly, the regulatory framework in the United States is comparable to regulations in B.C. (Kniewasser & Riehl, 2018)



One of the objectives of this study was to gather data specifically on Indigenous peoples' experiences living near fracking operations. Recruitment activities actively sought Indigenous residents, but efforts to secure interviews were unsuccessful. Therefore, the report primarily reflects the settler perspective supplemented by content from Indigenous speakers at public events. The persistence of the gap of Indigenous perspectives should be addressed in future research.

In the course of the interviews, participants identified factors that attracted them to the region and are part of what they appreciate about where they live. They conveyed an interest in living in a sustainable, peaceful environment that facilitates outdoor activities. In their interviews, participants noted significant changes accompanying the influx and increase in fracking-related operations in their communities. These changes and perceived connections to their health are reported herein.

Findings of the study are organized by and reported under three sub-themes: constancy, stress, and sensory experiences; reported symptoms and health conditions; and community-level impacts.

Links with the health literature highlighted in *Fractures in the Bridge* are made, and specific health impacts are outlined in connection with additional evidence. Recommendations for action and advocacy are provided in connection with the health impacts reported.



LAYING NATURAL GAS PIPES
BETWEEN FARMERS' FIELDS
IN FARMINGTON, B.C.

2. Study Context

A general overview of industry practices and processes is helpful to provide context, clarity, and a greater understanding of the participants' reported lived experiences and health impacts connected to related industry operations. Understanding industry operations helps illustrate what interviewees say as they connect their health perceptions to specific aspects of UOG, hydraulic fracturing processes, and various related facets.

Oil and gas are produced via conventional and unconventional industry methods, depending on the nature of the rock reservoirs in which the resource is stored (Precht & Dempster, n.d.). In a conventional approach, oil and gas flow freely from rock pores to wells and the surface, as the reservoirs are permeable and porous (Precht & Dempster, n.d.). However, different approaches are necessary for UOG operations where reservoirs are characterized by low permeability (Precht & Dempster, n.d.).

UOG operations² require the construction of roads, clearing of land, and infrastructure development, resulting in 400 to 2000 truck trips to the site before a well is drilled (Gorski & Schwartz, 2019). After a well is drilled, the stimulation technique of hydraulic fracturing creates fractures in the rock and applies high volumes of fluids at high pressures to facilitate the movement of oil and gas (Precht & Dempster, n.d.). The fluids used in hydraulic fracturing contain water, proppants (sand), and chemicals – many of which have known toxic effects, including endocrine disruption and carcinogenicity (Kniewasser & Riehl, 2018). Some fluids return to the surface as flowback water, accompanied by oil and gas (Precht & Dempster, n.d.). The flowback water can be stored in tailings ponds on-site, after which the water is usually transported to another location (Kniewasser & Riehl, 2018). In addition to carcinogenic and endocrine-disrupting frack fluid chemicals, flowback water can contain heavy metals and NORM (naturally occurring radioactive material)



FRACKING OPERATIONS,
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² See CAPE's "Fractures in the Bridge" for more insight into UOG operations and processes: <https://cape.ca/wp-content/uploads/2020/01/CAPE-Fracking-Report-EN.pdf>



known to adversely impact human health (Saunders, 2018). During the mining and collecting process, harmful compounds are released into the water and into the air at multiple points.

Studies of populations living near UOG operations have identified negative health outcomes, including adverse birth outcomes such as congenital heart defects and neural tube defects, cancer, cardiovascular diseases, dermal effects, gastrointestinal symptoms, neurological effects, psychological impacts, respiratory illnesses, and adverse impacts on pregnancy;

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and negative birth outcomes such as high-risk pregnancy, preterm births and possibly low birth weight, and asthma exacerbation. Studies have also examined the potential effects of fracking on cancer incidence, with evidence that fracking may increase the risk of acute lymphocytic leukemia (ALL) among children. Occupational studies have linked leukemia in adults exposed to benzene, and a biomonitoring study conducted in northeastern B.C. found high levels of benzene metabolites in the urine of pregnant women who live close to fracking wells (Macfarlane, R., & Perrotta, K., 2020).

To sustain gas production, wells are drilled continually – meaning that many extraction sites have well pads with a large number of drilled wells – or existing wells are

re-stimulated (Gorski & Schwartz, 2019). The number of wells at each pad contributes to development over the span of up to 20-40 years (Gorski & Schwartz, 2019).

The experience and health impacts reported and described by participants refer to the above-noted processes and practices of fracking operations and their impact on the broader community context, infrastructure, and day-to-day living inclusive of health.



FRACKING OPERATIONS,
FARMINGTON AREA OF
NORTHEASTERN B.C.

3. Methods

The study uses a qualitative design to answer the question: “From a health perspective, what is the experience of living near a fracking site in Northeastern B.C.?”. Narratives of people in communities affected by fracking that have lived experience of the health risks involved were gathered in individual, semi-structured, in-depth interviews conducted over Zoom or telephone (see Appendix A for Interview Guide).

Participant eligibility criteria included those 18 years of age or older, English-speaking, and a current or former resident within the last ten years of Northeastern British Columbia. Community health advocates from the area provided referrals to potential study participants, sharing descriptions of the interview process and providing contact information of potential participants to the study researchers. A Facebook advertised survey targeted to the Northeastern British Columbia region was also utilized for recruitment.

