Radon in Utah

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Table of contents

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Executive summary
This report presents the current state of radon topics in Utah and economic burden estimates of radon-related lung cancer. It also discusses types of radon data, including data uses and limitations. The document includes a summary of radon-related policies in Utah, including an outline of common U.S. policies. It provides additional state and federal radon resources along with results from the radon questions included in the 2016 Behavioral Risk Factor Surveillance System (BRFSS) survey in Utah.

Introduction

Overview of radon

Radon is a radioactive gas that is odorless and colorless. Radon is released when radioactive elements in the soil break down. Uranium and radium release radon and occur naturally in the ground. Radon is released into the environment, where it can get into the air, groundwater, and surface water. People are then exposed to radon from these routes. Cracks in building foundations allow radon to enter the structures as it moves up from the earth below.

The most common route of exposure is when you breathe in radon-contaminated air. Radon is typically measured in picocuries per liter (pCi/L) of air in the U.S. A curie is a unit of measurement used to describe radioactive decay; a picocurie is one-trillionth of a curie. Even though outside air naturally has small amounts of radon (about 0.4 pCi/L), it poses its greatest threat when it gets trapped in enclosed spaces, which increases the concentration of radon in the air.

The two main factors that influence how much radon a person is exposed to are the geologic radon potential and the house or building where a person lives. The term "geologic radon potential" refers to pre-existing geologic conditions that influence how much radon is released into the environment. Conditions such as soil permeability, groundwater, and the amount of uranium and radium in the soil all impact the release of radon. While the underlying geologic conditions of any given area can play a role in determining indoor radon levels, it is ultimately the house or building itself that makes the largest impact with regard to people's radon exposure.

Radon is a health hazard because it is the second leading cause of lung cancer. The EPA estimates there are about 21,000 deaths from radon-related lung cancer every year in the U.S. When people breathe in radon contaminated air, the radon can travel to the lungs and release a dose of radiation. An individual's risk of developing radon-related lung cancer depends on how high the radon levels are in the home or building, and how much time a person spends inside. Smoking is also a very important factor in the development of radon-related lung cancer. While anyone who is exposed to radon faces an increased risk for lung cancer, people who smoke and are exposed to radon face a higher risk of lung cancer than from either radon or smoking alone. The risk of developing lung cancer is 10 times higher for people who smoke and live in a home with high radon levels.

The only way to know the radon level of a home or building is to test for it. There are different ways to conduct a radon test. The most common type of test is a short-term activated charcoal test that is typically used in single or double family dwellings. The EPA's

radon action level is 4.0 pCi/L. The term “action level” means that if a radon test shows a result equal to or greater than a certain amount, then the home or building owner is advised to install a radon mitigation system.

Methods of radon testing

Radon test kits are devices which measure radon concentrations in indoor air. Radon test kits are divided into two categories: short-term kits and long-term kits. Short-term test kits measure radon for 2 to 90 days and provide quick results. But, sample collections of short-term test kits rarely take longer than 7 days to complete. Long-term test kits measure radon for a 90 day time period and provide information about a home’s year-round average level. Radon test kits are further divided into active and passive devices. Active devices require power to work and include different types of continuous monitors and continuous working level monitors. Generally, active devices require operation by trained testers and cost more than passive device testing. Passive devices require no power to function, and include alpha track detectors, charcoal canisters, and charcoal liquid scintillation detectors. Passive devices are more commonly available in hardware stores and other commercial outlets. The passive test kit is mailed to a certified laboratory for analysis once the sample collection is complete.

Radon reduction systems

The EPA recommends installing a radon reduction system for levels higher than 4pCi/L. The most common type of reduction system uses a pipe and fan that pulls radon from under a home or building and vents it outside. Installation of the radon reduction system should be done by a certified contractor. Otherwise the installation process could be done incorrectly and make the problem worse. The URP provides a list of certified mitigators available in Utah.

