

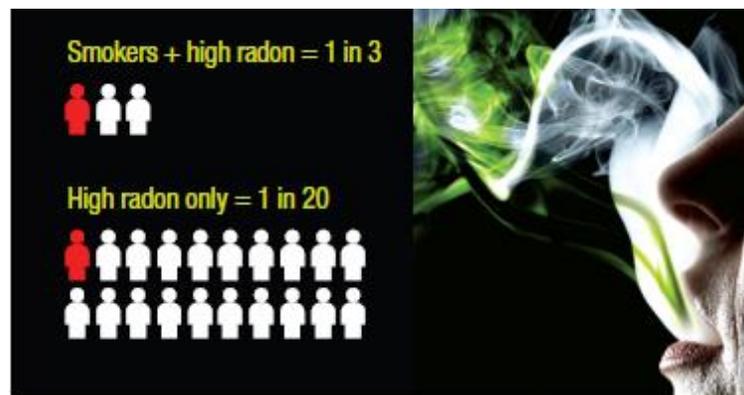
# Radon: second leading cause of lung cancer comes from rocks and soil



When naturally occurring uranium breaks down radon gas is produced. It is colourless, odorless, and radioactive. Radon gas also breaks down, and the radioactive particles that are released become attached to the surface of fine particles in the air, dusts, and smoke. When these particles are inhaled, they become deeply lodged in the lungs, where they cause damage to DNA in lung cells.

Radon has been classified by the International Agency for Research on Cancer (IARC) as a Group 1, a known cause of cancer in humans.<sup>1,2</sup> This classification is based on well-established evidence from human and animal studies that radon causes lung cancer.

Exposure to radon is especially concerning for smokers. If you smoke, the risk of developing lung cancer is 1 in 20 – this increases to 1 in 3 if you are also exposed to radon over your lifetime. Health Canada estimates that about 16% of lung cancer deaths are related to radon exposure. This amounts to approximately 3,300 deaths each year.<sup>3</sup>



Credit: Health Canada

People who do not smoke can also develop lung cancer if they are exposed to radon, but the risk is much lower.<sup>4</sup>

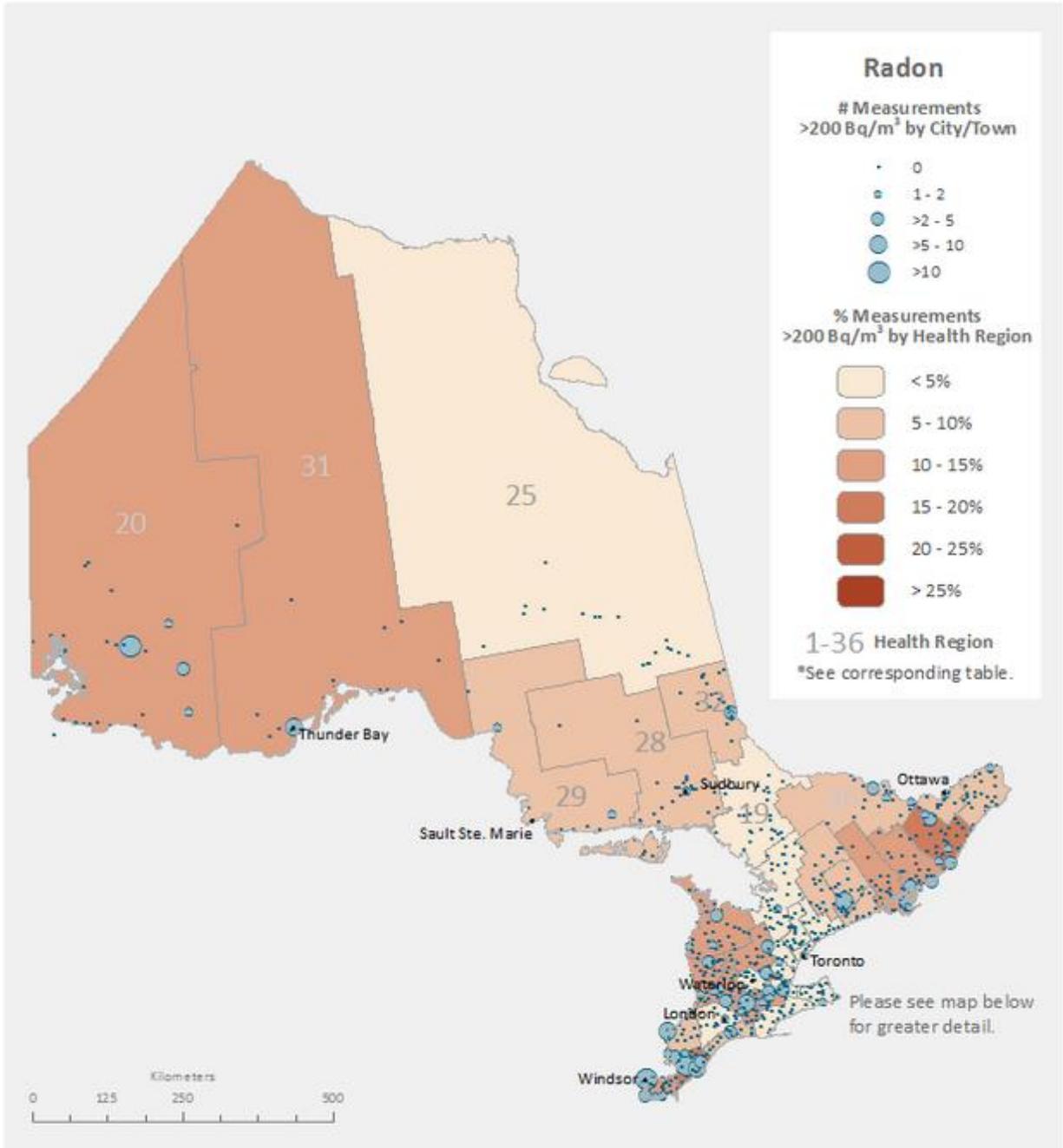
Radon levels are naturally higher in some areas of Canada. This briefing note reviews why this is the case, how exposure occurs, and what to do about it.

