

Pennsylvania Study Finds Correlation Between Childhood Lymphoma and Shale Gas Development

Buchanich, J., Talbott, E., Arena, V., Bear, T., Fabisiak, J., Wenzel, S., Youk, A., Yuan, J. (2023): Final Report for Pennsylvania Department of Health, Bureau of Epidemiology Hydraulic Fracturing Epidemiology Research Studies: Childhood Cancer Case-Control Study.

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Terms to know:

- Case-control study: a type of epidemiological study that compares the features of a group exposed to an outcome (cases) to those of a similar group that does not have the outcome (controls). These types of studies can examine rare diseases more efficiently, as well as look at multiple risk factors at once. Due to their retrospective nature, it is more challenging to establish causation with case-control studies. They are commonly used to build an initial evidence base on the associations between an outcome and an exposure.

The Pennsylvania Department of Health reports that operators have drilled [more than 13,000 wells](#) classified as shale gas wells in the state to date. Hydraulic fracturing, also known as fracking, is a process that is part of shale gas extraction and involves the injection of high-pressure fluids and chemicals into deep fissures in the earth to free up and ultimately collect shale gas. This technique has grown rapidly not only in Pennsylvania but the entire country – [32.5 trillion cubic feet of gas was produced from shale gas wells in 2022 alone](#), up from 1.9 trillion cubic feet in 2007 when data was first available.

Living and working close to shale gas operations can result in [significant harm to public health](#), including cancer. A previous study by McKenzie et al. investigating hydraulic fracturing and childhood lymphoma risk (non-Hodgkin's lymphoma), found that children aged 5-24 living in areas with active gas wells were [over four times more likely](#) to develop acute lymphoblastic leukemia in the highest exposure category. A case-control study by Clark et al. confirmed some of the



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results from the McKenzie et al. study, finding that children living with at least one shale gas well within 2 kilometers of their primary residence had [nearly two times the likelihood of developing acute lymphoblastic leukemia](#) compared to their unexposed peers; however, after adjusting for confounding factors, the results were no longer statistically significant. Due to the various life factors that may contribute to a cancer diagnosis, [proving the causation of a specific exposure](#) is a key challenge in most cancer studies.

Hydraulic fracturing involves the injection of [hundreds of chemicals](#) into the earth that have the potential to contaminate nearby water supplies. As many as [104 of these chemical additives](#) have varying levels of carcinogenicity – at least 14 are known carcinogens, and over 30 are at least probable or possible carcinogens. Shale gas operations also result in the emission of hundreds of millions of tons of pollutants that spread for miles around a given well site. [One study](#) found that only 29 out of 143 potential air pollutants from shale gas activity have been evaluated by the World Health Organization’s [International Agency for Research on Cancer](#). Of those 29, [7 were confirmed human carcinogens](#), while the remainder were either probable or possible carcinogens, or could not be evaluated for carcinogenicity. This leaves at least 114 pollutants not yet evaluated by the IARC.

Researchers at The University of Pittsburgh School of Public Health were tasked with evaluating environmental risk factors in childhood cancer to address residents’ concerns regarding the relationship between Ewing’s sarcoma and shale gas development. The study used existing health records from an eight-county area, selecting participants with records of leukemia, lymphoma, brain tumors, and bone cancers, which included Ewing sarcoma.

Case-control studies compare participants with a health outcome to similar patients without the outcome, so researchers identified 498 cases of cancer among children born in the study area and matched them to a child of the same age, race, and sex without cancer in the same county. Birth data from 1990 to 2019, and cancer diagnosis data from 2010 through 2019, were considered.

To measure exposure, researchers analyzed the cases and non-cases in the context of environmental risk factors. These factors included residential proximity to shale gas development, the density of active wells near their homes, and other related oil and gas activities, such as toxic release sites, compressor stations, and waste disposal sites. Any children between 0.5 and 5 miles were classified as exposed, and those living 5 or more miles away from

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a well or well activity were considered unexposed. Using these criteria, the researchers conducted various statistical analyses to understand the relationship between childhood cancers and environmental exposures related to shale gas development.

The study's results present a mixed report on the influence of shale gas development in Southwestern Pennsylvania. Analysis of cancer cases and exposure factors showed that there were no associations between shale gas development activity and childhood leukemia, brain cancers, or bone cancers (including Ewing sarcoma). The results did indicate, however, that children living within 1 mile of at least one well were 5 to 7 times more likely to develop lymphoma compared to children living in an area without a well within 5 miles distance.

The findings of this study further confirm the well-established link between shale gas development and cancer incidence. While the results indicate that some cancers cannot be linked to proximity to well sites, this result does not reject the risk of cancer from shale gas sites as a whole. Because cancers like Ewing sarcoma are so rare to begin with, sample size presents an initial challenge to the study. Further, the study's sample size and localization to a specific region necessitates a study with a larger sample size to determine more comprehensive results. Regardless of these limitations, this study represents one of the few population-based studies to date on shale gas activities, and its sound methodology in confirming at least some amount of increased cancer incidence as a result of residential proximity to gas development should be noted.

To learn more about the risk of cancer as a result of shale gas development, explore these EHP resources:

[Shale Gas Development and Cancer](#)

[Endocrine Disrupting Chemicals \(EDCs\) and Shale Gas Development](#)

[Shale Gas Development and Childhood Cancer: Should I Worry About My Kids? Health Professional Toolkit \(Oncology\).](#)

To learn more about this study, explore these links:

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