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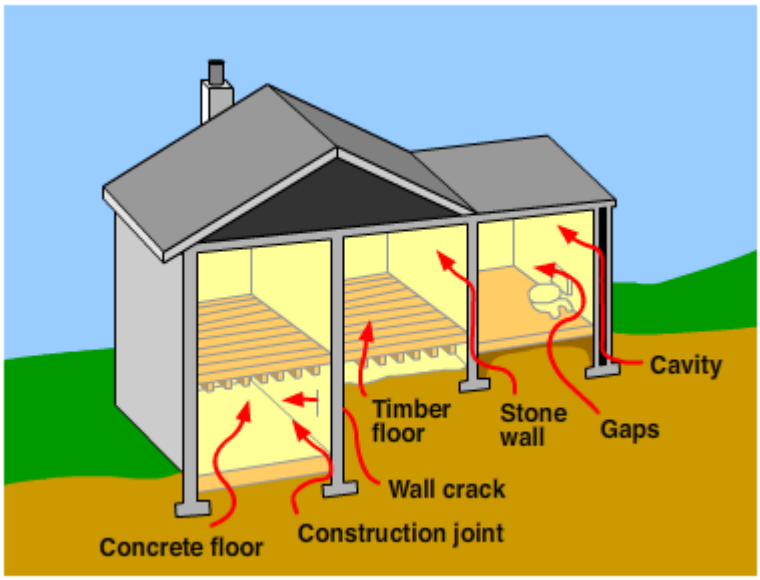
Exposure from the inhalation of radon and thoron



	Average[1] individual annual dose, mSv y^{-1}	Annual collective dose, man Sv y^{-1}
Dose to the UK population from inhaling radon and thoron while indoors[2]	1.1	73,700
Dose to the UK population from inhaling radon and thoron while outdoors	0.03	2,000
Total dose to the UK population from inhaling radon and thoron	1.13	75,700
1 There is a large geographical variation in the activity concentration of radon in air in buildings, resulting in large variations in the dose received by individual members of the UK population. 2 The dose from radon while at work is discussed under occupational exposure		

Radon is a radioactive gas in the radioactive decay chain headed by uranium which is found in rocks and soils, and any materials from which they are made. The most radiologically significant radon isotopes are radon-222 and radon-220 (^{222}Rn and ^{220}Rn), which are generally known as radon and thoron respectively. In outdoor air in the UK, radon and thoron are quickly diluted and therefore their activity concentration is relatively low, but levels indoors can be significantly higher.

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The amount of radon and thoron present in air inside a building depends on many factors, such as the amount of uranium or radium in the underlying geology, the construction and materials used in the building, the heating, ventilation and usage. In addition, radon dissolved in potable water also contributes to the total radon activity concentration in indoor air. That contribution is generally small in mains supplies, although private supplies present a greater risk (Advisory Group on Ionising Radiation, 2009). As a result of all these factors, large geographical variations exist in the activity concentration of radon in air in buildings (Rees and Miller, 2017; Wrixon et al, 1988). These variations in activity concentration result in large variations in the dose received by members of the UK population.

More information on radon, including managing radon in buildings and how to find out the radon levels in your home, can be found here: UKradon - Home

Employers are required by law to assess risks to their staff while at work, including potential radon exposures. Such exposure of workers to radon is considered in the Occupational Exposures section.

Estimating exposures to radon

An individual's exposure relates to the radon level, their exposure time and breathing rate and a conversion factor to calculate radiation dose from a known radon level. In the mid-1980s, a national survey was carried out to determine the level of radon in residential buildings across the UK (Wrixon et al, 1988). Since then, further measurements have been made, although these were mostly targeted at buildings within areas of the UK that were likely to have relatively high radon levels. An updated national survey is anticipated for the 2020s, but in the meantime the 1980s national survey is still considered to provide the best estimate for the UK average indoor radon concentration in air.

Estimated air concentrations (Bq m^{-3}) and average individual doses (mSv y^{-1}) for radon and thoron in the UK

	Air concentration, Bq m^{-3}	Estimated average annual individual dose, mSv y^{-1}
Radon – indoors[1]	20	1
Radon – outdoors[1]	4	0.02
Thoron – indoors[1]	0.3	0.095
Thoron – outdoors[2]	0.1	0.01
1 Air concentration (Bq m^{-3}) taken from (Wrixon et al, 1988) 2 Air concentration (Bq m^{-3}) taken from (UNSCEAR, 2000)		

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References

Advisory Group on Ionising Radiation (2009). *Radon and Public Health. Report of the independent Advisory Group on Ionising Radiation.* Chilton (UK), RCE-11.

Rees DM and Miller CA (2017). *Radon in Homes in England: 2016 Data Report.* Chilton, PHE-CRCE-032.

UNSCEAR (2000). *Sources and Effects of Ionizing Radiation, 2000, Report to the General Assembly with annexes.* United Nations Scientific Committee on the Effects of Atomic Radiation, New York.

Wrixon AD, Green BMR, Lomas PR, Miles JCH, Cliff KD, Francis EA, Driscoll CMH, James AC and O'Riordan MC (1988). *Natural radiation exposure in UK dwellings.* Chilton (UK), NRPB-R190.