One of the objectives of this study was to gather data specifically on Indigenous peoples’ experiences living near fracking operations. Indigenous residents were actively sought in the recruitment strategies, but efforts to secure interviews were unsuccessful. Therefore, the report primarily reflects the settler perspective supplemented by content from Indigenous speakers at public events. The persistence of the gap of Indigenous perspectives should be addressed in future research.

The primary data of the report are drawn from interviews with supplemental information from a separate survey and publicly available webinars on the related subject matter.

Notes taken during interviews were verified for accuracy and completeness when interview audio recordings were later reviewed. Interview recordings were stored with password protection.

Participants’ varied terminology about UOG operations, including hydraulic fracturing, were standardized for clarity and accuracy. Direct quotes are not provided in the report to protect anonymity and confidentiality.

3.1 SAMPLE

Interviews were conducted with nine participants, one of whom was recruited from the survey. The collection of demographic information was limited to whether they were Indigenous or non-Indigenous. All formal interviewees identified themselves as settlers. Participants revealed additional demographic information in their interview responses. Some information about the consequences of living near fracking projects from interviews with health professionals conducted outside of this study was incorporated.

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FRACKING OPERATIONS,
FARMINGTON AREA OF
NORTHEASTERN B.C.



The survey – created on Survey Monkey and advertised on Facebook – garnered 74 responses, of which 53 respondents identified themselves as living within 5 km of oil and gas activity. The age of respondents is unknown; approximately 70% identified as male, about 25% identified as female and a small proportion identified as non-binary or preferred not to say. Of those who indicated they lived less than 5 km from oil and gas activity, 29 respondents described their residence in Northeastern British Columbia as in Fort St. John, Dawson Creek, Chetwynd, and the Peace area – regions known to have UOG operations with hydraulic fracturing. An additional seven respondents identified themselves as living or having lived further than 5 km away from oil and gas activity in the regions mentioned above. Some respondents did not disclose their current or former locations and/or their proximity to fracking operations. Limited qualitative data generated in response to whether survey participants had any health concerns connected to oil and gas activity and the impacts of oil and gas on their community were included in the report.

3.2 ANALYSIS

Data analysis of interview notes included coding excerpts and categorizing for meaning. Codes were then grouped into themes to facilitate the formulation of a narrative. Outlier codes produced questions and revealed knowledge gaps that inform future research recommendations.

Research cited in the report reflects relevant connections to literature in the *Fractures in the Bridge* report and additional scans of peer-reviewed journal articles and government resources.

4. Findings

4.1 CONSTANCY, STRESS, AND SENSORY EXPERIENCES

A significant aspect of the experience of living near hydraulic fracturing operations is the ways in which the by-products of industry operations impact the lives of nearby residents. The constancy – understood as sustained or persistent disturbance – of industry-related sensory inputs can be conceptualized in three ways – by modality, the experience when a well site is active, and the anticipatory cycle of fracking-related activity.

UOG operations, including hydraulic fracturing, generate stimuli that impact a number of sensory modalities, making escaping industry-related disturbances difficult. An interviewee reflected that if you cannot see fracking activity, you will be able to hear it, and even then, if you cannot hear it, you can probably smell it. Further, participants describe the constancy of UOG activity, including disruptions that occur on a 24-hour basis at active times. The constancy of industry is considered long-term by residents. Lulls in activity are accompanied by the perception that there will be new and continuing developments in the near future.

The long-term cyclic experience of living near fracking sites is illustrated by descriptions of how lulls in activity can be easily disrupted by receiving mail that details new development. One participant referred to the cycle of returning activity as a rollercoaster-like experience. Descriptions of how fracking infiltrates almost every aspect of their lives, a sense that there is always something going on in the background, and how the industry has become more intrusive illustrate participants' perceptions of the constancy of fracking activity. The constancy of the sensory irritants generated by UOG activity suggests that the environmental interruptions may be chronic, warranting attention to potential long-term health implications.

The constancy of unconventional oil and gas activity, which for nearby residents often manifests as the odours and noise they notice, interacts with the stress experienced. The stresses experienced by community members are exacerbated by this persistence, acting as a constant reminder of their concerns and inhibiting their perception and desire for a peaceful environment.

Some interviewees identified the psychological toll of living near hydraulic fracturing operations as the primary way their health has been affected. The stress and mental toll described are often connected to practical realities and day-to-day practices.

Some participants reflected on the lack of information about how health could be impacted by stress due to living near fracking well sites. For one participant, the uncertainty of how unconventional oil and gas activity will impact their business's viability – particularly applicable to farmers – and the moral concerns with passing the business to new owners in this environment has added stress to transitioning into retirement.

A significant aspect of the experience of living near hydraulic fracturing operations is the ways in which the by-products of industry operations impact the lives of nearby residents.



FRACKING WELL PAD
AMIDST FARMERS' FIELDS



Others reflect concerns over the stability of their home as an asset, with encroaching industry negatively impacting their property value. A survey respondent who identified themselves as working in oil and gas highlighted stress arising from shift work, performance standards, and pressure on industry as a health concern. Considerations relating to whether drinking water is contaminated or protecting pets if there is an emergency when the owners are away from home also contribute to stress.