Economic cost of radon in Utah

An average of 674 Utahns were newly diagnosed with lung and bronchial cancer each year between 2011 and 2020 with an average of 450 deaths. After diagnosis, the cost for the first year of medical treatment for all lung and bronchial cancers is estimated to be between $36,000 and $48,000 per person. The EPA estimates that more than 10% of radon-related lung cancer deaths occur among people who have never smoked cigarettes. The lung cancer incidence and mortality rates in Utah are lower than the national average due to significantly lower rates of smoking. It is likely that radon can be attributed to more than 10% of lung cancer cases in Utah.

In Utah, the estimated total cost of the first year of treatment for lung cancer attributable to radon exposure is $2.7 million to $3.6 million. This amount only reflects the treatment costs for the first year of lung cancer after diagnosis and does not include the treatment costs accrued in subsequent years after diagnosis. This estimate also does not include

additional costs of lost productivity and death that can occur as a result of a lung cancer diagnosis.

An estimated 385 productive years are lost in Utah to ill health, disability, or premature death due to radon-related lung cancers diagnosed each year. These lost years reduce an individual's ability to contribute to the economy in Utah due to lifestyle changes, psychological distress, and death.

Radon data in Utah

Three main sources of radon data exist in Utah: geologic potential data, test kit data, and the Behavioral Risk Factor Surveillance System (BRFSS) questionnaire data. While none of these sources alone can predict individual indoor radon levels or measure radon exposure, they can provide insight to radon levels and testing behavior in Utah.

Geologic radon potential

The term geologic potential refers to how geologic conditions "[influence] the local concentration, release, and migration of radon." Since radon originates from underlying geologic conditions, it is useful to examine how variations in such conditions impact radon emissions. The conditions regarded as having the greatest impact on radon potential are soil permeability; soil concentration of uranium and/or radium; and presence of groundwater. Geologists use knowledge about geology in the state to estimate areas that are likely to have higher radon levels. The Utah Geological Survey (UGS) provides the most complete geologic radon potential data for Utah. The UGS believes that Utah has a high potential for elevated radon gas in homes.

The UGS began the Geological Hazards Mapping Initiative in 2007 to provide quadrangle-level maps for 10 geological hazards, one of which is radon. This initiative produces the most detailed and robust geologic radon potential maps to date in Utah. Currently, the UGS has radon quadrangle maps available for Magna, Copperton, all of Davis County, Tickville Springs, Moab, and Glen Canyon.

Short-term test kit data

The Utah Department of Environmental Quality Division of Radiation Control Radon Program has maintained a database of results from short-term radon test kits since 1990. The test result data comes from certified laboratories in the U. S. All data provided to the Utah Radon Program is de-identified as part of DEQ's agreement with these laboratories. The variables sent to the Radon Program are as follows: test number, test result (pCi/L), test date, analysis date, county, ZIP code, and year.The Radon Program uses this data to produce a quarterly public dataset using the test kit results data. This dataset aggregates all data from 1992 to the current quarter by ZIP code, county, and state and provides the

following variables: percentage of tests that are less than 4.0 pCi/L; percentage of tests that are greater than or equal to 4.0 pCi/L; maximum test value; average test value; and total number of tests performed.

Behavioral risk factor surveillance system (BRFSS)
Questions about radon were included in the BRFSS survey in Utah in 2016. Four questions were developed and included in 2 of the 3 versions of the survey that were used. The questions posed were as follows:

1. Have you ever had your home tested for radon gas?
2. Did the radon test show a high level which is usually defined as at or above 4 picocuries per liter?
3. What is the most important reason you have not had your home tested for radon gas?
4. What health condition is most often associated with radon gas?

The results of the survey indicated that 81.5% of Utahns have not tested their home for radon gas. Of the 18.5% of Utahns who have tested their homes for radon gas, about 83% indicated the test result was not above the 4.0 pCi/L action level, while 9% said they don't know what the results were. When respondents were asked why they had not tested their home for radon, 21% indicated they had not thought about it, 14% answered that they were not sure why they hadn't tested, and 12% responded that they did not know about radon. Around 26% of respondents knew that lung cancer was the health condition that was most often associated with radon, while 53% were unsure or did not know. The low testing by Utahns and unknown health conditions associated with radon requires attention

For the full results of the radon questions on the 2016 BRFSS surveys, see Tables 1-4 in Appendix A.

