

RADON IN OREGON HOMES: HOW TESTING CAN LOWER LUNG CANCER RISK

Radon is a naturally occurring, colorless and odorless radioactive gas. Radon is the second leading cause of lung cancer worldwide, accounting for approximately 10–15% of all lung cancer cases. While tobacco use continues to be the primary preventable cause of lung cancer in the U.S., an estimated 21,000 cases of lung cancer are caused by radon annually.¹

A map of Oregon shows that many areas have high levels of radon in rock and soil (Map). This *CD Summary* provides an overview of radon and its health effects, information about radon testing and mitigation, and resources for clinicians for counselling their patients about testing their homes for radon.

WHENCE RADON?

Radon forms from the decay of uranium and thorium found in different amounts in soil and rock throughout Oregon. As a gas, radon typically moves to the surface where it is released into ambient air or intrudes into built structures. For both adults and children, most exposure to radon comes from indoor air in environments such as homes, workplaces, schools and other buildings.

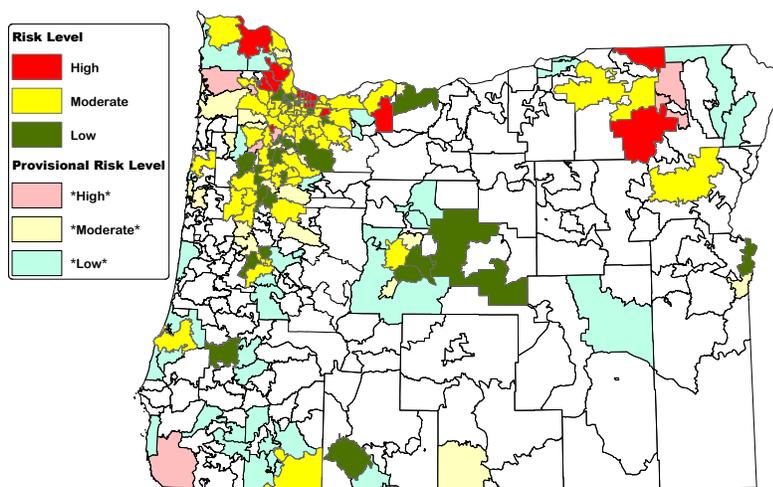
Levels found indoors depend on the characteristics of the rock and soil directly under a building and can be influenced by weather, building construction, integrity of the building's foundation or slab, and heating, ventilation and air conditioning systems. The other main factor impacting the ability for the gas to rise out of the soil is "soil structure"

otherwise called porosity (clay vs. sand, tight vs. loose). Because of this, radon levels may not be consistent among a group of homes, even those that are adjacent. Radon gas is heavy and stays low to the ground. People living or working in basements and ground floor spaces have a higher risk of radon exposure because of their proximity to the radon source and the behavior of radon gas.

HEALTH IMPACT IN OREGON

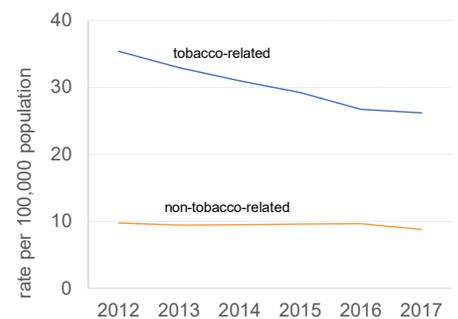
Radon is a carcinogen that can cause lung cancer with chronic exposure.² Radon-related lung cancers are mainly seen in the upper airways, although radon increases the incidence of other types of lung cancer as well. Moreover, the radon lung cancer risk is much higher in smokers — approximately 10 times as high as in people who never smoked.¹

Map. Indoor radon risk levels by zipcode, Oregon, 2018



The risk level for elevated indoor radon within each zip code was determined through a classification system that considers three factors: maximum observed test result value, average test result value, and the percent of locations with a test result that ≥ 4 picocuries per liter (pCi/L) within the zip code. Points are given for each factor and a total of those points is used to determine the overall risk score for the zip code. A zip code must have at least 20 test locations in order to be assigned a risk level. Provisional risk level assignments are made for zip codes where there are 5–19 locations. Zip codes with <5 locations are not assigned a risk level.

Figure. Tobacco and non-tobacco lung cancer mortality, Oregon, 2012–2017 (includes trachea, bronchus and lung)



In 2017, 1,865 Oregonians died from cancers of the trachea, bronchus, and lung. Based on death certificate information, physicians reported that 1,401 (75%) of these deaths were attributable to tobacco use. Data for the past 6 years indicate good progress on reducing the death rate from these cancers in those who used tobacco products (Figure). However, the rate of

lung cancer deaths not attributable to tobacco use has been relatively flat.

