

A hand is holding a handheld radon detector. The device has a digital LCD screen. The screen displays a large number '19' with 'Bq/m³' to its right. Below this, it says 'SHORT TERM AVERAGE' and '1 DAY' followed by the number '42' with 'Bq/m³' to its right. The background is a plain, light-colored wall.

**Widespread Indoor
Radon in Manitoba
is increasing lung
cancer.**

A Call to Action

**Manitoba Liberal Caucus
Updated May, 2022**

This report was prepared initially by Victoria Romero while working with Dr. Jon Gerrard, MLA River Heights and has had numerous revisions since.

Summary:

A home needs to be a safe place. To have a radioactive gas, like radon, at high levels in one's home is unsettling, disturbing and unhealthy. Yet this is a reality too many Manitobans have to face. It affects one quarter of the homes in our province. This radioactive gas is colourless, and odourless. It causes lung cancer and is turning deadly for too many Manitobans. Lung cancer is the leading cause of death from cancer in both men and women. Lung cancer continues to have a poor prognosis with a 5-year survival rate of less than 20% and a 10-year survival of less than 10%.

High radon levels are the primary cause of lung cancer in non-smokers, and are a major contributor to lung cancer in smokers. In some parts of Manitoba, as much as 40% of all lung cancers are due to high radon levels.

One in twenty non-smokers with very high radon levels in their home will develop lung cancer. The odds of a smoker developing lung cancer are one person in eight. The odds are much higher, one in three, if a person who is a smoker lives in a home with high radon levels. A home with high levels of radon can be a death trap to a person or a family who are unaware of the problem.

The lack of action by successive NDP and Conservative governments in Manitoba poses a threat to the safety and livelihood of citizens. No Manitoban should be caught unawares in finding unexpectedly that their home has high radon levels and is a potential death trap. This applies particularly with the purchase of a new home, which is expected to be safe, but isn't. Manitobans should not have to play Russian roulette when they purchase a home, rent an apartment or spend a lot of time in a workplace with high radon levels.

We call for immediate and strong action by the Manitoba government to take a public health approach to this issue and to ensure that every home in Manitoba is checked for its radon levels and that no more Manitobans will have to live in a home without knowing its radon status. This is important for every home owner. It is also important so that sellers (whether the seller of the house or the agent who sells the house) will not have future liabilities for selling a home which could be a hidden death trap.

This report includes recommendations which focus on the government using a public health approach to address the high radon levels in Manitoba buildings. Major actions needed include:

- 1) A public awareness campaign
- 2) Ensure radon testing is widely available, in part by providing free access to borrowing digital monitors through libraries in Manitoba.
- 3) Provincial subsidies for mitigation measures to include a subsidy for low income homeowners and a tax credit for high income homeowners, and a mixed package for middle-income home owners.
- 4) Ensuring every home where a person or a pet develops lung cancer is tested for radon levels.

Introduction:

In Manitoba, the age-adjusted incidence rate for lung cancer is 69 per 100,000 per year, while the age-adjusted mortality rate is 51 persons per 100,000 per year (The Canadian Cancer Society, Statistics Canada and the Public Health Agency of Canada report (2020)). This translates into approximately 930 new cases of lung cancer and 690 deaths each year from lung

cancer. While smoking tobacco is well known to cause lung cancer, less well appreciated is that many lung cancers arise because of exposure to radon. In Manitoba about 24% of homes have high radon levels. Radon has a larger role to cause lung cancer in Manitoba than in other provinces where such rates are lower (*Cross Canada survey on Radon in homes, 2012*). In this report, we look at the role of radon to cause lung cancer in Manitoba, and put forward calls to action to better address high indoor radon levels.

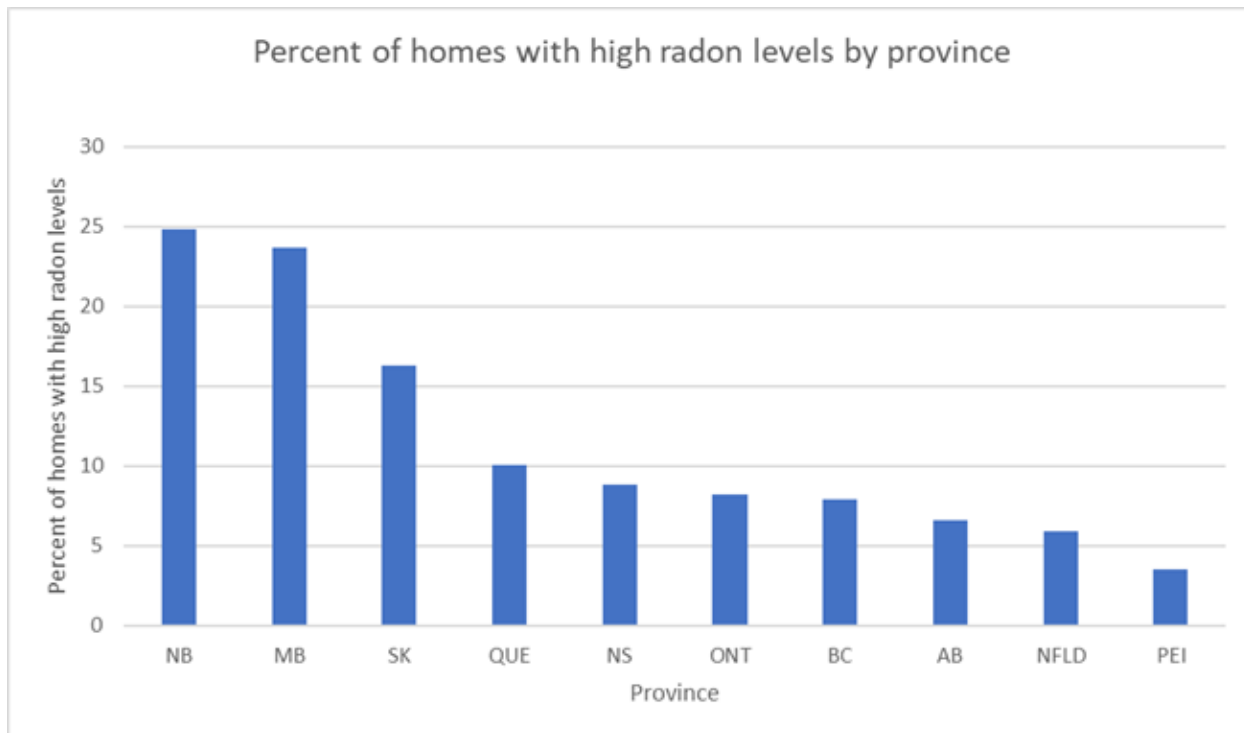


Figure 1: The percent of homes with radon levels above 200 Bq/m³ by province and territory. Manitoba has a very high percentage (24%), second only to New Brunswick. Data from Government of Canada 2012.

Radon forms when radioactive metal (radium, thorium or uranium) present in small concentrations in rocks, soil or groundwater breaks down. The radon, which forms naturally in this way, then moves through the soil/ground until it escapes into the air. In the outside air it is not much of a concern as it is rapidly dispersed and diluted. But when radon gas accumulates in the air just above the soil below a home and then gets inside the home, it can have dangerous and even fatal repercussions. It is a harmful carcinogen and is responsible for about 40% of the radiation humans are exposed to (*Gryzwa-Celinska et al, 2020*). Radon exposure by itself is very dangerous, but when paired with tobacco smoking it has a synergistic effect to amplify the risk of lung cancer.

Every single homeowner should be aware of the potential for radon exposure in their home, yet up to 82% of Manitobans were not aware of the impact of radon on their health (Government of Canada 2012). Radon does not discriminate. Nearly every country in the world deals with the issue of managing high indoor radon levels. Many are far ahead of where we are in Manitoba in preventing lung cancer and subsequent deaths from radon, and in ensuring homeowners have the information on the radon status of their own home.

Currently, there are no regulations, public health advisories, or policies surrounding radon concentration, disclosure, testing, or tracking in Manitoba. The Manitoba Real Estate Association

on its property disclosure form does mention radon, but the wording is vague, and few homes have actually had their radon levels measured with the result that many homes with high radon levels may still be bought and sold without the buyer or seller being aware of the presence of high radon levels. There has been a long history of inaction in Manitoba in terms of policy, in data collection and in public awareness. This issue has not been taken as seriously as it should, and measures are urgently needed to protect Manitobans from exposure to radon. There is an extreme need for public health action to create better understanding and awareness of radon and to work with homeowners to monitor home radon levels as well as for financial assistance from governments for testing and mitigation of homes and for increased transparency during real estate transactions.

Radon as a carcinogen:

Exposure to radon is the primary cause of lung cancer in non-smokers (*Radon gas: it's in your home*, 2007). When radon enters the lungs, it breaks down and decays into radioactive particles that release energy. This energy is then absorbed by the surrounding lung tissue and causes damage that can result in cancer when cells reproduce.

When radon penetrates a tissue, it can damage genetic materials and lead to the formation of malignant tumours (*Grzywa-Celinska et al*, 2020). Radon progeny (particles) accumulate in the respiratory system differently based on size. Small, fine progeny of approximately 4 nm known as “unattached activity” are deposited almost completely upon inhalation, while 80% of larger progeny of 100-400 nm (attached activity) associated with aerosol activity are expelled. When radon particles are inhaled, they emit radiation throughout the body for around four hours, but the damage to cells can cause persisting degradation of tissues.