## Radon Levels in Canada

Radon concentrations vary depending on local geology, soil, and building characteristics. The highest concentrations of radon are found in areas with uranium and thorium ore deposits and granite formations. In these areas, radon seeps out of the ground into surrounding air, water, and soil. This becomes a hazard if the radon gas gets indoors. Radon has been found in public buildings, schools, hospitals, and new and older homes in many places across Canada.<sup>5</sup>

CAREX Canada's map of Ontario (see Figure 1)<sup>6</sup>, summarizes radon measurements from Health Canada's Cross Canada Radon Survey (Phase 1 and 2)<sup>7</sup>, highlighting the percentage of home radon measurements in each health region above the Health Canada guideline of 200 Becquerel per cubic metre (Bq/m<sup>3</sup>).

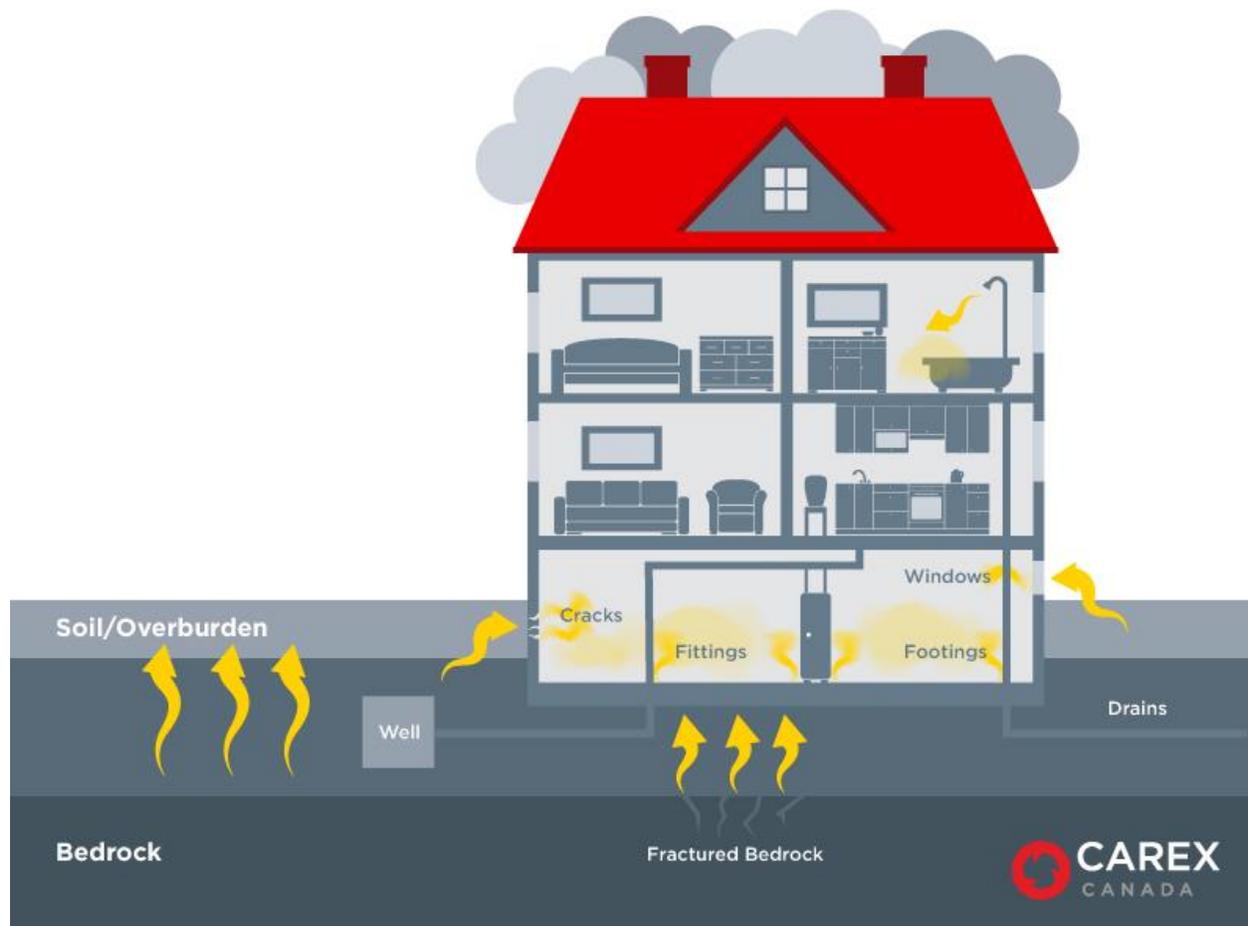
NOTE: First Nations homes on reserve were not included in the survey.