Utah radon data limitations

Geological potential data
The primary issue with Utah geologic radon potential data is that geologic potential estimations are neither a robust predictor nor indicator of indoor radon levels or individual exposure. As previously explained, the individual house or building is the greatest determinant on indoor radon levels; it is possible for houses and buildings in areas with a "low" geologic potential for radon to have high levels of indoor radon, and vice versa.

Short-term test kit data
The issues surrounding the quality of short-term test kit data fall into 2 categories:

the thoroughness of data received and inadequate surveillance coverage. These issues reduce the extent to which the current radon surveillance system in Utah accurately captures indoor radon levels in Utah.

- Imperfect ZIP code reporting: When an individual orders a short-term test kit through the DEQ, the reported ZIP code in the record represents the purchaser's ZIP code, which may be different from the ZIP code of the actual testing location. This difference in reporting distorts the geographic distribution of the number of tests conducted and local test results. Similarly, some individuals rely on post office boxes (P.O. boxes) for their mail. This is particularly important in rural areas of Utah, some of which are known to have high radon geologic potential. P.O. box ZIP codes can differ from the true residential ZIP code of the individual which masks the true location of where the test was conducted.
- No pre- or post-mitigation designator: Test results provided to the DEQ do not indicate whether the test was conducted in a house with an installed mitigation system or not. Pre-mitigation testing is used to help individuals decide whether a mitigation system would be necessary; post-mitigation testing is used to determine to what extent the mitigation intervention is effective. From a public health perspective, pre-mitigation test results would help target radon intervention programs and allow programs and agencies to efficiently use limited resources. However, mixing pre- and post-mitigation test results dilutes indoor radon test data and leads to underestimating true indoor radon levels for any given ZIP code.
- Multiple tests conducted in the same home or building: It is common practice to conduct multiple tests in the same home or building. This can be beneficial to understand how radon levels vary in different parts of the same home or building, or to verify the test reading. The radon test kit data does not provide any identification for multiple tests conducted in the same unit. Even though the DEQ receives the test kit number, it cannot be used to link tests conducted in the same house or building. This artificially increases the reported number of tests conducted in a given geographic area. Furthermore, the test kit data does not stratify results for tests conducted on different levels of the same home or building. Because radon levels can vary from room to room and floor to floor, aggregating test results from different locations in the house likely reduces the overall average reported.
- Lack of quality assurance: The individual who conducts the short-term radon home test is ultimately responsible to follow the testing guidelines and instructions to make sure the test result is accurate. This issue is inherent to radon test kit reporting and not unique to radon data in Utah. Failure to follow test guidelines can produce inaccurate readings. Examples of incorrect testing procedures include exposing the test kit to indoor air longer than the recommended amount of time, waiting longer than recommended to send the test kit to the laboratory, and

incorrect placement of the test kit. These errors can result in indoor radon readings which are higher or lower than the actual concentration.

- Lack of surveillance coverage: Radon test result reporting to the state is not compulsory in Utah. The URP only receives data from the test kits that are acquired through its subsidized programs. These include the Indoor Radon Program and the New Parent Program. Test kits purchased from a different vendor, analyzed by a different laboratory, or conducted as a long-term test are not reported to the URP. Private entities that conduct radon testing in Utah perform and collect data on more tests than what is received by the URP through its subsidized programs. Work is ongoing to determine the necessary infrastructure and data standards which would allow data from private entities to be submitted to the URP voluntarily. Current available radon data represents a small portion of the total testing events which occur or have occurred in Utah households.

Behavioral risk factor surveillance system

As is true for all surveys, bias can influence the results of collected survey data. Bias can enter the results when people do not respond to the survey, such as refusing to participate or not being included in the sample frame. Even if a person is chosen to participate and agrees to do so, bias can enter the results if a person cannot recall information correctly or changes his/her response to something more socially acceptable. The BRFSS also does not call individuals who live in group living facilities, such as dormitories. The 2016 questions were directed at randomly selected adults and not households, so comparisons with geologic potential data or short-term test kit data should be made with caution.