While radon exposure poses a risk on its own, exposure to radon gas and tobacco smoke together has a synergistic impact that increases the likelihood of developing lung cancer. Tobacco smokers can be up to 25 times more at risk of developing lung cancer from radon exposure than non-smokers. (*World Health Organization*, 2021)

Table 1: Radon and the lifetime risk of getting lung cancer

	Radon Level	Lifetime Probability of Getting Lung Cancer
Smoker*	Base Level	12%
Smoker	200 Bq/m3	17%
Smoker	800 Bq/m3	30%
Non-Smoker	Base Level	1%
Non-Smoker	200 Bq/m3	2%
Non-Smoker	800 Bq/m3	5%
(Source: Health Canada. 2006. Report of the Radon Working Group on a New Radon Guideline for Canada).		
* Base level is less than 200 Bq/m ³		

The synergistic effect of radon and tobacco smoking is especially concerning for certain demographics, such as trade workers. Blue-Collar workers are more likely to smoke tobacco and are often exposed to occupational hazards like radon (and other harmful particles such as asbestos). The odds of someone who smokes and lives in a home with low radon levels developing lung cancer is 1 person in 8. The odds of a similar person developing lung cancer who is a tobacco smoker and is regularly exposed to high radon levels in their home is 1 person in 3 (Table 1). This is extremely high. The synergistic effect of radon and tobacco must be brought to the forefront when discussing this issue (see also Appendix A).

In Manitoba, there are approximately 150 cases of lung cancer caused by radon exposure annually (Appendix A). The average estimated cost to care for these 150 patients (assuming a median cost of \$18,000 per patient, not including out of pocket / medication costs paid for by the patient), is \$2.7 million. The cost to mitigate 150 homes (assuming a median cost of \$3000 per home) is only \$450,000. These cases are completely preventable and enacting policy to protect Manitobans from radon exposure and assisting with the financial burden of mitigation would save the healthcare system millions of dollars.

Measurement of radon concentration:

Radon concentrations are measured through testing. There is no way to tell if there is radon in a home other than to perform a radon test.

One time testing kits, including lab fees, can be found through different organizations including the Manitoba Lung Association, and usually cost around \$50-\$70. There are also continuous, electronic home detection systems (digital monitors) that can be purchased at hardware stores, that usually retail for around \$200-\$300. The Canadian Association of Radon Scientists and Technologists is working on a guide which will provide recommendations with respect to different makes of digital monitors. Professional radon testing companies are also an option for those looking to have their home tested for radon. The costs of these services start at around \$150 and can run upwards of \$400.

Health Canada recommends that contractors looking to perform radon testing be certified as a radon measurement and/or mitigation professional from a recognized organization.

Contractors can become certified through the Canadian National Radon Proficiency Program (C-NRPP). The C-NRPP offers courses that provide contractors with the expertise needed to thoroughly test and perform radon mitigation measures.

Radon mitigation services that are performed by professionals certified through the C-NRPP can be covered by the Manitoba Hydro Energy Finance Plan. This is a loan which currently offers a 6.75% (OAC) interest rate.

Radon levels may vary by time of year. Testing is recommended in winter (October to March) (we were told they tend to be higher in winter when houses are generally more tightly sealed with less air flow because fewer doors and windows are left open). One homeowner observed that in some winters levels were within the acceptable range, while in other years the radon level in the house was high. We found little data on such variability, but this observation suggests the importance of some level of long run monitoring in homes to ensure that radon levels stay low.

Radon in Manitoba:

Elevated radon concentration and radon exposure are a large issue in Manitoba. Manitoba has the second highest percentage of homes in the country with indoor radon concentrations above Canada's recommended safe level (200 Bq/m³) (Figure 1). In Manitoba, approximately 24% of homes (19.7% if population weighted) have concentrations of radon that are higher than the national Health Canada safety guidelines (200 Bq/m³), (*Canadian Cancer Society*) (*Health Canada*, 2014). As radon levels vary due to season, weather etc, it is very possible that this statistic is actually an understatement. It must be noted that the World Health Organization recommends "establishing a national average residential radon concentration reference level of 100 Bq/m³." It is possible Canada may lower the level to 100 Bq/m³ in the future, indeed various organizations including the Lung Association (2015) have already made such a recommendation.

Some regions in Manitoba, including near Brandon and Winkler, have reported a rate of close to 50% of homes with high radon levels; this proportion of homes is among the highest in Canada (Warkentin, 2019) (Figure 2). The Cross-Canada Survey of Radon Concentrations in Homes tested 121 different health regions for indoor radon concentrations; of these 121 regions, "there were 14 Health Regions where the raw percentage of homes testing above the guideline ranged from 23 to 44%" (*Cross Canada Survey on Radon Concentrations in Homes*, 2012). Five of these 14 regions were in Manitoba. The Brandon Regional Health Authority had the highest percentage of homes testing above the guideline, (44.3%). The Parkland Regional Health Authority (43.4%), Assiniboine Regional Health Authority (34.5%), Central Regional Health Authority (42.6%) and the Interlake Regional Health Authority (24.8%) all had alarmingly high rates (Figure 2). Communities of particular concern in Manitoba, as identified by The Canadian Association of Radon Scientists and Technologists (CARST), include Brandon (37%), Silver Harbour (46%), Souris (48%), Lakeshore (48%), the RM of Dauphin (71%) and the RM of Harrison Park (79%).

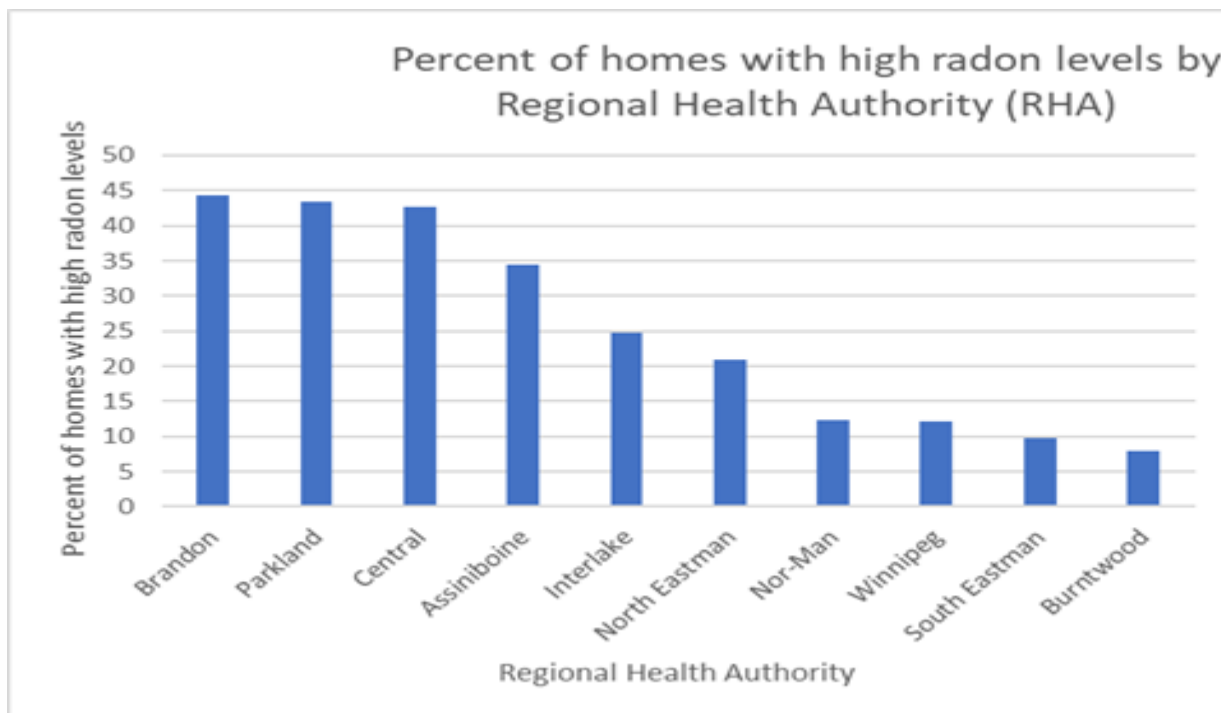


Figure 2: The percent of homes with Radon levels above 200 Bq/m³ in each regional health authority region (RHA), using pre-2012 RHA districts. Data from Government of Canada 2012.

