

# The association of radon poisoning levels and poverty rates in Washington.

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**Hypothesis: Poorer socioeconomic conditions between counties in Washington state may be correlated to higher levels of radon poisoning.**

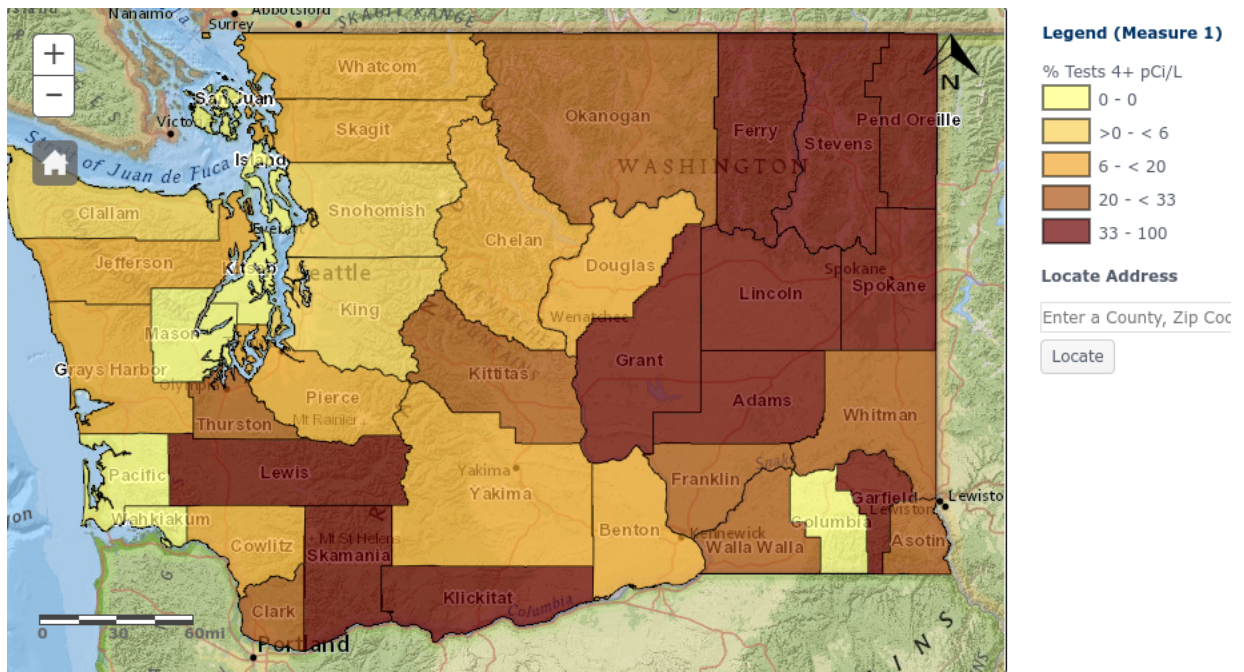
## Introduction

Radon is a radioactive gas that is odorless, tasteless, colorless, and is naturally released by radioactive elements within rocks, soil, and water. [1] Radon gas can seep into homes and buildings through tiny cracks in either the floor or foundation. [2] If you are exposed to radon for an extended period of time, or if you are exposed to large amounts of radon at once, it can cause lung cancer, is the second leading cause of lung cancer within the USA, and the leading cause of lung cancer among non-smokers.[2] It is estimated by the Environmental Protection Agency (EPA) that 21,000 lung cancer deaths are caused by radon each year within the USA. This study is dual purpose, I want to find out whether poorer counties in Washington need more protection and education against radon compared to other counties or if the spread of radon throughout Washington is not linked to poverty. I also want to be able to educate on some methods that can be used to prevent radon poisoning.

