Radon 2. References

This article is a 'work in progress' incorporating new information whenever time permits.

Sections 1-10 are in Radon 1. Information

1. Building materials
2. The effect of changes in building construction techniques
3. Occupational exposures
4. Ground disturbances (earthquakes, etc.)
5. Fracking
6. Weather and seasonal changes
7. Water supplies
8. Health effects
9. Remediation
10. Measuring radon levels in your home, school and workplace

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References

Afolabi OT et al 2015 – *Radon level in a Nigerian University Campus* BMC Res Notes Nov 14;8:677 PMID: 26578086

Aït Ziane M et al 2014 – *Exposure to indoor radon and natural gamma radiation in some workplaces at Algiers* Algeria Radiat Prot Dosimetry 160(1-3):128-33 PMID: 24711531

Akbari K et al 2013 - *Influence of indoor air conditions on radon concentration in a detached house* J Environ Radioact 116:166-73 PMID: 23159846

Akkaya G et al 2016 – *Variation in the radon concentrations and outdoor gamma radiation levels in relation to different geological formations in the thermal regions of Bursa, Turkey* J Radiol Prot 36(3):490-503 PMID: 27355348

Alharbi SH & RA Akber 2015 – *Radon and thoron concentrations in public workplaces in Brisbane, Australia* J Environ Radioact 144:69-76 PMID: 25827573

Alvarez-Gallego M et al 2015 – *High radon levels in subterranean environments: monitoring and technical criteria to ensure human safety (case of Castañar cave, Spain)* J Environ Radioact 145:19-29 PMID: 25863322

Axelsson G et al 2015 – *Lung cancer risk from radon exposure in dwellings in Sweden: how many cases can be prevented if radon levels are lowered?* Cancer causes Control 26(4):541-7 PMID: 25677843

Aykamis AS et al 2013 – *Natural radioactivity, radon exhalation rates and indoor radon concentration of some*

Barbosa-Lorenzo R et al 2017 – *Residential radon and COPD. An ecological study in Galicia, Spain* Int J Radiat Biol 93(2):222-230 PMID: 27778529

Barros N et al 2015 – *Comparative survey of outdoor, residential and workplace radon concentrations* Radiat Prot Dosimetry 163(3):325-32 PMID: 24936021

Bochicchio F 2014 – *Protection from radon exposure at home and at work in the Directive 2013/59/Euratom* Radiat Prot Dosimetry 160(1-3):8-13 PMID: 24729590

Borgoni R et al 2014 – *Hierarchical modelling of indoor radon concentration: how much do geology and building factors matter?* J Environ Radioact 138C:227-237 PMID: 25261869

Bossew P et al 2013 – *Geographical distribution of the annual mean radon concentrations in primary schools of Southern Serbia – application of geostatistical methods* J Environ Radioact 127C:141-148 PMID: 24231373

Botha R et al 2016 – *Radon levels measured at a touristic thermal spa resort in Montagu (South Africa) and associated effective doses* Health Phys 111(3):281-289

Branion-Calles MC et al 2016 – *A geospatial approach to the prediction of indoor radon vulnerability in British Columbia, Canada* J Expo Sci Environ Epidemiol 26(6):554-565 PMID: 25805255

Branion-Calles MC et al 2015 – *Evaluation of different radon guideline values based on characterization of ecological risk and visualization of lung cancer mortality trends in British Columbia, Canada* BMC Public Health Nov 19; 15(1):1144 PMID: 26584618

Bräuner EV et al 2015 – *residential radon exposure and skin cancer incidence in a prospective Danish cohort* PLoS One 10(8):e0135642

Bräuner EV et al 2013 - *Residential radon and brain tumour incidence in a Danish cohort* PLoS One 8(9):e74435 PMID: 24066143

Bräuner EV et al 2012 - *Residential radon and lung cancer incidence in a Danish cohort* Environ Res 118:130-6 PMID: 22749110

Bräuner EV et al 2010 - *Is there any interaction between domestic radon exposure and air pollution from traffic in relation to childhood leukemia risk?* Cancer Causes Control 21(11):1961-4 PMID: 20607382

Briestensky M et al 2014 – *Radon, carbon dioxide and fault displacements in central Europe related to the Tōhoku earthquake* Radiat Prot Dosimetry 160(1-3):78-82 PMID: 24711525

Capello MA et al 2013 - *Radon-contaminated drinking water from private wells: an environmental health assessment examining a rural Colorado mountain community's exposure* J Environ Health 76(4):18-24 PMID: 24341157

Carrigan CR et al 2016 – *Delayed signatures of underground nuclear explosions* Sci Rep Mar 16;6:23032 PMID: 26979288

Casey JA et al 2015 – *Predictors of indoor radon concentrations in Pennsylvania, 1989-2013* Environ Health Perspect 123(11):1130-7 PMID: 25856050