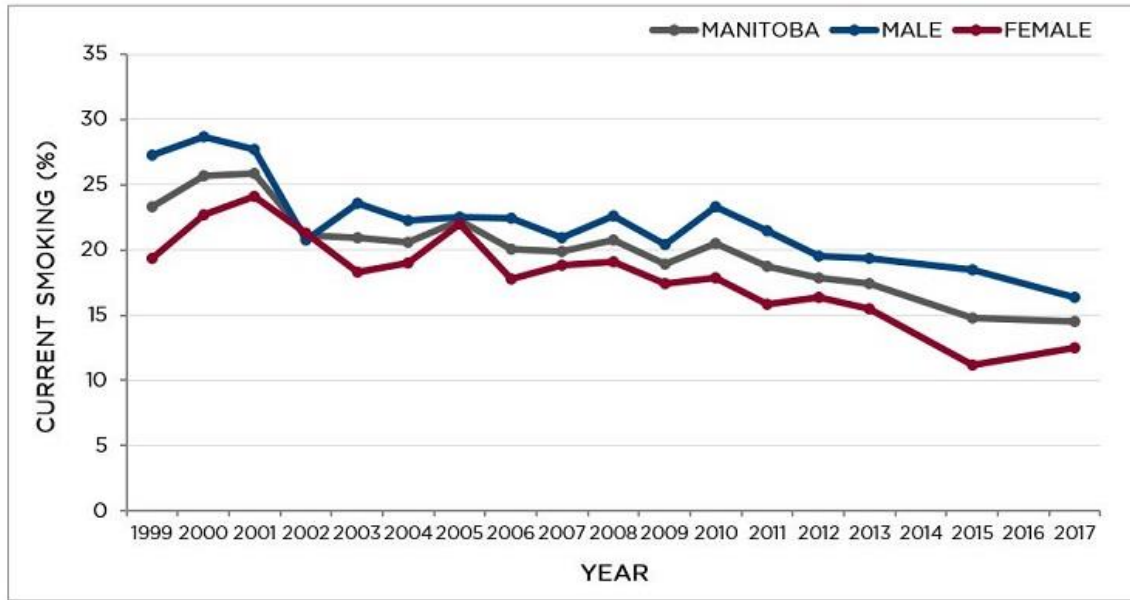
The number of cases and deaths due to lung cancer in Manitoba

From the Annual reports of Cancer Care Manitoba, the average number of new lung cancer patients in 2000-2002 in Manitoba was 801 with an age-standardized incidence rate of 69.7. For the years 2014-2016, the average number of new lung cancer patients was 924.7 with an age-standardized incidence rate of 70.3. (*Cancer Care Manitoba* <https://www.cancercare.mb.ca/Research/epidemiology-cancer-registry/reports>).

While there has been a significant fall in the number of smokers (Figure 3), the incidence of lung cancers has not fallen in Manitoba. It is possible that in part this reflects a continuing impact of radon on lung cancer in Manitoba. Since it is already well known that radon exposure is the leading cause of lung cancer in non-smokers, the relative importance of radon as a cause of lung cancer will increase as the proportion of smokers in the population decreases, and the proportion of non-smokers increases.

Using the proportions shown in Table I, it is possible to do a rough calculation of the percentage of lung cancers and lung cancer deaths in Manitoba, and within regions of Manitoba, which are due to radon. The latest information on smoking prevalence in Manitoba indicates that 14.5% of Manitobans are currently smoking. This is 14,500 smokers per 100,000 population and 85,500 non-smokers per 100,000 population. From Table 1, the lifetime risk for a smoker who does not live in a house with high radon levels is 12%, which translates to 0.12 multiplied by 14,500 = 1,740 smokers per 100,000 population who will develop lung cancer during their lifetime on the basis of smoking alone. A similar calculation, as shown in Appendix 1, for smokers exposed to 200-600 Bq/m³ of radon gives a lifetime **excess** risk of lung cancer (above that from smoking alone without radon) of 153 per 100,000. Adding to this number, the number of cancers due to smoking with high radon exposure of 68 per 100,000, those due to non-smokers being exposed to radon (low and high) of 269 per 100,000 and the lifetime risk for non-smokers exposed to radon yields **a lifetime risk of 490 lung cancer cases due to radon per 100,000 Manitobans**. Thus, of the total lifetime risk of lung cancer 3,085 per 100,000 for Manitoba, 16% of this risk is due to radon. Applying this to the numbers of cases and deaths per year yields 149 cases per year of radon induced lung cancer in Manitoba and 110 deaths per year from radon. To put this in the context of the COVID-19 pandemic where we have about 1,200 deaths to the end of December 2021, this means that in 11 years we will have, in Manitoba, as many deaths from lung cancer due to radon as we have had deaths from COVID-19 by the end of 2021.

FIGURE 2.12: CURRENT SMOKING PREVALENCE* BY SEX, MANITOBA, 1999-2017



*INCLUDES DAILY AND NON-DAILY SMOKERS
 DATA SOURCES: CANADIAN TOBACCO USE MONITORING SURVEY (CTUMS), 1999-2012; CANADIAN TOBACCO, ALCOHOL AND DRUGS SURVEY (CTADS), 2013, 2015, 2017

Figure 3: Tobacco smoking has (and continues to) decrease over the last twenty years.

Schools in Manitoba:

Results of a survey conducted by CAREX Canada who that Manitoba has one of the poorest records of testing radon in schools in Canada, with only 8% of Manitoba schools tested (CAREX Canada 2022). The results of information obtained through a FIPPA request show that four of the public schools in Manitoba which were tested were found to have high radon levels. We have been told that these four schools have received mitigation measures. Since radon levels can vary from time to time, it will be important not only to complete testing of all schools, but also to have a plan to retest schools periodically, perhaps focusing on schools where children use basement locations which are the most likely to have high radon levels. Missing in the information received were test results in independent schools and in First Nation schools. It will be important provincially to ensure independent schools are tested for radon, and federally that there is a partnership with First Nation communities to test schools in these communities and in both cases to ensure any schools which have high radon levels receive mitigation. In addition, since the WHO recommended radon level is below 100 Bq/m³, consideration should be given to moving the allowable limit in schools down to the internationally recognized level of 100 Bq/m³.

Child Care Centres

There should be a requirement, as part of licensing, that child care centres test for radon levels and mitigate if they are high. The results of radon testing should be publicly available to ensure transparency and accountability. The province should provide a subsidy and ensure this happens.

Manitoba Housing

A FIPPA request for information has revealed that 18% of the buildings managed or owned by Manitoba Housing have been found to have radon concentrations higher than the safe-recommended average (200 Bq/m³). We have been told that all buildings managed or owned by

Manitoba Housing with high radon levels have had mitigation measures implemented. The FIPPA response indicates that the focus since 2009 has been in rural Manitoba where the likelihood of high radon levels is greater. Manitoba Housing plans to complete testing the entire rural portfolio and then to test and mitigate buildings in Winnipeg over the next five years. Consideration should be given to a) completing the testing and mitigation in Winnipeg more quickly and b) following the initial round of testing, retest all units where radon levels are above the WHO recommended 100 Bq/m³ and mitigating those buildings where levels are above 100 Bq/m³ and c) including radon mitigation measures in the construction of all new buildings.

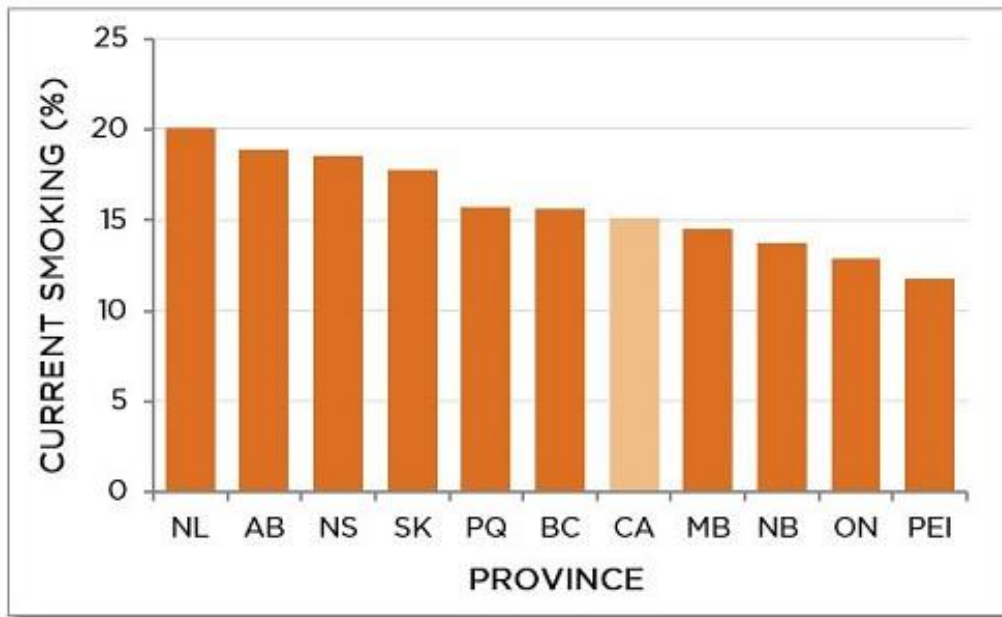
While past studies on radon in Manitoba have been conducted, there is a lack of current and updated data on Manitoba indoor radon concentrations. A new province wide study would be valuable to gain a deeper understanding of the prevalence of radon, how it is impacting citizens and whether there has been any progress in mitigating the risk of radon. There is, however, already sufficient data to show that the provincial focus should be on identifying and mitigating high radon levels in homes.

Situation Elsewhere (Canada / USA)

Radon exists and impacts all regions on the planet. North America in particular, struggles with indoor radon pollution. It is estimated that radon exposure kills around 21,000 Americans (*EPA*) and 3,200 Canadians (*Government of Canada*) each year. The Environmental Protection Agency has estimated that around 1 out of every 15 homes (7% of homes) in the United States have higher than average radon levels. (*EPA*)

All Canadian provinces deal with indoor radon pollution. Manitoba, New Brunswick, Yukon Territories, and Saskatchewan have the highest proportions of homes that test above the Canadian radon guideline of 200 Bq/m³. Manitoba has the highest age-standardized incidence rate for lung cancer across the prairies, followed by Saskatchewan (Figure 5). The lung cancer rates across the prairie provinces are higher in Manitoba than in Saskatchewan and Alberta; but the smoking rates in Alberta and Saskatchewan are much higher compared to Manitoba (Figure 4), while the radon rates in Manitoba are much higher compared to the other two provinces. This is consistent with an increasing relative impact of radon as the prevalence of smoking decreases. The higher radon levels in Manitoba could explain why Manitoba's lung cancer rates are higher than expected based on smoking data alone.