Radon may have contributed to the tobacco-related cancer mortality. For those deaths not related to tobacco use, radon and other environmental exposures, genetic susceptibility, and other factors likely contributed.

RADON TESTING

To reduce exposure to radon and lower lung cancer risk in the population, indoor air needs to be tested. All homes should be tested every two to five years for radon. Retesting should also be done following home renovations, the installation of radon mitigation systems, heating or air conditioning systems and after earthquakes. One might think that radon risk would not change with time, particularly as it is ultimately derived from thorium and uranium having half-lives of 14 and 4.5 billion years, respectively (i.e., radon source is not going anywhere).

OREGON DATA

The Oregon Public Health Division's Radon Awareness Program maintains home radon test data by zip code (see Table for selected data). The Radon Awareness Program also provides an interactive GIS map created from the results of indoor radon tests performed in homes throughout Oregon (see Map, *verso* and link provided under "For More Information").

Recent data show that homes in all areas of Oregon can be at risk for radon levels at or above the EPA action level of 4 pCi/L for mitigation.¹ The radon risk map and underlying data should not be used as a basis to advise for radon testing of a home — all Oregon homes should be tested. This becomes clear when looking

Table. Selected home radon test data by Oregon zip code, 2018

Zip code	City	Locations tested	Radon risk level	Maximum result (pCi/L)	Average result (pCi/L)	Percent of locations >4 pCi/L
97008	Beaverton	211	Low	45.8	1.7	9.0
97009	Boring	98	High	41.3	4.7	41.8
97016	Clatskanie	25	High	33.7	4.2	44.0
97330	Corvallis	353	Moderate	28.6	2.2	16.1
97415	Brookings	13	*High*	39.1	6.8	30.8
97801	Pendleton	36	Moderate	9.2	1.9	10.3
97211	Portland	1433	High	114	5.2	49.0
97520	Ashland	97	Moderate	15.7	1.5	11.3

* indicates only 5–19 locations had a radon test: more results needed to determine risk level.

at zip code 97008 "Beaverton" as an example where we see a "low" risk level based on an averaging of all results received for that zip code. However, the highest reported test result was 45.8 pCi/L, more than 11 times the EPA action level. In fact, almost 10% of homes within the "low" risk level for zip code 97008 had results higher than the EPA action level.

MITIGATION

A radon mitigation system is designed to reduce radon concentrations in the indoor air of a building. Effective mitigation strategies vary among buildings and depend on design, structure and size of the building. The EPA generally recommends systems that prevent radon from entering a building, rather than reducing levels after it has entered.³ Mitigation may involve active suction of radon from underneath the home and venting it to ambient air, sealing the foundation, house or room pressurization, or heat recovery ventilation. Because of the complexity in radon mitigation, a certified radon mitigator should be hired, see list in "For More Information".

RECOMMENDATIONS

The Oregon Radon Awareness Program recommends that clinicians discuss radon risks and advise all patients to test their homes for radon, regardless of the risk level assigned to the home's geographic location. This is because radon levels can vary within zip codes. Clinicians can include prompts for radon discussions alongside tobacco behavior questions as an effective strategy for discussing the synergistic effect of radon and tobacco smoke for increased risk of lung cancer.⁴⁻⁶ Tobacco smokers and

people in homes with tobacco smoke are at increased risk when radon is also present at high levels.

FOR MORE INFORMATION

Information on how to obtain a radon test kit and radon mitigation is available from the Oregon Radon Awareness Program www.healthoregon.org/radon. The Program sends educational brochures to clinics and the public; provides webinars and educational seminars; and is available for questions related to radon exposure and health by phone at 971-673-0977 or 1-877-290-6767 TTY or email at radon.program@state.or.us.

- Map of indoor radon risk levels, Oregon <http://geo.maps.arcgis.com/apps/Style/index.html?appid=b48af2492fac4dd7857e5601c54dbf0f>
- List of certified radon mitigators www.oregon.gov/oha/PH/HEALTHYENVIRONMENTS/HEALTHYNEIGHBORHOODS/RADONGAS/Pages/mitigation.aspx
- American Lung Association – how to obtain a test kit https://action.lung.org/site/Ecommerce/1518438484?FOLDER=1940&store_id=1741
- Continuing Medical Education Credit Training Opportunities www.lung.org/local-content/wisconsin/our-initiatives/education-and-training/radon-cme.html

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