Celebi N et al 2015 – *Indoor radon measurements in Turkey dwellings* Radiat Prot Dosimetry 167(4):626-32 PMID: 25389360

Chauhan V & M Howland 2014 – *Gene Expression Responses in Human Lung Fibroblasts Exposed to Alpha Particle Radiation* Toxicol In Vitro 28(7):1222-9 PMID: 24945610

Chen J et al 2014 – *Results of simultaneous radon and thoron measurements in 33 metropolitan areas of Canada* Radiat Prot Dosimetry 163(2):210-6 PMID: 24748485

Chen J 2013 - *Canadian lung cancer relative risk from radon exposure for short periods in childhood compared to a lifetime* Int J Environ Res Public Health 10(5):1916-26 PMID: 23698696

Cheng W 2016 – *Radon risk communication strategies: A regional story* J Environ health 78(6):102-6 PMID: 26867298

Choi H & P Mazzone 2014 – *Radon and lung cancer: assessing and mitigating the risk* Cleve Clin J Med 81(9):567-75 PMID: 25183848

Choi JR et al 2016 – *Gene mutation discovery research of non-smoking lung cancer patients due to indoor radon exposure* Ann Occup Environ Med 28:13 PMID: 26985396

Collignan B et al 2016 – *Relationships between indoor radon concentrations, thermal retrofit and dwelling characteristics* J Environ Radioact 165:124-130 PMID: 27693653

Cosma C et al 2015 – *Testing radon mitigation techniques in a pilot house from Băiţa-Ştei radon prone area (Romania)* J Environ Radioact 140:141-7 PMID: 25483354

Cucoş Dinu A et al 2017 – *radon levels in Romanian caves: an occupational exposure survey* Environ Geochem Health 39(5):1085-1099 PMID: 27696229

Dlugosz-Lisiecka M et al 2017 – *Indoor 222Rn concentration in the exhibition and storage rooms of Polish geological museums* Appl Radiat Isot 121:12-15 PMID: 28013151

Do Carmo Leal AL & D da Costa Lauria 2016 – *Assessment of doses to members of the public arising from the use of ornamental rocks in residences* J Radiol Prot 36(3):680-694 PMID: 27556635

Dowdall A et al 2016 – *The rate of radon remediation in Ireland 2011-2015: Establishing a base line rate for Ireland's National Radon Control Strategy* J Environ Radioact 162-163:107-112 PMID: 27227562

Druzhinin V et al 2016 – *Lymphocytes with multiple chromosomal damages in a large cohort of West Siberia residents: Results of long-term monitoring* Mutat Res 784-785:1-7 PMID: 26731314

Duan P et al 2015 – *Nonlinear dose-response relationship between radon exposure and the risk of lung cancer: evidence from a meta-analysis of published observational studies* Eur J Cancer Prev 24(4):267-77 PMID: 25117725

Edwards JK et al 2014 – *Occupational Radon Exposure and Lung Cancer Mortality: Estimating Intervention Effects Using the Parametric g-Formula* Epidemiology 25(6):829-34 PMID: 25192403

El-Kameesy SU et al 2016 – *Radiological safety assessment inside ancient Egyptian tombs in Saqqara* Isotopes Environ Health Stud 52(6):567-76 PMID: 26988604

Fan D et al 2016 – *Occupational exposure to radon in different kinds of non-uranium mines* Radiat Prot Dosimetry 170(1-4):311-4 PMID: 26940440

Forkapic S et al 2017 – *Correlation analysis of the natural radionuclides in soil and indoor radon in Vojvodina, Province of Serbia* J Environ Radioact 166(Pt 2):403-411 PMID: 27477915

Francisco PW et al 2017 – *Ventilation, Indoor air quality, and health in homes undergoing weatherization* Indoor Air 27(2):463-477 PMID: 27490066

Hinojosa de la Garza OR et al 2014 – *Lung cancer mortality and radon concentration in a chronically exposed neighbourhood in Chihuahua, Mexico: a geospatial analysis* ScientificWorldJournal 2014:935380 PMID: 25165752

Holmgren O et al 2013 – *Radon remediation and prevention status in 23 European countries* Radiat Prot Dosimetry 157(3):392-6 PMID: 23771958

Howarth C 2013 - *Long term durability of radon remedial measures in a sample of UK homes* J Radiol Prot 33(4):763-771 PMID: 24025515

Hubaux R et al 2012 - *Arsenic, asbestos and radon: emerging players in lung tumorigenesis* Environ Health Nov 22;11:89 PMID: 23173984

Hunter N et al 2015 – *Calculation of lifetime lung cancer risks associated with radon exposure, based on various models and exposure scenarios* J Radiol Prot 35(3):539-55 PMID: 26083042

Huntington-Moskos L et al 2016 – *Radon, secondhand smoke, and children in the home: Creating a teachable moment for lung cancer prevention* Public Health Nurs 33(6):529-538] PMID: 27443982