FIGURE 2.1: SMOKING PREVALENCE* BY PROVINCE, 2017



*INCLUDES DAILY AND NON-DAILY SMOKERS
 DATA SOURCE: CANADIAN TOBACCO, ALCOHOL AND DRUGS SURVEY (CTADS), 2017

Figure 4: Manitoba has a prevalence of smoking which in recent years has been lower than the national average and considerably below Saskatchewan and Alberta.

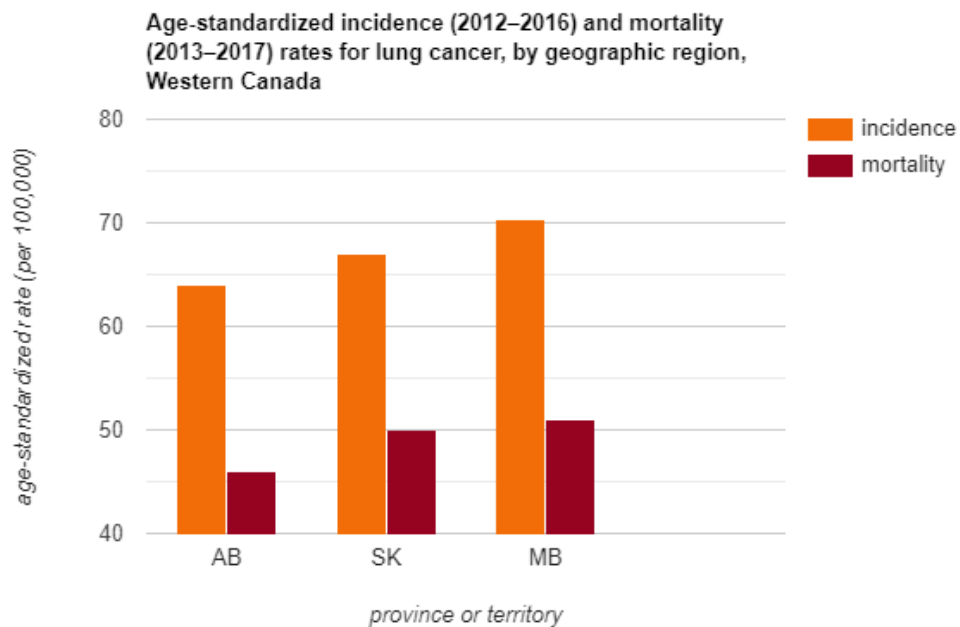


Figure 5: This graph shows the prevalence of lung cancer in the Western Prairie region of Canada. Manitoba has a higher incidence and mortality from lung cancer than Alberta or Saskatchewan.

In 2007, The Health Canada guidelines on radon concentration were updated to state that anything below 200 Bq/m³ is a “safe” amount of radon expected in the air. The World Health Organization has recommended that the national radon safety level be set at 100 Bq/m³. The WHO also states that the risk of contracting lung cancer increases by approximately 16% for every 100 Bq/m³ increase in indoor radon concentration (*World Health Organization, 2014*). It is probable that at some point the safe level in Canada will be lowered to 100 Bq/m³.

There was a Canada-wide study conducted and released in May 2019 that predicted the impact that modifiable risk factors, such as radon exposure, have on the rate of lung cancer diagnoses. The Canadian Population Attributable Risk of Cancer (ComPARE) study used data and collaborative efforts from health experts to estimate the percentage of new cancer diagnoses now and, in the future, caused by various modifiable risk factors (*Canadian Cancer Society, 2020*). The ComPARE study found that in 2020, 7% of all new lung cancer cases (approx. 2050), and 7% of lung cancer deaths in Canada were attributable to residential radon exposure. However, the proportion of new lung cancer cases which are due to radon varies widely as a result of the large variation in the local percentage of homes with high radon levels, and on the proportion of the population who are non-smokers. Based on figures for the lifetime risk of lung cancer the proportion of lung cancers due to radon will vary from 6% in Burntwood/Churchill area, to 19% in the Assiniboine RHA, 25% in the Brandon RHA, 28% in the Central RHA and 32% in the Parkland RHA (Appendix A). We were told there were two locations in Manitoba with 70% of homes with high radon levels (one of these is the Rural Municipality of Dauphin, Take Action on Radon – RM of Dauphin 2020). In such communities up to 41% of lung cancers may be due to radon exposure (Appendix A). If the lung cancers not ascribed to smoking or radon are excluded, then 50% of the lung cancers in communities where 70% of homes have high radon levels are due to radon.

In 2005, The World Health Organization conducted a study on indoor radon concentrations, radon disclosure policy, and mitigation measures, in 45 of its member countries. These countries all indicated they had some measures to decrease radon exposure. The countries with the lowest recommended “safe” levels were Germany and The United States (100 Bq/m³, 148 Bq/m³).

While most countries in the world have *recommended* “safe” levels, there are few places globally that have *enforced* “safe” levels. Sweden is one of these few, and the only one in the EU. Their enforced “safe” level is 400 Bq/m³. In collaboration with the EU Radiation Directive (which mandates all member states to make a national radon action plan), the Swedish Radiation Safety Authority has implemented a national action plan for radon to combat the dangers posed by indoor radon pollution. This action plan has various goals including the creation of a radon campaign to raise awareness and encourage testing, as well as having all public authorities strive to meet the target level of 200 Bq/m³ of radon indoors. This plan also calls for data on radon concentrations and exposure to be made more comprehensive in order to ensure it is accessible to all citizens.

For new buildings, Norway and Switzerland aim for very low levels (50 Bq/m³ – 100 Bq/m³ range) of indoor radon for new buildings, as well as for buildings after they have implemented mitigation measures. There is no such target in Manitoba. Indeed, in our province new homes can have high radon levels as one homeowner discovered when his newly built home tested at 400 Bq/m³ radon indoors.

In the United States, there are many states that have laws on radon disclosure and testing. According to The Policy Surveillance Program, there are only seven states that do not have any version of a radon disclosure form, whether it be through the Association of Realtors or a legislative process. While some state laws are stricter than others, it is a step forward to have any regulations implemented. Eleven states in particular, including California, Illinois & Kansas,

have a policy to impose civil penalties for those who misrepresent their radon readings (*The Policy Surveillance Program*). Some states including Illinois have a policy that protects the seller from liability, as long as due diligence is performed. Regulations surrounding radon disclosure can be beneficial to all parties involved (buyers, sellers and real estate agents) and can ensure the safety as well as legal security of citizens. In Manitoba, the Manitoba Real Estate property disclosure form does ask about radon in the home in the following question: “Are there are substances, materials or products that may be an environmental hazard such as, but not limited to, asbestos, formaldehyde, radon gas, lead-based paint, food or chemical storage tanks and contaminated soil or water on the property?” However, there is no requirement to test for radon, and it is possible that many times sellers put a “No” because they are not aware of the high radon levels present in the home. It is noteworthy, that of all the environmental risks listed, the excess cancer risk is listed as more than 1,000 per 100,000 people from radon, and less than 100 per 100,000 for other environmental toxins including asbestos, formaldehyde and benzene (<https://www.carst.ca/Phase-1-Assessment>). Radon is by far and away the most dangerous substance on the list.

In terms of testing, there are some options across states that offer financial aid to assist with the cost. The Missouri Department of Health and Senior Services provides free radon test kits on request. In the past four years these have been requested around 5200 times per year on average. (*Columbia Missourian*)

Internationally, there are few countries that offer grants/subsidies for radon mitigation or testing, but they do exist. Europe is one region where many countries recognize the dangers of radon and the need for financial assistance when testing. The governments of Sweden and Norway both offer up to 50% compensation for the cost of radon mitigation procedures.

Mitigation measures

There are many steps that can be taken to mitigate and minimize the amount of radon inside buildings. Passive radon mitigation methods can reduce indoor radon concentrations by more than 50%. Combined with ventilation systems the concentration levels can be even more greatly reduced. (*World Health Organization, 2021*) We were told that for some buildings, schools were given as an example, HVAC ventilation systems could effectively reduce radon levels. However, since such systems may be adjusted from time to time this approach may be less successful over the long term than doing mitigation approach with a pipe from the basement to the outside and a fan to direct the air from below the building to the outside.

Radon often enters homes through the basement through cracks in the foundation, floor drains, window casements etc. Solutions usually include sealing cracks/holes or installing specific equipment such as specially designed traps for floor drains that minimize the entrance of radon. Other solutions include increasing ventilation (in basement spaces particularly) through heat recovery ventilators, or by ventilating basement subfloors. Installing radon detection and sump systems are also effective ways of monitoring and mitigating high radon concentrations.

Another method of radon mitigation is through active soil depressurization (ASD) (also called sub-slab depressurization). This is when a pipe with a fan is put in place through the foundation floor to the outside; this draws out radon from underneath the house to the outside air, effectively stopping the radon that would have entered and been concentrated in the home. This method has been shown to be very effective and has produced dramatic drops in radon levels in homes (Figure 6).

Radon mitigation measures can bring positive results.