Radon and Utah law

Concurrent resolution on radon gas

Substitute Concurrent Resolution on Radon Gas (SCR 11), sponsored by Representative John Valentine, was passed in the 2013 General Legislative Session, and designates January as Utah State Radon Action Month. It urges Utah citizens to prevent radon exposure, and calls specific groups of people such as business owners, home builders, realtors, schools, government agencies, and the media to educate the citizens in Utah how to protect themselves from the dangers of elevated radon gas levels.

Radon awareness campaign

Senate Bill 109 (SB 109) was proposed by Utah State Senator Aaron Osmond during the 2014 session of the Utah State Legislature. It was signed by Governor Gary R. Herbert on 28 March 2014. SB 109 requires the Utah Department of Health in collaboration with the Division of Radiation Control, to “develop a statewide electronic awareness campaign to

educate the public." The Utah Department of Health Cancer Control Program received a one-time $25,000.00 appropriation from the general fund with the responsibility to develop and oversee the awareness campaign.

Tenant rights and the Utah fit premises act

In Utah, there is no legal requirement for rental property owners to test rental property for radon gas or install a mitigation system if elevated indoor radon levels are found. When tenants have concerns about the suitability of their rental property, the Utah Fit Premises Act (Utah Code, Title 57, Chapter 22) defines owners' and renters' responsibilities and provides tools to help solve disputes. The Act explains that rental properties must be "fit for human habitation" and follow all "local ordinances and the rules of the board of health." As part of keeping a rental property in proper condition, the Act specifies it is the owner's responsibility "to protect the physical health and safety of the ordinary renter" and keep the property "safe, sanitary, and fit for human occupancy." Similarly, the Act explains tenant responsibilities to maintain "cleanliness and sanitation" and adhere to any local rules that pertain to "physical health and safety." There is no detailed language about specific contaminants that are harmful to human health; only generalized language exists. Despite the lack of language about specific health hazards, the Act has been used to address health concerns about mold. It is unclear how radon would be interpreted in the Utah Fit Premises Act. In explaining its limitations, the Act states that it "does not apply to [...] conditions which do not materially affect the physical health or safety of the ordinary renter." Considering this, radon would apply as a condition that affects human health.

When dealing with other specific health contaminants, specific regulations and policies exist to protect Utah citizens from exposure. For example, lead is covered by the lead-based paint rule (Rule R307-842, Lead-Based Paint Activities) and the injury reporting rule (R386-703-4, Injury Reporting Rule). Asbestos is covered by the asbestos rules (R307-801,Utah Asbestos Rule). However, there are no specific regulatory laws for radon.

Mitigator licensing

In Utah, any individual who installs or repairs a radon mitigation system must be licensed as a S354 - Radon Mitigation Contractor under the state's construction trades licensing law (Rule R156-55a, Commerce, Occupational, and Professional Licensing, Utah Construction Trades Licensing Act Rule).

Building codes

Building codes guide the construction of new building structures to make sure a minimum standard of safety and quality are met. In 2023, the Utah State Legislature adopted the 2021 edition of the International Residential Code (IRC) as law. The IRC is issued by the International Code Council. The IRC has a series of appendices, A through X, that detail

additional standards. Appendix F in the IRC is titled “Radon Control Methods” and “contains requirements for new construction in jurisdictions where radon-resistant construction is required.” The IRC Appendix F is not adopted in Utah as standard. According to the IRC, the areas where such construction would be required are counties that have a Zone 1 designation, meaning they are classified as having a high radon potential. The counties in Utah that the IRC designates as Zone 1 include Carbon, Duchesne, Grand, Piute, Sanpete, Sevier, and Uintah.

Home sales
Currently there are no laws in Utah that require radon testing to be performed when a piece of real estate transfers owners. However, in 2014, the Utah Association of Realtors (UAR) agreed to include radon testing on their Buyer Due Diligence Checklist. The checklist is provided to help home buyers review the home before purchase and make sure it is safe for habitation. Radon now appears as its own dedicated item and is listed fourth in the overall checklist. This section contains specific language about radon as a health hazard and provides the link to the Utah Radon Program website. Previously, radon only appeared in the third item, “Hazardous Waste and Toxic Substances,” in a non-exhaustive list of common household hazards.