Published literature on psychosocial impacts documents stress as an outcome resulting from nearby UOG activity (Hirsch et al., 2018; Casey et al., 2018). Research suggests that industry activity contributes to perceptions of whether wellbeing is maintained or deteriorates in connection to unconventional gas development (Lai et al., 2017). Research also indicates that even in the

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exploratory phase of fracking-related development, increased stress levels in the community are reported (Short & Szolucha, 2019).

Community members living near fracking operations described sensory experiences associated with processes involved in the life cycle of unconventional oil and gas operations, including well site preparation, drilling, and hydraulic fracturing. These sensory stimuli are conceptualized as hazards associated with UOG development. Odours are categorized as chemical hazards, and noise, light, and vibration are physical hazards (Gorski & Schwartz, 2019).

Fracking-related sensory stimuli are sometimes reported as odours that arise from events such as leaked gas and condensate spills. Residents described the smells as stronger than propane, foul, or like rotten eggs. Multiple individuals interviewed related how smells can indicate harmful fracking-related events. Residents explained that they attempt to self-assess whether the odour is

benign and indicates concern. In many incidents, respondents relied on neighbours for information surrounding an event contributing to an odour.

People in these communities often initiate reaching out to regulators and industry in odour-generating instances instead of data being shared proactively by industry with nearby residents. A participant described it as exhausting to contact industry repeatedly when there is a problematic odour. The ultimate fear is that it will be too late when residents are finally notified of a particularly harmful event.

The experience of feeling responsible for monitoring for harmful events is described as stressful. This is tied to a lack of trust in oil and gas companies or regulators to transparently and efficiently share information. The experiences of dealing with unknown odours, as described during interviews, elucidate how the problem of uncertainty and lack of information manifests as an adverse health outcome.

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Similar experiences are also cited in relation to other indicators. Fracking-produced light is evident to residents when emitted from flaring or lights used to illuminate well pads at night (Gorski & Schwartz, 2019). One participant who lives near a site that processes flowback water was informed that flaring should only occur during emergencies – yet the interviewee questions if there is always an emergency as they continually see the light from flaring. The participant connected the experience of wondering what is happening to warrant flaring to their feelings of emotional distress.

High levels of noise may be produced during drilling and hydraulic fracturing, as well as during industry-related trucking (Gorski & Schwartz, 2019). Interviewees describe the disruptive noise associated with UOG operations as akin to vacuuming, hissing, or a running engine. Traffic-related noise is particularly significant during the preparation of a well site, which is reflected in the comment of one interviewee who indicated that they could estimate when a well site is being prepared to be active again based partly on increased traffic.

Many of the sensory inputs described by residents are seen as inhibiting their efforts to maintain good health. A consistent example is the adverse impacts on sleep quantity and quality, particularly from noise generated by UOG activity. Participants described general difficulty sleeping, inability to sleep well, and disturbed sleep.

A participant shared how being awoken by intermittent UOG activity at night can evoke stress and anger. Another interviewee connected the disturbed sleep they experienced to the development of other problems. While this participant did not elaborate on the effects, there are documented, substantial short-term and long-term health consequences of sleep disruption, including increased activity of the sympathetic nervous system and hypothalamic–pituitary–adrenal axis, metabolic effects, changes in circadian rhythms, proinflammatory responses, stress responsivity,



somatic pain, reduced quality of life, emotional distress, mood disorders, cognitive, memory, and performance deficits, hypertension, dyslipidemia, cardiovascular disease, weight-related issues, metabolic syndrome, type 2 diabetes mellitus, and colorectal cancer among others (Medic et al., 2017).

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noise and other disturbances arising from hydraulic fracturing and associated activity. One participant reported that when fracking noise, odours, or generally feeling unsafe impacts their ability to sleep, they chose to spend the night at a hotel in town – a luxury that the interviewee noted is not affordable for all community members.

In addition to other barriers, hotel expense was reported as a difficulty in mitigating sleep impacts. A participant whom an oil and gas company offered evening hotel stays to reduce noise exposure described the solution as unreasonable as the trip to town itself drew on time and money resources. A further complication was that the ability to travel elsewhere to avoid industry-related sensory exposures was generally constrained during the COVID-19 pandemic.

In addition to the effects of altered sleep on individual health, community safety was a noted concern as it may be negatively impacted with multiple residents experiencing poor sleep. A health professional interviewed expressed concern that if fracking operations moved closer to their home, the sleep disruptions that they expect could affect the safety of their patients.



AREA CLEARED IN PREPARATION FOR LAYING DOWN THE COASTAL GASLINK PIPELINE

In addition to how sensory disturbances generated from UOG operations impact community members' sleep, residents' perceived ability to maintain good health is also impacted by the infiltration of industry exposures into comfort spaces or hobbies. One individual emphasized that when cross-country skiing at night – a hobby that they enjoy – the flames from the flares can be seen in the sky, impacting their ability to achieve peace of mind during the activity. This aligns with another participant's perspective on hiking trails losing their pristine character shortly after the orange surveyor stakes arrived and UOG operations developed.

An inability to find spaces or activities to manage stress can have pervasive physical and mental health impacts. Hirsch et al.'s literature review on the psychosocial implications of fracking reports that loss of solitude, peacefulness, and rural 'way of life' are concerns in these communities (2018). Further, home, which for some people is desired as a site of refuge after a stressful day at work, can become a site of stress from persistent inputs from UOG activity. One interviewee described working in a stressful environment and returning home to another stressful environment.