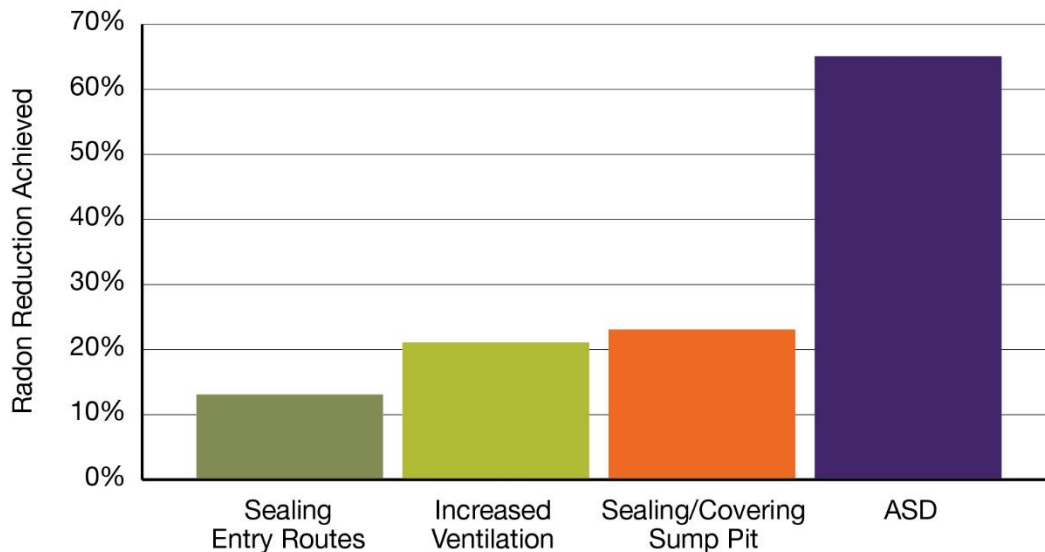


Figure 6: Average radon reduction by mitigation measure where only one measure was used. From Health Canada. Residential Radon: Mitigation Actions Follow-up Study 2018. ASD = Active Soil Depressurization.

Winnipeg homeowner Autumn W. had a new home built in early 2018 and tested for radon out of curiosity. Her initial reading showed elevated radon concentration levels of 396 Bq/m³ (196 Bq/m³ over the recommended safe level).

Upon receiving the test results back, Autumn implemented radon mitigation measures, such as sealing the sump pump and caulking spaces between the foundation and ground. Two months after the mitigation efforts were put in place, she retested, and the radon levels had dropped from 396 Bq/m³, to an improved level of 270 Bq/m³. This is still 70 Bq/m³ over the recommended safe-average, and more measures will be needed to reach a safe level. In any event, testing must be done on a regular basis to ensure levels continue to drop.

One Liberal MLA tracked radon levels in his basement using a digital radon meter. For many months the levels were generally between 70 and 120 Bq/m³. Then during the second winter they rose to above 400 Bq/m³. Following mitigation done using active soil depressurization radon levels have been in the 10-20 Bq/m³ range.

The above results are consistent with the findings of a survey of 1132 homeowners across Canada who had levels at or above 200 Bq/m³, approximately 29% of whom undertook mitigation measures. Active soil depressurization (ASD) was by far the most effective means of reducing radon levels Figure 6. (Health Canada 2018). Further, this study also showed that when radon mitigation was done by a certified radon professional that close to a 90% reduction in radon level was achieved. In another study, certified radon professionals achieved a 91% reduction in radon levels (Take Action on Radon Team 2019)

Mitigation measures like ASD can cost anywhere from \$2,000-\$4,500 to implement. This creates a large financial burden for some homeowners. It is estimated that in Manitoba there are around 8,000 low-income homes with high radon levels (*Lung Matters 2021*). Much of the advocacy of radon awareness organizations, such as CARST, is in pursuit of financial aid for low-income homeowners looking to have radon mitigation measures implemented.

Hailey Coleman, with the Manitoba Lung Association, together with CARST, and Take Action on Radon are creating a grant program to address the health inequity that low income homes face with the cost of radon mitigation. The program “Lung Matters” is being designed to cover \$1,500 of radon mitigation costs for low-income homeowners who meet specific criteria. Low-income homeowners meeting a specific income criterion or those who have been diagnosed with lung cancer, will be eligible. The program was set to launch in November 2021, with a goal of having a \$90,000 donor funded pool over the first three years of operation. The launch has been delayed until the \$90,000 target for funding is achieved. The goal set for the number of homeowners assisted per year is as follows: Within the first five years, the Lung Matters Grant Program aims to assist at least 140 low-income Manitobans with radon mitigation with 15 households to be helped in the first year climbing to 50 households in year 5 (*Lung Matters 2021*). This is an important initiative. However, it will only cover a small fraction of the need, and provincial support for such a subsidy is badly needed.

The only way to identify if there is radon in a home is to test. Widespread awareness and public education about the impacts of radon, as well as a potential subsidy for low income homeowners for mitigation costs and a tax credit for median to high income homeowners for mitigation costs could positively influence the number of homeowners interested in and willing to test the radon levels in their home.

Who needs to do what?

Role of the Real Estate Industry

In Manitoba there is currently very minimal policy and regulation requiring the disclosure of radon concentrations in a home. There is a property disclosure form offered to sellers that asks about lead pipes and mould, as well as whether they have any reason to believe that there is an issue with radon gas in the home. This property disclosure form is the same for any type of building, whether it is residential or commercial, home or condominium or apartment. There is no requirement to provide any proof of testing; the onus is placed on sellers to be fully honest. If a seller chooses to lie on the disclosure form, legal action is possible if the new buyer falls ill or dies, but is rarely, if ever, pursued.

The above is a concern because it means buyers of homes and/or buildings are at risk of buying a structure with poisoned air (high levels of radon). While there is no legal requirement of sellers or real estate agents to inform buyers of the presence of radon in a home which is being sold, there is certainly an ethical requirement. Further, sellers and their real estate agents who do not disclose or inform potential buyers of radon levels, may have liability. While this has not been tested in court in Manitoba, it is possible it may be only a matter of time before a buyer or buyers who develop lung cancer related to radon could take their seller and the seller’s real estate agent to court for damages. Of note, the law in Illinois with respect to radon levels in homes protects buyers and also protects sellers who have done due diligence with respect to high radon levels

in the home. One of the significant reasons why Manitoba needs a law like that in Illinois is to protect both buyers and sellers.

Property disclosure statements can serve as added selling features, according to various real estate associations in Canada. In British Columbia, if a home has tested for radon and has levels of less than 100 Bq/m³, sellers can disclose the results as an enticing benefit to potential buyers.

In British Columbia, while there are no strict legal requirements for sellers to test their home for radon, if a seller knows that radon is a problem, they have a duty to inform potential buyers of the latent defect.

Similarly, the Real Estate Council of Alberta states that if a seller of a home tests for radon and has results reading higher than 200 becquerels per cubic metre, and the seller has done nothing to mitigate the radon gas, the situation becomes a *material latent defect*, and the representing realtor must disclose the defect to potential buyers. Upon doing so, if the seller instructs the realtor not to disclose the high concentration of radon gas, they must refuse to provide further services to or on behalf of the seller (*RECA*, 2019). British Columbia has a similar requirement where high radon levels in the home are not mitigated, that this become a *material latent defect*. Currently, some realtors in Canada are using “hold back” funds to allow for radon testing after the sale of a home is complete. If a radon test reveals a high concentration, the hold back funds can then be used for mitigation services.

Some places in Canada, including Nova Scotia and Alberta, have implemented mandatory radon information training for realtors. Under the Nova Scotia Real Estate Commission, one must enrol in and complete the “Radon Awareness for Real Estate” course. This course is mandatory for all NS realtors who want to keep their license. The aim of this course is to equip realtors with the information and tools they need to help homeowners buy and sell while being aware of the dangers of radon exposure. This course is not an integral part of the training of real estate agents in Manitoba. It should be.

In America, 37 states have regulations requiring the disclosure of radon hazards upon sale of the property (National Conference of State Legislatures). These states require disclosure through the specific state’s Real Estate Commission or via legislation, as well as through forms developed by each state’s Association of Realtors. (*State Radon Laws, Geltman Glass, 2017*).

There are specific laws in some states, such as the Illinois Radon Awareness Act and the Illinois Real Property Disclosure Act, that outline consumer awareness as well as matters concerning licensing for radon testing and mitigation services (see Appendix B). Radon certification laws exist in 25 states, including Illinois. There are currently 18 states that have radon mitigation laws.

The presence of regulations surrounding radon disclosure and testing is generally much stronger in the United States than in Canada.

While it is very important to involve the real estate industry in the effort to reduce radon levels in homes, it is also important to put in place measures that will provide positive incentives for real estate agents to promote radon testing of homes. We have heard of one real estate agent – when asked by a seller whether the home should be tested for radon before it is sold said “No” it will cause complications and not be helpful in your sale. We need to turn this around – so that real estate agents have incentives – for example a premium on sales of homes where radon values are known to be low or where mitigation has occurred. As an example, the real estate forms could specifically ask if radon mitigation has been done, the type of mitigation and whether it was done by a certified professional.

Role of Homeowners

Currently, the onus is on homeowners to get radon testing if they feel it is necessary. Individuals usually choose to test their home after finding out about the dangerous and sometimes fatal impacts of radon exposure. If public awareness on the subject was increased, more homeowners may be interested in testing for radon gas. All obligations are placed on the homeowner to inform themselves of the dangers of radon, and to get tested if they feel concerned.

Role of Government in Manitoba

Every government has a role and duty to protect its citizens from harm. The ongoing negligence by the Manitoba government regarding radon exposure is doing the opposite of protecting citizens.

In terms of awareness, the government has the power to enact public safety or education campaigns, or to simply begin a vigorous conversation on radon gas.

The creation and implementation of bylaws/legislation that concerns property maintenance and building standards, permits and inspections, and disclosure acts could positively alter the impact of exposure to elevated levels of radon. For example, Manitoba could add a requirement for a passive stack (like British Columbia) and add a requirement for a leave behind radon test after a building is completed or after a building is sold.