**Figure 1:** CAREX Canada’s map displaying the results of Health Canada’s Cross Canada Radon Survey (Phase 1 and 2) for Ontario, by health region. The shaded blocks indicate the percentage of home radon measurements in each health region above the Health Canada guideline of 200 Bq/m<sup>3</sup>.

## How Exposure Occurs

Exposure to radon occurs mostly through indoor air. Radon gas enters buildings through unfinished floors, wall slab joints, sump pumps, windows, and cracks and openings in foundations (Figure 2).<sup>8</sup> In some cases, building materials are also important sources of indoor radon. Basements and cellars have some of the highest radon levels because they are situated close to the source of radon and tend to have low ventilation. Radon may also be present in tap water, and it can be released to the air in gas form when washing clothes, dishwashing, cooking and showering.<sup>9</sup> Drinking tap water with radon is not currently thought to be a high risk, as there is very little evidence that ingesting radon leads to cancer.<sup>10</sup>



**Figure 2:** Radon can infiltrate and accumulate in homes in the various ways pictured here.

Radon levels in buildings vary across seasons, and can change significantly in 24 hours (by a factor of two or three). The highest levels usually occur in winter because windows are kept closed, decreasing ventilation. When buildings are sealed to conserve energy, higher levels of radon can accumulate as well.<sup>11</sup>

At work, radon in groundwater, soil, or building materials can build up at work sites and expose people while on the job. The CAREX Canada team is currently developing an estimate of exposure to radon in

Canadian workplaces. The jobs at highest risk of exposure to radon are those that work specifically with uranium, or those that occur underground or in the lower floor of buildings, such as miners, some subway workers, and utilities workers.<sup>12</sup> Federal employees are governed by the Canada Labour Code (CLC),<sup>13</sup> which ensures that workers are not exposed to radon levels above 800 Bq/m<sup>3</sup>. Other workplaces are governed by the Naturally Occurring Radioactive Material Guidelines.<sup>14</sup>

**We want to move forward in improving environmental quality: the air we breathe, the land we walk on, the water we drink, the food we eat; that's who we are as a people. If our earth is health, we are healthy.<sup>15</sup>**

### **Testing**

The only way to know if you're being exposed to radon gas is to test for it. Data from Health Canada's most recent survey (2011) revealed that 42% of Canadian households had heard of radon, but only 5% of those households had tested for radon (up from 3% in 2009).<sup>16</sup> Because radon levels vary over time, Health Canada recommends using a long-term detector and testing for a minimum of three months, over the winter months if possible when homes tend to be sealed and ventilation is low.<sup>17</sup> If a worker has concerns about radon levels in a workplace, he/she can request a radon test.

Radon testing is available through certified service professionals; lists of these are available through the Canadian Association of Radon Scientists and Technologists (CARST)<sup>18</sup> and the Canadian National Radon Proficiency Program (C-NRPP).<sup>19</sup> Homeowners can also purchase do-it-yourself kits through local Lung Associations or hardware stores, and follow the guidelines outlined by Health Canada for how to properly conduct a radon test.

### **Remediation**

Health Canada recommends<sup>20</sup> that the higher the radon concentration, the sooner steps should be taken to remediate the issue:

- Over 600 Bq/m<sup>3</sup> - Remediate within 1 year
- Between 200 and 600 Bq/m<sup>3</sup> - Remediate within 2 years
- 200 Bq/m<sup>3</sup> and below - No action required

The specific methods used to remove radon from existing buildings depend on several factors, including building construction and soil type. The most effective of these methods is called "active sub-slab depressurization", where a remediator installs a pipe through the floor slab of the foundation. This pipe is attached to a fan that runs continuously to draw radon gas out from beneath the home, to the outdoors where it is effectively diluted.

For new buildings, the National Building Code of Canada encourages builders to prevent radon from entering homes by implementing what's called a "roughed-in radon reduction system" during construction.<sup>20</sup> This involves laying a polyethylene barrier under the slab, sealing the slab perimeter and all areas where pipes run through the slab, and installing airtight coverings for sump pit covers.

Other remediation approaches are summarized on Health Canada's Radon Reduction Guide for Canadians page.<sup>20</sup>

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