## Data Correlations

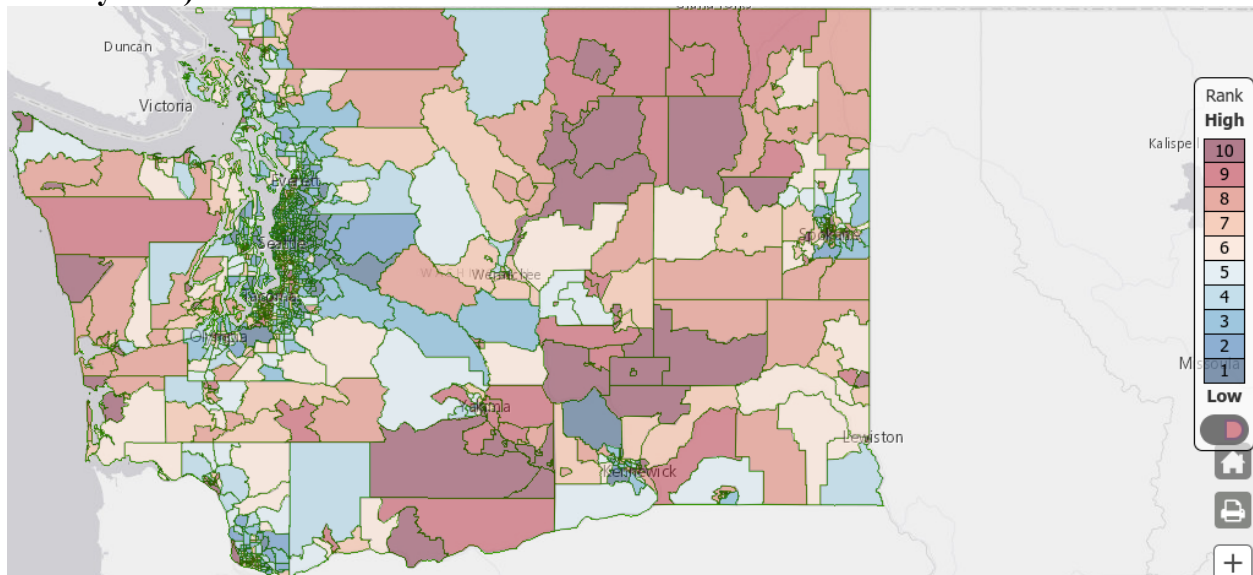
Most of the counties in eastern Washington as well as a few in southern Washington have the highest risk of radon poisoning as shown in figure 1, which is a map of what percent of radon tests showed dangerous amounts of radon. Once radon levels within a given area reach or exceed 4 picocuries (pico curies are a measure of how much radiation a substance emits, and is about 1 trillionth of a normal curie. A normal curie is  $3.7 \times 10^{10}$  disintegrations per second) per liter, it is recommended by the EPA to take action to reduce levels. [1]

**Figure 1: WTN data of what percent of radon tests come back as actionable levels**



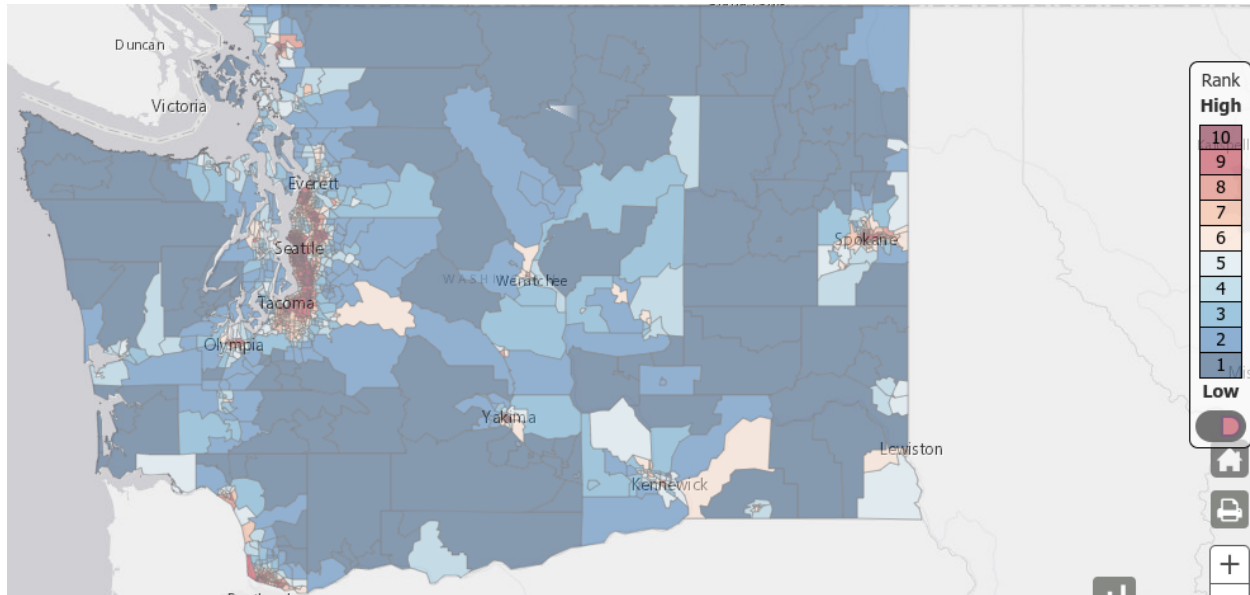
A quick comparison of figure 1 to figure 2, a map of how many people are living in federal poverty in Washington, it is very clear that counties that tend to be mostly poor have higher levels of radon compared to the richer counties.

