Residential Radon (Rn-222) and Thoron (Rn-220) Survey in Metropolitan Areas

Radon (Rn-222) is the second leading cause of lung cancer after tobacco smoking. It can easily move through small spaces in soils and other materials, allowing it to enter buildings and accumulate to levels that can pose a health risk. Health Canada recommends that all Canadians test their home for radon and remediate if levels are higher than 200 becquerels per cubic meter (Bq/m3).

The isotope that is typically called “radon” is Rn-222, which comes from the naturally occurring uranium (U-238) series decay chain. Thoron (Rn-220) is also an isotope of radon, which comes from the naturally occurring thorium (Th-232) decay chain. Both U-238 and Th-232 are found naturally in rocks and soils all over the earth’s surface.

Thoron has a half-life of only 56 seconds (compared to 3.8 days for radon). Due to its very short half-life, thoron cannot travel very far from its source and so it poses a health risk only if it emanates in sufficient quantities from construction materials within a home or building.

In order to better understand the risk to Canadians from exposure to radon and thoron, the National Radon Program (NRP) conducted an indoor residential measurement survey in 2012-2013 to gather information on radon and thoron levels across the Census Metropolitan Areas (CMA) in Canada.

At the time of this study, there were 33 CMAs in Canada and they accounted for roughly 70% of the Canadian population. A CMA must have a total population of 100,000 or more, with at least 50,000 coming from the urban core of the area. The goal was to recruit 122 homes from each CMA for roughly 4000 homes in total. Using random digit dialing within each CMA, a market research firm recruited 4064 participants. The same market research firm also followed-up with participants during the study.

Participants were provided with detectors and instructions to deploy them using Health Canada’s guidance for radon measurement in homes (https://www.canada.ca/en/health-canada/services/publications/health-risks-safety/guide-radon-measurements-residential-dwellings.html). Exposed detectors were analyzed in Health Canada’s National Radon Laboratory.

The data in the accompanying table from this study represents 3190 homes with known radon test durations of at least 30 days. Roughly 97% of the tests were at least 90 days in duration, and 99.8% of them were at least 60 days in duration. This study corroborated findings from the larger previous residential study that Canadians are willing to conduct a long-term radon test, which provides an accurate estimate of the annual radon exposure level.

The results in the data table are sorted alphabetically by province first, then by CMA name, and finally FSA. The result number is simply an incrementing value from 1 to 3190 based on the aforementioned alphabetical sorting.

The forward sortation area (FSA) is the first 3 digits of the postal code for each house. The data from this study are reported at the FSA level to protect the privacy of study participants, while still making the dataset as useful as possible for those accessing the data.

The SI unit for radioactive decay is the becquerel (Bq), and one becquerel corresponds to one radioactive disintegration per second. Hence the SI units for reporting radon in air are Bq/m3. The detection limit of the radon and thoron analysis system was roughly 15 Bq/m3 for each isotope based on a 3-month test duration. Any result below the detection limit is reported as <15 Bq/m3.

More information on this study can be found in the following publication: Results of simultaneous radon and thoron measurements in 33 metropolitan areas of Canada (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4312419/).

More information regarding Health Canada’s National Radon Program can be found here: canada.ca/radon.