It is striking that while Manitoba has a much higher percentage of homes with high radon concentrations than in BC, Alberta and Nova Scotia, that Manitoba is far behind these provinces in terms of actions taken.

Government Action/Inaction

There has been some research in Manitoba on the concentration of radon gasses in homes. The last study done, The Cross-Canada Survey of Radon Concentrations in Homes, published in 2012, only surveyed a small number of homes. Throughout Manitoba, 1183 homes participated, and only 66 of those were within the Winnipeg Health Region (*Cross Canada survey of Radon Concentrations in homes*). Research is the foundation for strong policy and action to help remedy the issue, so more data collection is necessary to address this issue.

The government has done little to gather information on the subject, making it exceedingly difficult for other organizations to create or suggest policy that could help mitigate indoor radon concentrations.

The Manitoba Provincial Government is, and has been for some time, aware that the issue of radon exposure is immense in our province. In 1990, the "Manitoba Government's Response to The Radon Issue" was released and detailed four pillars of their action plan in order to reduce the damage done by radon exposure. The four "program areas" - Information, Risk Identification, Public Protection & Coordination - were created to advance the two main principles of protecting Manitobans from radon exposure; Manitobans should be given accurate and consistent information regarding radon and the risks of its exposure, and that the quality of services related to testing and mitigating radon should be subject to control in order to protect Manitobans from unqualified sellers of these services. While this action plan did identify the need for public awareness, and it included mention of the need for regulation in the radon mitigation and testing industry, it did nothing to help deal with the financial burden of these services. Furthermore, the public awareness efforts were minimal, and it did not even offer increased protections within the

health care system such as mandatory testing of a home where someone has been diagnosed with lung cancer.

In 1992, a provincial study was done to measure average radon concentrations in basements in various different municipalities and regions in Manitoba. The data collected through this study is alarming. The study found that the average radon level for basements in the Dauphin area was 610 Bq/m³, in the Morden-Winkler area was 410 Bq/m³, in the Swan River area was 240 Bq/m³ and in the Brandon area was 230 Bq/m³. All these average readings are higher than the recommended safe average of 200 Bq/m³. This data was readily available and well known to the governments (both PC and NDP) of Manitoba, yet very little action has been taken in the years since.

The Manitoba government has been well aware of the radon issue for over thirty years and still has neglected to enact effective policy or to implement assistance for those who want and need to have radon testing and mitigation services conducted.

Overall, this issue is one that has been generally ignored or not given adequate attention by municipal or provincial governments.

Possible Initiatives in Manitoba

High levels of radon in homes is an issue that impacts all Canadians, but Manitobans in particular. Despite being the province with the second highest rates of elevated radon levels, there has been little action taken by the government to remedy this. Initiatives that could be implemented include increased consumer awareness measures, policy in place to mandate testing, public health advisories, or simply working more in collaboration with health care/ CancerCare specialists.

While the Health Canada recommendation for “safe” levels of radon is 200 Bq/m³, this is higher than the WHO’s recommended 100 Bq/m³, and it is likely that at some point in the future Canada’s standard may be lowered. Some regions across the globe have opted for legislation that requires lower radon levels in newer buildings as opposed to moderately higher levels in existing buildings. As Manitoba (Winnipeg in particular) has many historic and longstanding buildings, similar policy implemented here could work well in helping to protect Manitobans from the dangers of radon exposure.

Implementing a rule for mandatory testing either before/after selling a home would aid in recognition of radon and has the potential to dramatically lower the number of individuals who fall ill due to exposure.

One large issue that accompanies the identification of and remedy for high radon concentrations is the cost factor and the time involved with testing. A one-time test costs around \$70, and a professional inspection can be as much as \$400.

The Canadian Environmental Law Association has been advocating for a tax credit or grant to assist Canadians in paying for radon testing. In terms of offsetting the costs of an initiative of that nature, the CELA states that “such a program would be revenue neutral; the cost of a tax credit or grant to help Canadians with mitigation costs would be offset by increased corporate and sales tax revenues. We estimated higher tax revenue to provincial over federal coffers not even accounting for provincial savings in health care costs from lung cancer prevention.” (Financial Incentives for Radon Mitigation: Logical Next Steps for a Priority Indoor Air Pollutant, 2019)

Currently, the only financial aid offered in Manitoba in relation to radon testing is through the Manitoba Hydro Energy Finance Plan. The plan offers a 6.75% (OAC) loan for “qualifying upgrades,” which include radon mitigation treatment, but only if it is performed through a C-NRPP certified contractor. There is no aid offered at the current moment for those who wish to implement mitigation measures by their own volition. Indeed, the 6.75% loan is far too high for this to be considered financial aid. If the Manitoba Hydro loan was a no interest loan it would make a big difference.

The creation of a program to provide financial aid to those looking to perform radon mitigation is necessary and essential to prevent more Manitobans from falling ill and dying of Lung Cancer.

The Role of The Health Care System

The general focus of Manitoba’s health care system is to prevent and to treat diseases. Public Health has a mandate to prevent disease, as do institutions like CancerCare Manitoba and individual physicians. Currently, Public Health in Manitoba has a web site which lists radon as a concern and provides some material which provides information about the risk of exposure. But there are currently no active measures being taken to reduce radon exposure. As well as prevention, the Manitoba Health Care system has a mandate to treat those who have fallen ill due to exposure. Effective prevention can significantly reduce costs to the health care system as well as preventing illnesses to people.

Currently, there is no requirement for any radon testing of a patient's home upon receiving a lung cancer diagnosis. The health care system not only has a duty to treat its patients, but to practice prevention where possible. The lack of follow-up when a patient is diagnosed with lung cancer could be contributing to the unnecessary and tragic loss of life through lung cancer.

In Manitoba, many doctors at institutions such as The University of Manitoba and CancerCare Manitoba agree that radon concentration is a huge issue plaguing our province and recognize the lack of government initiative. Currently, CancerCare Manitoba is in the process of pursuing a province wide study on indoor radon levels. Assistance and cooperation from the government may result in a quicker, much more thorough, and effective outcome.

The Kansas State University National Radon Program Services suggests that upon finding out that your home has high/elevated levels of radon, one should ask their medical professional for a lung cancer test.

An Action Plan for Manitoba

Principles

1. All citizens are entitled to safety and security and should not be exposed to harmful radiation when possible. The lack of government action and public dispersal of information regarding radon exposure is alarming.
2. Buyers have a fundamental right to know if radon levels are high in a home or building, *before* they purchase it. Without mandating testing and disclosure this cannot be guaranteed. Implementing such policies is necessary to ensure the safety and well-being of Manitobans. Buying a home without knowing the radon level in the home is like playing Russian roulette.

Two major options to addressing radon levels in homes in Manitoba

1) A public health approach:

A public health approach would involve not just a public awareness campaign, but must involve an approach to getting houses in Manitoba tested for radon levels and an approach to mitigate high radon levels to ensure the houses are safe with respect to radon. It should include:

- a) A major public awareness campaign.
- b) Making radon testing widely available – as through providing free access to digital monitors through libraries throughout the province, as well as free long term tests where digital monitors reveal high levels
- c) Doing random, widespread testing accompanied by mitigation measures throughout the province.
- d) Provincial support for mitigation measures
- e) Measures to ensure mitigation occurs where levels are high.
- f) A provincial registry of home radon test results so home buyers can access information about homes they are considering buying.

2) An approach which focuses on when homes/buildings are bought or sold:

Addressing high radon levels in homes could focus on when homes are bought/and or sold. This approach has been used in a number of jurisdictions. The advantage of this approach is that it addressed the need and/or right of a person buying a building to know whether a home is safe or not. The practical problem with this approach is that radon testing can take some time (most government certified tests take 3 months). Digital monitors which can give readings in a much shorter times frame and which can be easily moved around to various sites in a home, are now readily available, and could be used to give much more rapid results. Nevertheless, in discussions with real estate agents, there is much concern about delays in the home buying process, a process which can occur rapidly. The government needs to work with real estate organizations in Manitoba to work out a process which can better inform home buyers and which can also be sufficiently strong and rigorous to protect real estate agents from liability for being involved in the selling or buying of a home with high radon levels.

The advice we have received to date suggests that the Public Health approach should be primary. A person with a home where they are living needs to know the results of radon tests on their home now without having to wait many years into the future when the house is sold.

Calls to Action

1. Manitoba should proceed with a public health approach as quickly and as thoroughly as possible. This should include:
 - a) A major public education campaign as to the presence of high levels of radon in many homes in Manitoba. The public education campaign should explain the science behind our knowledge of radon, where it comes from, why it is dangerous, how it causes lung cancer and how to mitigate homes with high radon levels. The public awareness campaign should include various media including social media to reach as many people as possible. Information on radon should also be delivered directly to homes throughout Manitoba. The cost of this can be decreased when the information is sent with other

government or Crown Corporation mailings – as when the government sent out tax information in 2021, or Efficiency Manitoba did in 2020.