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4.2 REPORTED SYMPTOMS & HEALTH CONDITIONS

Some individuals who live near well sites experienced acute or temporary health issues that arose directly after exposure to a fugitive emission or leaked gas. In the days after exposure to a fugitive emission, interviewees described becoming ill and developing sore throats. One individual described feeling sick to their stomach for hours after smelling sour gas emanating from nearby transport trucks. In a different context and with other symptoms, a separate participant noted that children coming in from the outside would report headaches related to UOG activities' smell.

The identifiable health impacts are described as manifesting temporarily in these cases. Still, they provide a starting point for discussing how exposure to emissions produced by hydraulic fracturing and other UOG processes affect the body, given that the symptoms occur directly after an identified exposure. When individuals note changes in their health after smelling a leaked gas or spill, it reiterates how sense-based clues become central to understanding and discussing how UOG activity has impacted their health.

Individuals experience stressors arising from many different aspects of living and working near fracking operations. Published research supports the claims of health impacts from disruptions. Participants' challenges in applying various mitigation strategies illustrate the untenability and inequity of individual responsibility for solving pervasive community-wide issues. The individual-level strategies are often insufficient to deal with the systemic problems identified.

Longer-term health conditions are also experienced by individuals living near fracking sites. Multiple chemical sensitivities are among the health impacts reported. A participant described experiencing ongoing scent sensitivity that has developed unexpectedly in the last ten years. The intensity of their scent sensitivity is reflected in the fact that they can no longer have a scented



BRIAN DERFLER,
FARMER, BY FRACKING
INFRASTRUCTURE IN
FARMINGTON, B.C.



candle in their house or use scented shampoo. This respondent said that their scent sensitivity has arisen over time due to poor air quality (Magill & Suruda, 1998; Jarry, 2021).

Interviewees experiences with scent sensitivity has caused them to realize how many people surrounding them seem to experience similar issues. The participant reported that half of their colleagues have requested a scent-free environment at their workplace. Further, when the participant asked someone working in the personal care service industry not to use scents, the worker shared that they stopped using scents years ago because all their clients have scent sensitivity.

For some people living near UOG well sites in Northeastern B.C., changes to the duration and seasonality of their allergies were experienced. Environmental allergies, which were previously limited to summer, are now a year-round experience for one participant. The change occurred following the initiation and increase in fracking-related activity in the area. Year-round symptoms such as a runny nose and eyes and cough were described.

Immune-function-related conditions were raised during interviews. Health professionals interviewed wondered if their observations of many young women with multiple sclerosis (M.S.) and more severe tremors in people with M.S. in the area may be connected to UOG and hydraulic fracturing activity.

Other immune-function-related conditions were raised during interviews. Health professionals interviewed wondered if their observations of many young women with multiple sclerosis (M.S.) and more severe tremors in people with M.S. in the area may be connected to UOG and hydraulic fracturing activity. At the mice model level, developmental exposure to water contaminated with chemicals used in UOG operations was found to exacerbate symptoms of experimental autoimmune encephalomyelitis – which models multiple sclerosis – in female offspring (Boulé et al., 2018).

As hinted in both scent sensitivity and allergy-based impacts, the respiratory system may be im-

As hinted in both scent sensitivity and allergy-based impacts, the respiratory system may be im-

pacted by exposures associated with living near fracking-related activity. Interviewees revealed both personal stories of respiratory issues as well as community-level observations. One participant reported that the onset of their respiratory issues was associated with the initiation of UOG and hydraulic fracturing nearby. They know many other people in the community who have respiratory problems. While the interviewee did not describe the specific respiratory issues, asthma is a respiratory condition studied in relation to UOG development. Another participant noticed that they had developed a persistent cough since the onset of fracking nearby.

Stress and air pollution can exacerbate asthma within a short period after exposure (Gorski & Schwartz, 2019). A study of asthma exacerbations demonstrated an association between unconventional natural gas activity and mild, moderate, and severe asthma exacerbations (Rasmussen et al., 2016). In addition, there were observations of many people experiencing COPD and sleep apnea in the community, including personal anecdotes of sleep apnea described in connection to perceived health impacts of fracking. Lastly, idiopathic pulmonary fibrosis was raised as a concern, in specific reference to a case where the individual lived quite close to a UOG well site.

There were observations of many people experiencing COPD and sleep apnea in the community, including personal anecdotes of sleep apnea described in connection to perceived health impacts of fracking.

Altered physical capabilities were also reported when interviewees were asked about their experiences living near well sites. In one case, a participant described weakness that coincided with the operation of a nearby well site with open water storage. When the activity was present at this particular site, the participant reported ongoing strong smells in their yard – to the extent that they repeatedly checked to see if their propane tank was leaking. The individual, who was known to help neighbours, found themselves declining requests for assistance, as they could not walk across their yard without difficulty. However, approximately one year after the cessation of the fracking activity at this site with open water storage, the individual stopped experiencing weakness problems. When medical attention during these bouts of weakness was sought, physicians did not have an explanation for the symptoms experienced.

An Indigenous resident described how studies undertaken in their community demonstrated disproportionately high levels of carcinogens measured in pregnant Indigenous people (Napolean 16:28-27:13 referring to Caron-Beaudoin et al., 2019). The consumption of traditional foods originating from areas with high levels of fracking was a concern related to this finding (Napolean 16:28-27:13).