Radon study
House Bill 45 (HB 45) was proposed by Utah State Representative Keven J. Stratton during the 2021 general session of the Utah State Legislature. It was signed by Governor Spencer Cox on March 16, 2021. HB 45 required the Department of Natural Resources to study and make recommendations regarding radon gas, ways to increase public awareness about the risks of radon gas, and ways to mitigate Utah residents' exposure to radon. The UGS and the UDEQ Radon Program presented at the 2022 legislative session and provided recommendations based on their study.

Radon notice
Senate Bill 201 (SB 201) was proposed by Utah State Senator Michael S. Kennedy during the 2023 general session of the Utah State Legislature. It was signed by Governor Spencer Cox on March 23, 2023. SB 201 required the Division of Waste Management and Radiation Control to provide county treasurers a shareable 4” x 5.5” paper with information about the effects of radon in the home, the presence of radon in some homes, and the availability of radon testing. County treasurers could include the radon information when mailing property tax notices during 2023.

Common radon laws in the United States
Many states have enacted laws that are designed to educate and protect citizens from radon exposure. This section provides information on which states have adopted common

radon-related laws. See Appendix B for a table of all states that have enacted common radon laws.

Testing and disclosure
These are laws that require sellers to disclose whether a property has been tested for radon or if it has a known radon hazard. Many state laws enable agencies to develop appropriate regulations and forms to implement this requirement. Utah does not have any radon testing and disclosure laws.

Mitigation certification
These are laws that require any individual who provides radon mitigation services to be nationally and/or state certified. Some states are required to keep a list of certified mitigators. Utah does have radon mitigation certification laws.

Construction standards
These are laws that adopt standards for radon-resistant new construction, and provide that municipalities that elect to adopt a radon-resistant new construction standard must use the state model standard. Utah has not adopted any construction standards for radon.

Public education
These are laws that require the state to prepare a public radon education/awareness program or document. Utah does not have a public education/awareness campaign for radon.

Schools and childcare facilities
These are laws that require radon testing in schools or childcare facilities, a mitigation system installed by a certified professional when radon levels are high, or radon-resistant new construction standards. Utah has not adopted any laws requiring testing or mitigation of radon in schools or childcare facilities.

Radon data and resources
The resources listed below provide more information and data about radon.

State resources
- Utah Environmental Public Health Tracking Network, Environmental Epidemiology Program, Utah Department of Health and Human Services: http://epht.health.utah.gov/epht-view/topic/Radon.html

- Utah Radon Program, Division of Radiation Control, Utah Department of Environmental Quality: https://deq.utah.gov/waste-management-and-radiation-control/radon-program
- Utah Geological Survey, Utah Department of Natural Resources http://www.geology.utah.gov/utahgeo/hazards/radon.htm

Additional resources

Disclaimer: The Utah Department of Health and Human Services may occasionally link to outside sources of information. DHHS and the state of Utah do not necessarily endorse the provider of the content and are not responsible for any content published on the external site.

- Reduce radon levels in your home: https://www.cdc.gov/radon/radon-action.html
- Environmental Law Institute, Database of Radon State Indoor Air Quality Laws: http://www.eli.org/sites/default/files/eli-pubs/2014-radon-database.pdf
- Environmental Law Institute, State Radon Legislation-Issues and Options: http://www.eli.org/sites/default/files/eli-pubs/d1_13.pdf
- Environmental Law Institute, Strengthening State Policy to Reduce Risk and Save Lives: http://www.eli.org/sites/default/files/eli-pubs/d22_05.pdf
- EPA's Radon Standards of Practice: https://www.epa.gov/radon/radon-standards-practice#current

Appendices

Appendix A– Responses to the 2016 Utah BRFSS survey radon questions
Source: Behavioral Risk Factor Surveillance System, Office of Public Health Assessment, Utah Department of Health and Human Services.

The tables in this appendix show the responses provided by individuals who participated in the 2016 BRFSS survey, expressed as percentages. The upper and lower limits, along with a 95% confidence interval, represent the range of values that would include the true estimate if the study were repeated.