- b) The major public education campaign should start with an announcement of the Manitoba government's proceeding with a subsidy to help low-income homeowners mitigate the impact of radon, a tax credit for high income homeowners, and a mixed package of subsidy and tax credit for homeowners who are in the mid-range of income. Moving the Manitoba Hydro loan to a no-interest loan would also be helpful. Various organizations including the Canadian Lung Association (2015) have further recommended that there should be changes to legislation to enable "providing of enforcement branches of public health units and occupational health and safety offices with the power to deploy a radon test upon inspection, and require remediation if radon test results are above federal Radon Guideline reference level." This option should be considered.
 - c) The public education campaign should include information about how to test for radon levels in homes.
 - d) The public information campaign should be initiated at the same time as the government makes available free loans of digital radon monitors through libraries around Manitoba.
 - e) The radon level in the homes of individual newly diagnosed with lung cancer, or an individual with a pet who develops lung cancer, needs to be tested. Because radon is such a significant contributor to lung cancer in both smokers and non-smokers, mandatory mitigation should be done both because ongoing exposure to radon could contribute to making the cancer more difficult to treat and because of the potential for the high radon levels to affect other family members. This preventative measure could help ensure that other residents or pets in the home do not fall ill due to radon exposure as well.
2. **Manitoba should work with Real Estate organizations** around Manitoba to implement an approach which will better protect buyers and sellers and real estate agents when homes are bought or sold in Manitoba. Examples include:
- a) The province of Manitoba should work with the Manitoba Real Estate Association, the Winnipeg Regional Real Estate Board and other interested parties including home builders and consumers to develop an effective approach to achieve the objective of ensuring all buyers are aware of issues related to radon and have access to results of radon testing. There are various options to achieve this goal which could be considered. Manitoba could move, as soon as possible, for it to be mandatory for information on radon levels in a home or condominium to be made available to the purchaser before the sale of a home, an apartment building or a commercial building, wherever such information is available. Because some buildings are sold and bought quickly, an alternative is to mandate for the test to be completed within the year after purchase and to have a reserve put aside for mitigation measure(s) to be implemented should the radon level be above 200 Bq/m³. Given the high proportion of homes with high radon levels in Manitoba, and the dangers of high radon with respect to causing lung cancer some measures are clearly needed. The Canadian Lung Association and other organizations (2015) recommend that provinces "enact home warranty legislation such that new homes are statutorily deemed to come with implied warranties of habitability that include specific reference to soil gas ingress and radon." This approach should be considered. Manitoba should also move, as Alberta and British Columbia have done to call high radon levels a "latent defect".

- b) We recommend that in Manitoba, as in Nova Scotia, information on radon in Manitoba should be part of the normal training of real estate agents. Currently, at least some courses for real estate agents in Manitoba do not have adequate information for prospective agents on radon.
- c) We recommend that Manitoba follow the lead of British Columbia and allow for a home where the radon levels have been tested and found to be lower than 100 Bq/m³ to have this listed as a highlighted selling feature when selling the home.

3. Additional general measures:

- a) Because of the time it takes for radon detection using test kits, it is essential to be able to use digital radon monitors as more rapid options. Though no digital monitors currently have certification from Health Canada, we understand that CARST is working on such certification and it may be available in the near future for one or more models. Even without such certification, monitors with an established track record can be used to give a worthwhile indication of the level of radon present in a home, and can give preliminary results in a week as opposed to several months. There does need to be a standard of practice for how these are used to monitor radon in a home. For example, a test on a second floor near a window is not adequate. Levels need to be provided in the basement and first floor according to standard practices. Certified radon test experts could be deployed to ensure accuracy of testing done by homeowners.
- b) Because of the cost of testing and mitigation, the government should include for home sellers a tax credit for the cost of kits or digital monitors for radon.
- c) Consideration needs to be given to changing the building codes for all new buildings in Manitoba so that radon mitigation must be part of the construction. In the interim, the province should require that all newly built homes and apartments have levels of radon which are less than the WHO standard of 100 Bq/m³.
- d) The province needs to develop a provincial plan for testing all homes and apartments in Manitoba and for mitigating all homes and apartments with high radon levels, starting in areas with the highest radon levels. A provincial plan for ongoing testing and mitigating of all schools, all Manitoba Housing buildings and all provincially or municipally owned buildings should be made public. A public registry should be kept of radon test results in buildings throughout Manitoba, as part of the standard information kept on buildings, and this information should be made available to be accessed by prospective buyers.

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Appendices:

Appendix A: Lifetime risk of Lung Cancer due to Smoking and Radon per 100,000 population

Appendix A: Lifetime risk of Lung Cancer due to Smoking and Radon per 100,000 population													
	Radon test ³			smokers per 100,000 pop	Lifetime risk of lung cancer per 100,000 population ²						Total radon	Lifetime risk	Radon % of all lung cancers
	% smokers ¹ in RHA	% homes 200-600 Bq/m3	% homes >600 Bq/m3		basal 1% of non-smokers	smoker no radon (0.12)	smoker low radon (0.05)	smoker high radon (0.18)	non-smoker low radon (0.01)	non-smoker high radon (0.04)			
Burntwood/Churchill RHA	14.5	7.2	0.7	14500	855	1740	52.2	18.27	61.56	23.94	155.97	2707	5.8
Brandon RHA	14.5	40.5	3.8	14500	855	1740	293.625	99.18	346.275	129.96	869.04	3464	15.1
Parkland	14.5	31.9	11.5	14500	855	1740	231.275	300.15	272.745	393.3	1197.47	3792	31.6
Central RHA	14.5	35.2	7.4	14500	855	1740	255.2	193.14	300.96	253.08	1002.38	3597	27.9
Assiniboine RHA	14.5	32.7	1.8	14500	855	1740	237.075	46.98	279.585	61.56	625.2	3220	19.4
Communities with 70% of homes high radon	14.5	55	15	14500	855	1740	398.75	391.5	470.25	513	1773.5	4368	40.6
All Manitoba	14.5	21.1	2.6	14500	855	1740	152.975	67.86	180.405	88.92	490.16	3085	15.9

1 As recent data for the incidence of smoking in these regions of Manitoba was not available, for this purpose of this table, all were given the latest provincial average of 14.5%

2 Lifetime risk of lung cancer was taken from the Manitoba Health report (<https://www.gov.mb.ca/health/publichealth/environmentalhealth/radon.html>) which was derived from an earlier Canadian report (see Table 2).

3 Cross Canada Survey of Radon Concentrations in Homes <https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/radiation/cross-canada-survey-radon-concentrations-homes-final-report-health-canada-2012.html>

APPENDIX B: Calls to Action Options

Options for assisting with cost of radon testing/mitigation being used in other jurisdictions:

1. The creation of a tax credit or subsidy by the provincial government for radon testing as well as mitigation.
 - Radon kits that include lab analysis fees usually cost around \$40 - \$60. a subsidy could be implemented to cover this cost, as it is fairly reasonable.
 - Radon mitigation services, however, are much more expensive, ranging from around \$2000 - \$4500. A subsidy that covers half or even one third of the cost of radon mitigation could be incredibly helpful in assisting those financially burdened by radon mitigation costs.
 - a tax credit offered to those who need to perform a radon test or radon mitigation measures could also be immensely helpful in terms of financial assistance. The Province of Saskatchewan has implemented the “Home Renovation Tax Credit” for homeowners looking to have radon mitigation measures implemented. This tax credit permits homeowners to claim a 10.5% tax credit on up to \$20,000 of qualifying home renovation expenses. Eligible expenses include labour costs, professional mitigation services, and materials or resources necessary for radon mitigation. A similar tax credit could be implemented in Manitoba and would greatly increase the number of homeowners looking to have their homes tested and mitigated.
 - A tax credit or subsidy offered specifically to homeowners that fall under the “low-income” bracket. While radon testing and mitigation services are costly, some homeowners may be able to cut expenses and budget for them. Lower income homes, however, may have greater difficulty accommodating such an expense. No one should have to live in an unsafe home solely due to their income.
2. Implementation of a program such as the one operated by the Missouri Department of Health and Seniors that provides free test kits upon request. Through this program, all Missouri home or property owners can request a free residential radon testing kit. In order to pay for this program, the Missouri Department of Health and Seniors secured a grant from the United States Environmental Protection Program, with the goals of raising awareness of the dangers

of radon as well as minimizing its harm through testing. A grant could be secured through Environment and Climate Change Canada, or another government entity.

3. Creation of a digital radon monitor rental program, where electronic radon monitors can be loaned to homeowners free of charge. This option is best for lessening the financial burden on both homeowners looking to test as well as the government in terms of providing kits. This program would be best operated through an independent organization such as the Manitoba Lung Association, with collaboration from the provincial government.

Options for increasing the duties of the Real Estate Industry:

1. Implementing a mandatory testing before listing to market and disclosure rule. Homeowners would be required to test their homes for radon before putting their home up for sale. Upon receiving a high reading, homeowners should be required to perform radon mitigation services, to make the home safer as well as more appealing to potential buyers. Even after performing mitigation services, homeowners would still be required to notify realtors or potential buyers that the home has a history of high radon concentrations, and what measures have been implemented to reduce them. If they choose not to perform services, homeowners must still disclose to the realtor and any potential buyers that the home has high radon concentrations. This is similar to policy enacted through the Real Estate Council of Alberta and would ensure that the new purchaser is at least aware of the potential danger and work towards remedying the issue.
2. An option to help ensure the safety of new homeowners would be implementing policy where realtors must disclose the dangers of radon, the prevalence of radon in Manitoba, and even if there are not high concentrations in the home (ex: prior owner tested and results were fine), realtors should suggest that homeowners should test for radon in the future. Radon concentrations are extremely variable; routine testing is necessary to ensure that radon concentrations in the home are at a safe level.
3. Implementing mandatory radon education for Manitoba realtors. As radon is a huge issue in the province of Manitoba, all realtors operating in said authority should be required to take a radon safety course or radon safety informational training to be well-equipped to sell homes with high radon levels, and to be aware of resources available for those who want to test, mitigate, or install radon monitors in their (new) homes. A program similar to this is operating in Nova Scotia; in order for NS realtors to keep their real estate license, they must enrol in and complete a "Radon Awareness for Real Estate" course.