Research also found that concentrations of some trace metals known to be associated with hydraulic fracturing were higher in pregnant women residing in regions with significant natural gas extraction activity in Northeastern B.C. when compared to the reference population. Even higher concentrations of some metals measured were found in Indigenous participants (Caron-Beaudoin et al., 2019).

Exposure to trace metals has been associated with adverse birth outcomes. An epidemiological study in Northeastern B.C. of the association between proximity and density of fracking wells



MASSIVE WATER STORAGE
FOR THE 10 MILLION PLUS
LITRES USED FOR EACH
FRACKING PROCEDURE



during pregnancy and birth outcomes found these patterns, though findings were inconsistent (Caron-Beaudoin et al., 2020). The study points to the need for additional research, accounting for more detailed address location, the well production phase, contaminant concentrations, and covariates like racialization (Caron-Beaudoin et al., 2020). The call for additional research on adverse birth outcomes is supported by their mention in interviews conducted for this report.

Elevated cancer rates in young people are a reported health concern. A health professional recalled moving to Northern B.C. and, within two weeks of practising medicine in the area, noticing differences in the way that patients presented. They observed elevated incidence of advanced-stage cancer in younger people and reported industry workers dying of cancer in their late twenties. Community members also raised concerns about cancer rates in the region.

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The health professional relayed concerns about various cancers. They explained that based on prior experience outside the region, they would have started with ultrasound and other tests before sending someone for a C.T. scan. But in Northern B.C., with the later stages of cancer observed in younger patients, time did not permit this approach. It was reported that some elderly patients' children who grew up in Northern B.C. have since moved but are experiencing some of the same cancers as young people still residing in the North.

Additional concerns related to health symptoms and conditions included medications such as anti-hypertensives typically prescribed to older people being prescribed to young oil and gas workers. There were also brief mentions of health concerns relating to rheumatological impacts, erectile dysfunction, and hypogonadism. While participants mentioned these and other health conditions, they also expressed difficulty knowing whether these were caused by or correlated with fracking activity. As the issues raised are reflections by participants about health impacts experienced by residents near UOG activity, they are observations and suspicions that signal a need for deeper investigation into the full range of health outcomes related to fracking operations.

4.3 COMMUNITY-LEVEL IMPACTS

Published literature addresses some of the community-level health impacts of UOG activity, including recognition that collective trauma related to the cycle of ‘boom and bust’ can occur in extraction-based industries such as fracking (Hirsch et al., 2018). UOG development and the associated changes in the social fabric of a community may be particularly distressing for long-time community members (Hirsch et al., 2018). A study in communities near UOG development in West Virginia found that alterations in residents’ sense of place generated widespread social stress (Sangaramoorthy et al., 2016).

People who live near UOG well sites in Northeastern British Columbia are also concerned with the community impacts of fracking activity. An individual described how they feel less inclined to socially interact and connected this to how community dynamics have changed with the influx of fracking sites. This participant also expressed a general sense of irritation amongst community members due to the loss of the ability to have a peaceful environment.

Others echo feelings of irritation and disheartenment near fracking sites. In addition, interviewees described how the community disagreement and division on fracking stress the community. These aspects may undermine social connectedness, with social relationships – a social determinant of health (SDH) – adversely affected by resource development activities (Aalhus et al., 2018).

Interviewees described the movement of people out of communities due to health, wellbeing, and ecological threats arising from fracking activity as a concern. Participants reflected on the experience of having family members move away as a ‘blow,’ given that family proximity was viewed as necessary to some. A participant explained that one of the reasons they still live in the region, despite their concerns relating to UOG, is the presence of family nearby. Another participant reported that half of their friends had moved away from the area to escape the constant worry.

The loss of social support networks, from family and friends, may adversely impact the wellbe-

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FRACKING OPERATIONS,
FARMINGTON AREA OF
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ing of those who remain in the community. While new people move into the area as others move away, the loss of those with whom strong relational ties existed may not be easily replaced. One participant highlighted how people leaving the community were important to its overall fabric. When describing this impact, the participant emphasized the effect of the loss of farmers and people who had invested in the community long-term on the community's wellbeing. Differential impacts from the loss of support networks result from several factors, including access to the internet and other avenues of communication.

While the motivations for farmers leaving areas near fracking activity likely differ, people in the agricultural industry who continue to live near fracking sites have described how it has become more difficult to sustain one's livelihood in agriculture. One implication of increased fracking activity, according to an interviewee, is that local stores which traditionally supplied the agricultural industry have shifted to focus on oil and gas.

In addition, increased traffic associated with UOG development influenced practices for nearby farmers. In one instance, the truck traffic on a dirt road adjacent to an agricultural field generated so much dust that their produce had to be washed 4-5 times before it was in sellable condition.

A common argument supporting UOG development is that some people in the community are supported by work in the industry. However, the impacts on the ability to make a living are not uniform, as evidenced in part by the barriers UOG operations create for those who financially support themselves and their families through agriculture. Interviewees expressed concern

Interviewees expressed concern that rural and Indigenous communities pay the price for fracking operations.

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Participants noted that overdoses have become more common in their community and connect this to increased industrial activity.

One story involved an oil and gas worker overdosing on drugs on the job. In a report focused on rural and Northern communities, it was highlighted that the impact of resource extraction on employment should include consideration of working conditions (Aalhus et al., 2018).



