



Highlights of World Health Organization's *WHO Handbook on Indoor Radon: A Public Health Perspective*

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Available for free download at
www.who.int/ionizing_radiation/env/radon/en/index1.html

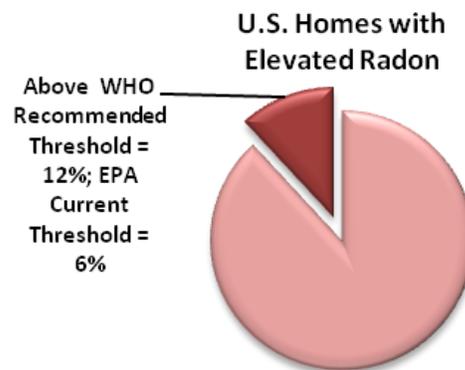
The WHO Handbook reflects contributions from about 100 scientists and experts from more than 30 countries (including 7 from the U.S)

Key Points:

- **Radon in homes**
 - **Responsible for 1 of every 7 U.S. lung cancer deaths**
 - **The lead cause of lung cancer deaths among non-smokers**
 - The second lead cause of lung cancer deaths among smokers
 - May be associated with other diseases, e.g., leukemia
- **WHO recommends lowering radon levels** to 2.7 pCi/L or less
 - **1/3 less than the current U.S. Threshold for Action** of 4 pCi/L
 - When the WHO recommendation is adopted in the U.S.:
 - **U.S. homes needing mitigation will nearly double**
 - . . . from about 7 million to 13 or more million
 - If radon was reduced in all U.S. homes to the WHO recommended level
 - **More than 9,000 U.S. deaths could be prevented each year**
- WHO identifies that **effective radon control systems in new homes are critical to reverse the growing number of homes with elevated indoor radon concentrations**
 - In the U.S. over the past 2 decades, the number of homes with elevated radon increased from 6 million to as many as 8 million
 - Because more new homes with elevated radon have been added than existing homes which have been mitigated
- WHO clearly place **responsibility for radon risks on architects, builders, real estate professionals and home sellers.**
 - Spotlights indoor radon concentrations are not naturally occurring
 - **Indoor radon levels are caused by the way homes are designed and built**

Establishes WHO's recommended Reference Level (aka action level) for indoor radon concentrations of 100 becquerels per cubic meters (Bq/m³). Bq/m³ is an international unit of measurement of radioactivity. One hundred (100) Bq/m³ is equivalent to 2.7 picocuries per liter (pCi/L), a unit of measurement commonly used in the United States.

- Strongly recommends that when indoor concentrations exceed this level, action be taken to reduce the concentration as low as reasonably achievable.
- **The WHO recommended action level is 33 percent lower than the U.S. Environmental Protection Agency's (EPA) 4 pCi/L Threshold for Action**, a level that has been used for nearly 40 years as a guide for when radon control has been urged
 - At EPA's current Threshold for Action, about 6% of all U.S. homes (houses, townhouses, apartments) or between 7 and 8 million homes are above the action level
 - At WHO's recommended level, **the portion of U.S. homes with elevated radon nearly doubles to about 12% or 15 million homes**



Finds that residential case-control studies of indoor radon and lung cancer indicates that radon is responsible for up to 14 percent of lung cancer deaths. Some research indicates that that radon may be responsible for 18 percent of lung cancer deaths.

- Radon is the second leading cause of lung cancer.
 - U.S. EPA estimates that **among non-smokers, radon is the leading cause of lung cancer.**
 - Confirms that there is **no safe amount of radon** and that even exposure to small concentrations of radon creates a risk of lung cancer.
 - **The majority of radon-induced lung cancer deaths are caused by exposure to low to moderate radon concentrations versus high concentrations.**
 - **This point emphasizes the importance of reducing radon in all homes not only indoor concentrations that may be above an action level such as 2.7 pCi/L.**
 - Notes that there is limited evidence of radon exposure with other diseases, such as leukemia, and further investigations are underway.

Recommends long-term radon measurements, for example three or more months while recognizing that short-term measurements may be beneficial in time-sensitive situations such as home buying.

Seeks to correct a major problem in national radon programs - - the growing number of homes with elevated radon. Identifies cost-effective strategies for inexpensive radon control in new and existing homes.

- Underscores that the goal for radon risk reduction in the population must include effective radon prevention systems in new homes as well as radon mitigation in existing homes.
 - Without this strategy, the number of homes with elevated radon will increase as the case has been in the U.S.
 - **The number of homes with elevated radon in the U.S. over the past 20 years has increased from 6 million to as much as 8 million homes.**

Illustrates that it is cost-effective for governments to **require radon prevention systems in new homes** in areas where average indoor radon concentrations are 70 Bq/m³ (2 pCi/L) or more.

- Virtually all of the northern U.S. and Canada would be in this zone

Recommends that buildings codes be established for cost-effective radon prevention systems in new homes.

- To take a step in this direction, a number of states have enacted building code requirements for radon control systems in new homes, e.g.,
 - California, Connecticut, Florida, Michigan, Minnesota, New Jersey, Rhode Island, and Washington.

Emphasizes that indoors, radon is largely caused by the way homes are designed and built. Clarifies a long-term misconception that indoor radon is naturally occurring. Outdoor radon concentrations are naturally occurring but indoors, radon concentrations are profoundly influenced by way homes are designed and built. The implications of this clarification are that it **places clear responsibility for radon control** on:

- architects and designers
- builders
- building code officials
- home sellers
- real estate agents and brokers

Recommends that governments seek to improve the “acceptance rate” for radon testing and radon remediation, for example:

- only 25% of U.S. homes have been tested for radon
 - Of those homes tested by homeowners and to have elevated radon, only 10% have been remediated.

The WHO Handbook on Indoor Radon complements the July 2009 United Nation’s Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) report of that new residential radon-lung cancer studies are in remarkably good agreement with earlier risk estimates derived from studies of underground miners. The significance of this agreement is that there is now much stronger evidence of the health risk of indoor radon.