**Figure 2: WTN data of what % of a population is living in poverty (<= 185% of Federal Poverty level)**



Although radon is naturally occurring, there could still be a chance that there is a stronger correlation between radon poisoning incidence and proximity to hazardous waste treatment, storage, and disposal facilities as shown in figure 3. These facilities could potentially carry uranium and other radioactive materials which radon gas could come from after a long series of radioactive transformations. [3]

**Figure 3: WTN data on how close a population is to hazardous waste treatment, storage, and disposal facilities.**



However, comparing this to figure 1, the areas closest to these facilities do not have the highest radon poisoning incidence and as such no correlation can be made with this data.

Because this paper is a study and not an experiment, it is important to note here that correlation does not equal causation. Just because poverty and radon poisoning incidence appear to be linked with the given data does not mean that poverty *causes* radon poisoning.

### Data significance

It is cited by the American Cancer Society that of the 609,360 yearly deaths from any kind of cancer [4] about 20.853% (127,070) of them being from lung cancer. [5] Using the data from the EPA that 21,000 (about 16.526%) of those lung cancer deaths are caused by radon poisoning. It can then be estimated, assuming those rates are constant in Washington, that of the 12,796 yearly deaths from cancer in state, [6] about 2668 are from lung cancer, and about 441 of lung cancer deaths are due to radon poisoning. If these numbers are accurate than proper education of radon and its dangers, as well as action by the state to provide counties at a particularly high risk of radon poisoning with better aid, could save hundreds of lives.

### Possible solutions to this issue

There are a few solutions to deal with this radon issue that would be especially helpful to people who live in areas with high radon incidence.

- Perform radon tests in your home if it has not been tested before, plan on doing renovations, or plan on spending more time in a basement/lower level. This is even more important for older homes.

- Understand the early symptoms of radon poisoning such as a persistent cough, wheezing, coughing up blood, fatigue, loss of appetite, and chest pains. [10]
- If your house contains high but not actionable levels of radon consider contacting a professional to install a radon reduction system.

### Equity impact shown by this study

This project has discovered that counties with a high population of people living in poverty have higher radon incidence. However, treating lung cancer is expensive and the hospital bills alone could burry someone in medical debt for a number of years. Along with this all of the solutions that were proposed could be prohibitively expensive to people living in poverty. Acknowledging these issues, it could be possible for the state to provide some form of aid to the counties which are most at risk for radon incidence. State funded radon testing in areas which have abnormally high radon incidence could help to save lives.

### References

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- [3] US EPA, O. (2019, February 11). *Where does radon gas come from?* US EPA. <https://www.epa.gov/radiation/where-does-radon-gas-come>
- [4] ACS Medical Content and News Staff. (2022, January 12). *2022 Cancer Facts & Figures Cancer | Cancer Death Rate Drops*. Www.cancer.org. <https://www.cancer.org/latest-news/facts-and-figures-2022.html>
- [5] American Cancer Society. (2022, February 14). *Key Statistics for Lung Cancer*. Cancer.org; American Cancer Society. <https://www.cancer.org/cancer/lung-cancer/about/key-statistics.html>
- [6] *Stats of the States - Cancer Mortality*. (2020, February 18). Www.cdc.gov. [https://www.cdc.gov/nchs/pressroom/sosmap/cancer\\_mortality/cancer.htm](https://www.cdc.gov/nchs/pressroom/sosmap/cancer_mortality/cancer.htm)
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