BRIAN DERFLER, FARMER, BY FRACKING INFRASTRUCTURE IN FARMINGTON, B.C.

The nature of shiftwork and social isolation in resource extraction industries can contribute to problematic substance use issues among workers (Aalhus et al., 2018). The conversation surrounding how the industry activity impacts health should include potential long-term impacts of substance misuse habits for workers.

Food insecurity is a reported challenge for Indigenous communities near UOG development. Traditional foods are becoming less accessible and unsafe for consumption. An Indigenous resident described how some hunting grounds are overwhelmed by well sites, rendering hunting lands less available (Napolean 16:28-27:13). Further, there are concerns about the viability of traditional foods such as meat, fish, and berries.

Food insecurity is a reported challenge for Indigenous communities near UOG development. Traditional foods are becoming less accessible and unsafe for consumption.

Members of Indigenous communities near fracking sites have observed cysts and abnormal growths in moose, which they had never previously encountered (Napolean 16:28-27:13). Their impression that consuming traditional foods from certain lands could result in cancer and was no longer safe was connected to identified increased levels of carcinogens in pregnant Indigenous peoples (Napolean 16:28-27:13). The health impacts of reduced access to and safety of traditional foods may also include adverse effects on the wellbeing of Indigenous peoples, as practices related to traditional foods can be tied to important cultural and social traditions.

With influxes in fracking activity in the areas surrounding the home of interviewees, community-level public safety concerns were raised in relation to the presence of transient workers. Some interviewees described concerning driving habits amongst some transient workers. One interviewee described instances of observing excessively speeding transient workers. In terms of drinking and driving, the community members cited the number of beer cans tossed onto the side of the road between a fracking site and the nearest main intersection as one of the clues of this behaviour. Road safety is a public health problem and, in this case, a negative health implication of living near oil and gas fracking activity.



PREPARATION FOR
LAYING PIPELINE UNDER
WET'SUWET'EN TERRITORY
SACRED RIVER



4.4 OTHER REPORTED EXPERIENCES

While the previous sections discuss the findings coded and categorized based on identifiable patterns and relationships, additional results do not readily fit into the identified sub-categories. These outlying reported experiences are valuable and make essential contributions to the knowledge of fracking operations' impacts on nearby residents.

Some of these reported experiences include concerns related to the land, including seismic activity and tremors and infrastructure concerns on abandoned sites. Observations also highlighted

Some of these reported experiences include concerns related to the land, including seismic activity and tremors and infrastructure concerns on abandoned sites. Observations also highlighted ecological concerns relating to animals – changes in animal behaviours and increased roadkill.

ecological concerns relating to animals – changes in animal behaviours and increased roadkill. Additionally, concerns were raised relating to specific groups, such as harassment by transient workers, older people vulnerable to accepting oil and gas development on their land, and increased family/home responsibilities for partners of UOG workers.

Speaking up for concerns relating to fracking activity was connected to activist burnout and experiencing increased security presence. With the industry in communities in Northeastern B.C., participants also described associated issues such as the increased risk of exposure to COVID-19 and lack of hotel availability. Intertwined into many of these experiences is a lack of trust in the competency of industry and regulators.

While these issues may have been less prominent or strayed from the research question of the report, they supplement the information provided in the three sections of the report: constancy, stress, and sensory experiences; reported symptoms and health conditions; and community-level impacts.

Interview reflections of changes arose from several perspectives and were a prominent conversation topic. Examples include living in multiple emergency planning zones, having oil and gas development on participants' own land, growing up in families with generations of roots in Northeastern B.C., joining the community within a few years of booming activity, and moving to the area after fracking. They suggest continued examination of the adverse effects of living near fracking activity.

5. Discussion

Northeastern B.C. continues to be a hub of natural gas development in Canada. As described in this report, individual, community, mental, and physical health impacts illustrate that this is not an innocuous activity.

The way community members speak about their experiences of constant noises, smells, and light relating to fracking activity illustrate these irritants as more than nuisances. The persistence of these irritants in their everyday lives, the worsening of stress, and connections to their understanding of their environment exemplify how these disruptions and the experience of living near UOG are significant for health and wellbeing.

Participants spoke about symptoms and conditions experienced and how these have changed in unexplained ways, coinciding with the timing or nature of UOG activity near their residences. Their descriptions are important in reiterating the role of scientific investigation in measuring and monitoring the effects that residents face.

Depictions of community-level impacts provide a fuller understanding of the facets of life that are altered and, in this way, reflect the wholeness of the perceived effects of fracking. Though the findings are divided into separate sections, it is important to note that individual-level health outcomes interact with community-level reflections – and further, interplay likely exists between the stress and sensory experiences and the symptoms and conditions experienced.

The constancy of industry and sensory experiences reported suggests undocumented health impacts related to fracking operations. Community-level health impacts and associated public health considerations indicate the potential for more widespread or population health impacts, in the short and long term, both directly and indirectly related to living in proximity to fracking activities.

The findings presented in this report are limited to the data collected. The health impacts of living near UOG operations may be broader than the effects described. For instance, this report primarily describes the psychological implications for people living near UOG operations as stress. However, research on mental health conditions such as depression has also been conducted. In Pennsylvania, living near more and larger, unconventional natural gas development (UNGD) wells was associated with more depression symptoms (Casey et al., 2018). In another example, epidemiological research found that individuals living with heart failure exposed to more significant UNGD activity are more likely to be hospitalized (McAlexander et al., 2020).