Table 1. Percentage of people who responded to the question have you ever had your home tested for radon gas, 2016 BRFSS Survey

Response	Percent	Lower limit	Upper limit
Yes	18.47	16.98	20.06
No	75.53	73.72	77.24
Never heard of radon	1.66	1.21	2.25
Don't know/not sure	4.35	3.45	5.47

Table 2. Percentage of people who reported a high level which is usually defined as at or above 4 picocuries per liter

Response	Percent	Lower limit	Upper limit
Yes	7.64	5.70	10.17
No	82.96	79.49	85.94
Don't know	9.41	7.19	12.22

Table 3. Individual's belief as to what health condition is associated with radon gas, Utah, 2016 BRFSS survey

What health condition is most	Percent	Lower limit	Upper limit

often associated with radon gas			
Asthma	7.93	6.84	9.19
Heart disease	1.40	0.97	2.03
Lung cancer	25.56	23.93	27.25
Breast cancer	0.56	0.34	0.90
Emphysema	2.30	1.75	3.01
Stroke	0.81	0.48	1.36
Some other condition	7.34	6.26	8.59
Unknown	52.81	50.83	54.78
Don't know what radon is	12.03	10.53	13.71
Don't know where to get a test	2.06	1.48	2.85
Not recommended	3.18	2.43	4.17
Cost	2.86	2.25	3.62
Not at risk/not needed	9.93	8.82	11.17
House was tested by previous owner	0.62	0.33	1.16
Haven't thought about it	21.34	19.52	23.27
Too many other problems with house	0.01	0.00	0.04

Table 4. Reason for not testing for radon gas, Utah, 2016

House is new	6.61	5.61	7.77
House is old	0.50	0.24	1.03
Don’t know how testing is done/how it works	1.74	1.27	2.38
Test doesn’t work	0.14	0.04	0.57
Don’t want to know	1.17	0.83	1.64
Too lazy	1.96	1.49	2.58
No time	1.70	1.21	2.37
Planning to do it soon	0.61	0.36	1.04
Don’t own home/renting	6.72	5.72	7.89
Other	12.47	11.14	13.93
Don’t know/not sure	14.35	12.85	15.98

Appendix B– Radon laws in the U. S.
States that are not listed do not have laws that fall into any of the 6 categories.

States	Testing and disclosure	Mitigation certification	Construction standards	Public education	Schools	Childcare centers
Alaska	X					
California	X	X	X	X		
Colorado	X	X		X	X	X
Connecticut	X	X	X	X	X	X
Delaware	X					X
District of Columbia	X	X	X			
Florida	X	X	X	X	X	X
Idaho						X
Illinois	X	X	X		X	X
Indiana	X	X				
Iowa	X	X			X	X
Kansas		X				
Kentucky	X	X				
Louisiana	X					
Maine	X	X	X	X	X	
Maryland	X	X	X			X
Massachusetts			X			
Michigan	X		X			X
Minnesota	X	X	X	X	X	
Mississippi	X					
Montana	X	X		X	X	
Nebraska	X	X	X			
New Hampshire	X	X				

New Jersey	X	X	X	X	X	X
New York	X	X				X
North Carolina	X					
Ohio	X	X				
Oklahoma	X					
Oregon	X	X		X	X	
Pennsylvania	X	X				
Rhode Island	X	X	X		X	X
South Carolina	X					
South Dakota	X					
Tennessee	X					
Texas	X					
Utah		X				
Vermont					X	
Virginia		X	X		X	
Washington	X		X			
West Virginia		X			X	
Wisconsin	X			X		

Source: Environmental Law Institute, Database of state indoor air quality laws, Database excerpt: radon laws (2023)

Appendix C - Abbreviations

BRFSS– Behavioral Risk Factor Surveillance System
DEQ– Utah Department of Environmental Quality
EPA– U.S. Environmental Protection Agency
IRC– International residential code
pCi/L– picocuries per liter of air
SB– Senate bill
SCR– Substitute concurrent resolution
UGS– Utah Geological Survey
URP– Utah Radon Program

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