August 29, 2019

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Dear Ms. Rankin and Ms. Weinberger:

Thank you very much for your letter and the reference to the Compendium of scientific, medical, and media findings demonstrating risks and harms of fracking (unconventional gas and oil extraction), 6th ed. developed by the Concerned Health Professionals of New York and Physicians for Social Responsibility. This edition includes more publications than the previous version released in March 2018 and I am really pleased to see the more than 1400 publications and reports. Of the sources have been produced on the topic of health impacts of the unconventional oil and gas industry, the Compendium thoroughly documents the existing peer-reviewed literature, government reports and investigative journal reports, among other sources. As you are aware, the Compendium includes findings related to contamination of air, drinking water and soil along with other environmental aspects like radioactivity of associated waste and earthquakes. It also addresses, to a lesser extent, sociological aspects such as social and environmental equity issues.

The suspected health and environmental effects linked to unconventional oil and natural gas production (ONGP) operations have been the topic of scientific studies in recent years. Unconventional oil and natural gas production is a rapidly growing industry in Pennsylvania. As of summer 2019, there are about 10,680 active unconventional wells in Pennsylvania, and nearly tenfold more conventional wells. The Department of Health (DOH) is interested in assessing the health effects associated with ONGP operations using available scientific studies. Many of the reports included in the compendium are based on studies conducted in Pennsylvania. Some examples include studies by Currie, Greenstone, and Meckel (2017), Denham et al. (2019), Jackson et al. (2013), Hill (2018), Rasmussen et al. (2016), Tustin et al. (2017), Casey et al. (2016), and Swarthout et al. (2015).

It is important to use available literature to gain understanding of the health risks associated with ONGP. The Compendium does not provide an assessment of the scientific quality of each article or report. Critically evaluating the reports included in the Compendium (e.g. use of appropriate sampling strategy, analytical methods to address confounding and interactions) would certainly improve the ability of scientists and citizens alike to use this edition.
At DOH, we conducted the systematic literature review with our colleagues at the Colorado Department of Public Health and Environment with the intent to start this process of assessing study quality (Bamber et al., 2019). As explained in the paper and the supplementary materials, we sought to critically evaluate the epidemiological literature only. Our intention was to gain additional information about what the epidemiologic literature has contributed and what it can contribute in the future to this field of inquiry. There was no intent to inform policy decisions related to this industry. My comment, “As a pediatrician and a public health advocate, the public can rest assured that if I knew that we were inadequately protecting public health, I would make that case clear to Governor Wolf… we do not have enough information to make such a determination in this case” was not solely based on this single literature review.

The fact that the Compendium is a living document updated frequently is truly an accomplishment and shows how invested Concerned Health Professionals of New York and Physicians for Social Responsibility are in enlightening public officials, researchers, and community stakeholders about the possible health impacts associated with unconventional oil and gas development. The 20 peer-reviewed articles selected for review represent relevant environmental epidemiologic work and our discussions reflected their strengths and weaknesses.

Future epidemiologic research on the health effects of ONGP would be important to incorporate the following:

1) A prospective cohort study design that follows people over time, who are and are not exposed to fracking and record incidences of adverse health events in both groups.
2) An environmental exposure assessment based on actual measurements as opposed to modelled estimates or proxies.
3) A limit to the health outcomes of interest to epidemiologically-indicated outcomes, perhaps those identified in previous studies such as premature birth, low birthweight, and asthma exacerbations (Hill, 2018; Rasmussen et al., 2016; Stacy et al., 2015). Given the long latency of cancer, a prospective study with cancer as an endpoint would not be feasible.
4) A sample size that is large enough for sufficient statistical power (Dorey, 2011).
5) The use of biomarkers to more accurately capture exposure OR health (Noonan et al., 2002; Wessels et al., 2003).

The limitations of such a study include the difficulty in identifying appropriate exposed and unexposed groups given the widespread nature of previous and ongoing oil and gas operations in southwestern and northeastern/northeast central Pennsylvania. Further, many of the chemicals are ubiquitous and have sources other than ONGP operations. Researchers will also need to consider how to rule out exacerbations of existing industrial contamination as a cause of the health effects as well as naturally occurring weather (wind speed, wind direction, and rainfall) and other geologic changes that could impact air and water quality (Lin et al., 2001; Todd et al., 2012) which cannot be overtly linked to specific ONGP operations. Southwestern Pennsylvania, in particular, is home to coal mining operations, abandoned oil and gas wells, former chemical processing plants, former steel mills, and frequent air inversions with the potential to make environmental conditions worse (Shmoool et al., 2014).
In reality and as you have mentioned, we are unable to perform randomized control trials or other experimental studies due to concerns over ethics (Rothman, 1993). One exception is the natural experiment, but these usually can only be performed after the exposure or intervention occurs. Therefore, we are limited in the types of questions that can be answered with certainty. Additionally, given the limitations of observational studies in general, no one epidemiologic study will be sufficient proof of causation between ONGP and any adverse health outcome.

Nevertheless, as a secondary suggestion, another research study that could be done on the health effects of ONGP would be an incremental study following a similar research design to the work of Geisinger/Johns Hopkins researchers (Casey et al., 2016; Casey et al., 2018; Rasmussen et al., 2016). These studies are retrospective in nature and use existing medical records to get at temporality (i.e., fracking coming before the health symptom or condition) and location in a more specific way other than county or zip code level cross-sectional studies. The new study or studies should focus on southwestern Pennsylvania using UPMC medical records as the Geisinger/Johns Hopkins work has focused on northeastern Pennsylvania. This second study or studies should also include a well-constructed activity index built on well phase and distance as a proxy for exposure.

A third study type could also be considered but would involve significant challenges and limitations. A case-control study could be designed to analyze factors, including environmental factors which contribute to the development of certain cancers including Ewing’s family of tumors. Cancer types are thought to have different etiologies; thus, any study design would require a questionnaire that is specific to that cancer type and including details regarding the exposures of interest. Challenges for this study type would include that we do not know how much any one environmental factor contributes to each cancer’s development, making study sample size calculation a nearly impossible task (Rushton, 2003). A case control study protocol would need to interview cases and controls (or their survivors) to estimate historical exposure time, residence histories, occupation and other demographics, medical histories and parental medical history, as well as detailed environmental exposure and behavioral histories. Detailed survey and exposure history questionnaires need to be reviewed by experts and constructed.

The department continues to collect information on health effects through its registry (https://www.health.pa.gov/topics/envirohealth/Pages/OilGas.aspx) and to review new peer-reviewed literature as it becomes published.

We appreciate your continued engagement and concern on this issue. We would certainly consider additional strong epidemiological studies that confirm prior findings of specific health outcomes during discussions with our agency stakeholders.

Sincerely,

Rachel L. Levine, MD
Secretary of Health
References