Delayed onset and latency of specific health outcomes and conditions such as cancer and neurodegenerative diseases may preclude the identification of these impacts at present but may follow industry development in the future (McKenzie et al., 2017; Gorski & Schwartz, 2019). Additional

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consideration and research on hydraulic fracturing and related activity should recognize that long-term impacts may not yet have been identified.

The understanding garnered from this study, using the experience of living near well sites with hydraulic fracturing, in combination with scientific evidence of adverse health consequences, is that fracking has noticeable and significant impacts on human and environmental health. The

The understanding garnered from this study, using the experience of living near well sites with hydraulic fracturing, in combination with scientific evidence of adverse health consequences, is that fracking has noticeable and significant impacts on human and environmental health.

evidence gathered and analyzed humanizes affected individuals and communities and their concerns relating to industry activity adjacent to their backyards. Along with other research on this phenomenon, the experiences reported by participants in this study demonstrate the need for attention on the health impacts of living near natural gas wells.

This glimpse into how the local impacts of hydraulic fracturing for gas extraction manifest in Northeastern B.C. points to the need for greater attention to the implications of fracking operations for all residents in proximity to these operations, regardless of geographic location, racialization, occupation, or age. The reported health outcomes described by participants also imply the need to prevent future adverse health impacts associated with hydraulic fracturing and UOG development.

While research relating to evidence of the health impacts of hydraulic fracturing and associated UOG development continues to evolve, historical and current evidence are instructive. The commonality of adverse health consequences at the individual and community level has been demonstrated in association with other extraction-based, boom-bust industries (Hirsch et al., 2018). Interviews reveal that UOG extraction, including fracking, also represents a specific experience and risks.

UNIST'OT'EN HEALING LODGE – FREDA HUSON WON RIGHTS LIVELIHOOD AWARD (ALTERNATE NOBEL PRIZE) FOR THIS LODGE – PIPELINE WILL BE CLOSE TO THIS LODGE AND INTERFERE WITH ITS OPERATION



The health implications of hydraulic fracturing extend beyond the direct ways in which its processes impact people who live near well sites to include the health risks of contributing to climate change. The 2021 IPCC report on climate change highlighted the immediate importance of reducing methane emissions – a concern in relation to fracking – due to methane’s short-term warming potential (“Control methane to”). Further, the transportation of natural gas through LNG pipelines creates health harm.

In Northwestern B.C., the coastal gas link pipeline is proposed to go through Wet’suwet’en territory; specifically, their sacred headwaters, Wedzin Kwa. These waters provide drinking water and habitat for spawning salmon (an important food source), and they are tied to other resources. Given these practices, the pipeline threatens the health of the Wet’suwet’en people (Wickham 27:43-35:29).

Several factors limit individual-level strategies to mitigate the impacts of fracking and highlight that health impacts are not equally borne. Economic, geographic, and social factors including racialization and Indigeneity are evident in the disproportionate impacts reported herein. Social determinants of health are a well-established framework for understanding how health is a complex outcome of many factors, including proximity to industry. Collective, higher-level action to make change is needed. As such, for health promotion and illness prevention, several recommendations are offered to mitigate and prevent fracking impacts on the health of residents.

The health implications of hydraulic fracturing extend beyond the direct ways in which its processes impact people who live near well sites to include the health risks of contributing to climate change. The 2021 IPCC report on climate change highlighted the immediate importance of reducing methane emissions – a concern in relation to fracking.



“NO TRESPASS WET’SUWET’EN STRONG”
BANNER ON WET’SUWET’EN TERRITORY



6. Recommendations

As reported from a health perspective, the experiences of living near a fracking site in Northeastern B.C. illustrate common concerns and raise several questions. This report is not conclusive evidence of health impacts associated with fracking but adds to previously identified research gaps and appeals for education and advocacy action. Three overarching narratives as described in the report provide clear areas for action to address health concerns for residents in the short and long term. Based on individual and community-level health impacts, we make the following recommendations:

- 1 In alignment with the findings of the previously produced *CAPE Fractures In the Bridge* Report, we recommend a moratorium on the development of new natural gas wells across Canada and phasing out existing wells and infrastructure. Furthermore, government subsidies to UOG should be ceased immediately.
- 2 The generation of an infographic map showing fracking sites in Northeastern B.C. and integrating health narratives and environmental and health risks would support knowledge translation and engagement on these issues. It would be beneficial for a future project to collect this information (sufficient evidence was not collected in this study) and produce relevant infographics and other media to facilitate communication efforts.
- 3 Anecdotal reports by residents near fracking operations, paired with published literature on health impacts, call for implementing the precautionary principle (Kriebel et al., 2001). In the absence of conclusive evidence, residents living near fracking sites should be protected from industry impacts through an approach that foregrounds caution, health protection, and illness prevention.
- 4 Community health studies, notably co-designed with Indigenous residents, should be undertaken to document any adverse health impacts, and plans for the treatment and prevention of illnesses should be developed. In particular, the impacts on oil and gas workers' physical and mental health in Northeastern B.C. is a significant gap in literature and understanding that should be addressed.
- 5 Just transitions³ must be developed in partnership with workers and community members, significantly in collaboration with Indigenous peoples, considering the concerns and health impacts currently being experienced and anticipated based on existing scientific literature and anecdotal reporting.