Options for raising public awareness:

1. Creation and implementation of an annual reminder from the government, sent to all home and property owners. The purpose of this would be to remind homeowners that radon is especially prevalent in Manitoba and that it is important to get your home tested as that is the only way to tell if there are high radon concentrations. Information in this reminder could include statistics on radon prevalence, dangers of radon exposure, resources for where to buy radon test kits, and radon mitigation measures.
2. More widespread public dispersal of statistics on radon prevalence, the importance of testing for radon, and the dangers of being exposed to it. Public awareness campaigns in the form of an advertisement or even a billboard may alert homeowners to test their homes. A social media campaign may also be considered.
3. Increased collaboration between The Manitoba Lung Association, CancerCare Manitoba, CARST (Canadian Association of Radon Scientists and Technologists) and The Government of Manitoba. Each of these organizations has the right information, tools and resources

needed in order to combat the issue of radon, but the need for collaboration is key to implementing any policy. The possible creation of a radon awareness/safety team, that includes representatives from each organization as well as civilian homeowners, would be a way to provide diverse knowledge and make dealing with radon (as well as implementing policy) much more accessible.

4. Collaboration with organizations such as Unsmoke Canada and The Manitoba Government in order to raise awareness on the particularly dangerous effects of radon on tobacco smokers. There is little being done to alert tobacco smokers of the extremely harmful, synergistic effect of radon exposure and tobacco smoke. Increased messaging about this through an organization such as Unsmoke Canada could prove beneficial.

Appendix C: In 2015 the Canadian Lung Association together with The Canadian Environmental Law Association, the Canadian Partnership for Children’s Health and Environment and the David Suzuki Foundation (2015) put out a Radon Policy Challenge. The report made a number of recommendations. These recommendation are listed here and discussed. There is further discussion of some of these in the main report.

1. **Recommendation:** Update all radon protection and mitigation provisions in Provincial and Territorial Building Codes in accord with the National Building Code.

The National Building Code was updated in 2010 and 2015. Updates from 2010 included updates related to radon. As far as we can determine these updates were incorporated into Manitoba’s building code since then. Thus from a radon perspective Manitoba’s building code matches the National Building Code even though Manitoba has not yet incorporated the 2015 National Building Code updates in the Manitoba building code.

2. **Recommendation:** Ensure that the NORM Guidelines are clearly applied to all workplaces given the fact that radon can infiltrate any building regardless of what occupations may be occurring within.

The only province so far to use the NORM guidelines in legislation is Ontario who has adopted NORM guidelines as a reference for existing workplace legislation but not as legislation itself.

With regard to this issue we have been told that CARST had a letter from the Minister of Labour (Manitoba) dated October 25, 2021 that states, “Workplace exposures are taken seriously, and there are provisions in the Workplace Safety and Health Regulation (the Regulation) to address the risks associated with radon.

Part 4.1 of the Regulation requires employers to ensure appropriate air quality and ventilation and take steps to ensure contaminants are prevented from accumulating in the air. Control measures, such as air quality testing and adequate ventilation, can effectively reduce the risk of radon exposures, as well as other hazardous chemical substances.”

They also stated that they work with “WSH works collaboratively with the Workers Compensation Board of Manitoba (WCB) and SAFEWork Manitoba to identify workplaces and industries that have high injury or illness frequency, or rates substantially different from their peers.”

We have also written to SafeWork Manitoba on how they respond to this, and we received a response saying they would look further into this, and to date (Jan 10, 2022) we haven't had any further response from SafeWork Manitoba from our November 2021 email exchange.

3.) **Recommendation:** Ensure legislation, supplementary guidance and resources (where appropriate) governing public health, occupational health and safety, residential tenancies, education, and occupiers' liability be amended to address radon, to place duties on school boards, licensed child care facilities, landlords, employers, and building owners to ensure mandatory radon testing, radon mitigation if necessary to achieve indoor radon levels below the federal Radon Guideline reference level, and mandatory public notification of test results and mitigating strategies.

Manitoba has done very little to achieve this.

4) **Recommendation:** Ensure that all government, utility and NGO sponsored programs advancing and/or delivering energy efficiency retrofit programs incorporate information about the need to test for radon and related information about radon remediation.

Many energy efficient measures can lead to increased radon retention in a home so this should be something addressed within government run programs promoting energy efficiency.

Manitoba has done very little to achieve this. CARST has been in conversation with representatives from Efficiency Manitoba to include information. They have in the past when they were MB Hydro, but to our knowledge they haven't continued this as Efficiency Manitoba.

There is a group who are designing curriculum for Energy Audits in Manitoba. There is radon information in their curriculum, but the feedback to date is that this material is often disregarded or downplayed by the instructor.

5) **Recommendation:** Enact home warranty legislation such that new homes are statutorily deemed to come with implied warranties of habitability that include specific reference to soil gas ingress and radon.

CARST and Health Canada spent several hours leading up to the previous attempts of creating mandatory legislation for home warranty to include references for radon. Our meetings with the stakeholders had encourage them to at least include education information on radon, however that legislation has been delayed due to lobbying efforts from the building community. CARST supports this recommendation.

6) **Recommendation:** Add legislative language providing enforcement branches of public health units and occupational health and safety offices with the power to deploy a radon test upon inspection and require remediation if radon test results are above federal Radon Guideline reference level.

CARST supports this recommendation

7) **Recommendation:** Require that property disclosure statements be included in the annexes to prescribed forms under real estate legislation/regulations providing that

sellers will disclose whether there is a known presence of radon in their homes before signing an agreement to sell or transfer real property.

CARST agrees that real estate agents and the provincial association is not paying attention to radon. CARST has sponsored booths at past events over the last couple of years, and the feedback we have received is that individual real estate agents see the importance of providing information on radon to their clients and have a desire to be well educated on it, however they are often distracted with other information. The real estate association have engaged slightly on this, by providing general information.

Manitoba should make a priority to improve the wording on the property disclosure statement to something more similar to what BC has used. Indeed, Manitoba could improve further on BC's statement <https://www.bcrea.bc.ca/education/three-questions-answered-in-bcreas-property-disclosure-statement-online-course/>

BC disclosure statement:

<p>V. Have the Premises been tested for radon?</p> <p>(i) If yes, when was the most recent test completed and what was the most recent level of radon detected?</p> <p>Level: _____ Bq/m3 or pCi/L (circle one) on <input type="checkbox"/> _____ (DD/MM/YYYY)</p>
<p>W. Is there a radon mitigation system on the Premises?</p> <p>(i) If yes, are you aware of any problems or deficiencies with the radon mitigation system?</p>

And the following was added to the Strata Title Properties:

<p>HH. Has the Unit been tested for radon?</p> <p>(i) If yes, when was the most recent test completed and what was the most recent level of radon detected for the Unit?</p> <p>Unit Level: _____ Bq/m3 or pCi/L (circle one) on <input type="checkbox"/> _____ (DD/MM/YYYY)</p>
<p>II. Has the Common Property been tested for radon?</p> <p>(i) If yes, when was the most recent test completed and what was the most recent level of radon detected for the Common Property?</p> <p>Common Property: Level: _____ Bq/m3 or pCi/L (circle one) on <input type="checkbox"/> _____ (DD/MM/YYYY)</p>
<p>JJ. Have the Lands been tested for radon?</p> <p>(i) If yes, when was the most recent test completed and what was the most recent level of radon detected for the Lands?</p> <p>Lands: Level: _____ Bq/m3 or pCi/L (circle one) on <input type="checkbox"/> _____ (DD/MM/YYYY)</p>
<p>KK. Is there a radon mitigation system in the Unit?</p> <p>(i) If yes, are you aware of any problems or deficiencies with the radon mitigation system in the Unit?</p>
<p>LL. Is there a radon mitigation system for the Common Property?</p> <p>(i) If yes, are you aware of any problems or deficiencies with the radon mitigation system for the Common Property?</p>
<p>MM. Is there a radon mitigation system for the Lands?</p> <p>(i) If yes, are you aware of any problems or deficiencies with the radon mitigation system for the Lands?</p>

8) **Recommendation:** Encourage the federal government to reduce the indoor radon reference level to the World Health Organization recommended level of 100 Bq/m³.

This is something that the government evaluates every once in a while. It is a good time to push them on it again because there has been clarification to the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) and an update. Last response was that if they were going to change, they were waiting on UNSCEAR's response to the updated ICRP report. (ICRP 137).

CARST has clear information from mitigation professionals that radon reduction is effective in reducing radon levels to below 100. CARST has this in various forms including the Radon Reduction Sweepstakes report. CARST will be releasing updates on this report shortly which continue to confirm this. <https://takeactiononradon.ca/radon-reduction-sweepstakes-report-2018-2019/>

9) **Recommendation:** Establish comprehensive radon testing data-sharing arrangements with other provinces/territories and the federal government and public registries to make radon tests results in public buildings, and related risk mapping, publicly available.

CARST agrees with this, we have started with a map through C-NRPP: <https://c-nrpp.ca/radon-map/>

CARST is willing to be the organization to host this, but regardless of who hosts it, CARST would like to see this happen.

Health Canada is primarily the governing body conducting radon studies, but provincial government support should be offered to increase the participation in these studies. Participation in ongoing studies tracking radon levels should be encouraged within the health regions by the provincial government to increase awareness around the studies significance.