³ "A Just Transition means greening the economy in a way that is as fair and inclusive as possible to everyone concerned, creating decent work opportunities and leaving no one behind. A Just Transition involves maximizing the social and economic opportunities of climate action, while minimizing and carefully managing any challenges – including through effective social dialogue among all groups impacted, and respect for fundamental labour principles and rights. Ensuring a just transition is important for all countries at all levels of development. It is also important for all economic sectors – by no means limited to energy supply – and in urban and rural areas alike." https://www.ilo.org/global/topics/green-jobs/WCMS_824102/lang--en/index.htm

- 6 While fracking operations continue through transitions, transparency and information dissemination to people facing fracking hazards are necessary. Practical exposure mitigation strategies must be developed and implemented in an accessible and equitable manner for residents and people living and working near fracking operations.
- 7 Health professionals, including physicians and identified allied professionals, should be furnished with knowledge and concerns related to fracking as outlined here and create partnerships to serve in advocacy roles to address current health impacts experienced by individuals and communities and work to prevent other adverse health outcomes.
- 8 Stable long-term funding should be secured for targeted health research related to UOG exposure, addressing the questions raised in this report and elsewhere. National and provincial funding for prospective longitudinal air and water quality measurement should be made available in communities with UOG activity. Furthermore, municipal, provincial, and federal funding should be provided to grassroots organizations working to protect the environment in communities with UOG.
- 9 Authorities and community leaders must recognize the possibility of undue influence by industry in community decision-making, and align efforts to redress this imbalance.

The 2021 IPCC report on climate change highlighted the immediate importance of reducing methane emissions – a concern in relation to fracking.



WET'SUWET'EN SUPPORTERS
PROTESTING COASTAL GASLINK
PIPELINE IN NORTHEASTERN B.C.



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Appendix A

INTERVIEW GUIDE

Participants were asked the following questions in their interviews, with probes added as needed.

Introduction

- a) Could you tell me a little bit about yourself?
- b) Could you tell me about the place where you live?

Health

- a) If you feel comfortable sharing, could you tell me a little bit about your health?
- b) If you feel comfortable sharing, could you tell me about any notable health events or illnesses that have been experienced by your family, friends or neighbours?

Fracking

- a) Where do most people in your community work?
- b) What do you think about the fracking sites in your community?
- c) How far from your home is the nearest fracking site?

Experiences of Health and Fracking

- a) Can you tell me about your experiences of living near a fracking site and/or having a fracking site in your community?
- b) How does living near a fracking site impact your life in the day-to-day?
- c) Did any of the health concerns you described earlier begin after a change in extraction activity?
- d) Among your family, friends or neighbours who have had serious health concerns – did any of those begin after a change in extraction activity?

Wrap-up

- a) Is there anything else you'd like me to know?
- b) Is there anyone else who you think I should talk to?

Appendix B

SURVEY QUESTIONS

The Canadian Association of Physicians for the Environment (CAPE) is working on a small research project to explore the health experiences of individuals living near liquified natural gas projects (LNG) in Northern BC.

We're collecting information from people currently who live near LNG projects (or have recently lived near LNG projects) about their experiences, with a specific focus on their health. We're also interested in hearing about community impacts of the oil and gas industry in the region.

Any adult who has lived in North East BC in the last 10 years is invited to participate. We hope to hear from people with a variety of occupations, (farmers, health professionals, industry workers etc). We'd also like to hear Indigenous and non-indigenous perspectives.

DEMOGRAPHIC QUESTIONS

These questions are included to help us identify trends – for example, are middle-aged women experiencing specific health effects

Gender

- Male
- Female
- Non-binary
- Prefer not to say

Do you identify as Indigenous?

- Yes
- No

If yes, would you like to specify your nation or community further:

Occupation

- Currently work at a oil and gas site
- Worked at an oil and gas site in the past
- Work for an oil and gas company, not on site
- Health worker
- Farmer
- Other:
- Prefer not to say



Geographic Questions

How long have you lived in Northern BC?

Where in Northern BC do you live?

- Blueberry River
- Chetwynd
- Dawson Creek
- Doig River
- Farmington
- Fort Nelson
- Fort St John
- Pouce Coupe
- Saulneau
- West Moberly
- Other
- Prefer not to say

How close is the nearest oil and gas activity to your home?

- Less than 100 meters
- 100–500 meters
- 500m–1km
- 1–5 km
- 5+ km
- Prefer not to say

Is there anything else you'd like to share with us about the impacts of oil and gas on you or your family or your community?

Health Questions

Since 2010, have you experienced any of the following health concerns? *Select any that apply.*

- Respiratory issues
- Persistent cough
- New or different allergy symptoms
- Cancer
- Neurological issues (M.S., stroke, etc)
- Disruption of sleep
- Stress
- Heart disease or heart attack
- Sexual health concerns
- Other:

Please describe in some detail any other health concerns you or your family have that you think may be connected to oil and gas activity.

Community Impacts

Is there anything else you'd like to share with us about the impacts of oil and gas on your family or your community?



The reported experiences of living near a fracking site in Northeastern B.C. illustrate common concerns and raise several questions about health impacts. Three overarching narratives as described in the report provide areas for action to address health concerns for residents in the short and long term. For health promotion and illness prevention, attention to the implications of fracking operations for all residents in proximity is needed.



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