Içhedef M et al 2014 - *Two year evolution of radon emission and tectonic movements in Tuzla Fault* Seferihisar-İzmir 3;86C:102-108 PMID: 24530978

Jiránek M & V Kaćmařikova 2014 - *Dealing with the increased radon concentration in thermally retrofitted buildings* Radiat Prot Dosimetry 160(1-3):43-7 PMID: 24729563

Kang DR et al – *Trends in research on indoor radon exposure and lung cancer in South Korea* Ann Occup Environ Med Mar 8;28:10 PMID: 26962457

Kayakökü H et al 2016 – *Measurements of radioactivity and dose assessments in some building materials in Bitlis, Turkey* Appl Radiat Isot 115:172-179 PMID: 27389882

Keith S et al 2012 - Toxicological Profile for Radon Agency for Toxic Substances and Disease Registry (US) PMID: 24049860

Kendall GM et al 2016 – *Variation with socioeconomic status of indoor radon levels in Great Britain: The less affluent have less radon* J Environ Radioact 164:84-90 PMID: 27442258

Kikaj D et al 2016 – *Radon in soil gas in Kosovo* J Environ Radioact 164:245-252 PMID: 27522328

Kim SH et al 2016 – *Attributable risk of lung cancer deaths due to indoor radon exposure* Ann Occup Environ Med Feb 26;28:8 PMID: 26925236

Kitto M 2014 – *radon testing in schools in New York State: a 20-year summary* J Environ Radioact 137:213-6 PMID: 25117690

Kotrappa P et al 2013 - *Measurement of indoor and outdoor radon concentrations during Superstorm Sandy* Radiat Prot Dosimetry 157(3):455-8 PMID: 23798707

Kourtidis K et al 2015 – *Radon and radioactivity at a town overlying Uranium ores in northern Greece* J Environ Radioact 150:220-7 PMID: 26372739

Kropat G et al 2013 - *Major influencing factors of indoor radon concentrations in Switzerland* J Environ Radioact PMID: 24333637

Kumar A et al 2013 - *Modeling of indoor radon concentration from radon exhalation rates of building materials and validation through measurements* J Environ Radioact 127C:50-55 PMID: 24158045

Langlois PH et al 2016 – *Residential radon and birth defects: A population-based assessment* Birth Defects Res A Clin Mol Teratol 106(1):5-15 PMID: 25846606

Lantz PM et al 2013 - *Radon, smoking, and lung cancer: the need to refocus radon control policy* Am J Public Health 103(3):443-7 PMID: 23327258

Larionov AV et al 2016 – *DNA excision repair and double-strand break repair gene polymorphisms and the level of chromosome aberration in children with long-term exposure to radon* Int J Radiat Biol 92(8):466-74 PMID: 27285066

Laurent O et al 2013 – *Potential impacts of radon, terrestrial gamma and cosmic rays on childhood leukemia in France: a quantitative risk assessment* Radiat Environ Biophys 52(2):195-209 PMID: 23529777

Laurier D & D Gay 2015 – *[Risks associated to ionizing radiation from natural sources]* Rev Prat 65(1):74-8 PMID: 25842437

Li X et al 2016 – *Preliminary study on the variation of radon-222 inside greenhouse of Shouguang county, China* J Environ Radioact 153:120-125 PMID: 26771243

Liu X et al 2016 – *Radon-induced alterations in p53-mediated energy metabolism of malignantly transformed human bronchial epithelial cells* J Toxicol Environ Health A 79(9-10):436-41 PMID: 27267826

Madureira J et al 2015 – *Radon in indoor air of primary schools: determinant factors, their variability and effective dose* Environ Geochem Health 38(2):523-33 PMID: 26100326

Marcon AE et al 2017 – *Mutagenic potential assessment associated with human exposure to natural radioactivity* Chemosphere 167:36-43 PMID: 27705811

Martins LM et al 2016 – *Indoor radon risk associated to post-tectonic biotite granites from Vila Pouca de Aguiar pluton, northern Portugal* Ecotoxicol Environ Saf 133:164-175 PMID: 27448957

Martín Sánchez A et al 2013 - *Additional contamination when radon is in excess* Appl Radiat Isot 81:212-5 PMID: 23548693

Melloni BB 2014 – *Lung cancer in never-smokers: radon exposure and environmental tobacco smoke* Eur Respir J 44(4):850-2 PMID: 25271226

Messier KP & ML Serre 2017 – *Lung and stomach cancer associations with groundwater radon in North Carolina, USA* Int J Epidemiol 46(2):676-685 PMID: 27639278

Mohery M et al 2013 – *Radon decay products in realistic living rooms and their activity distributions in human respiratory system* Radiat Prot Dosimetry 162(3):394-9 PMID: 24324251

Mojzeš A et al 2017 – R*adon measurements in an area of tectonic zone: A case study in Central Slovakia* J Environ Radioact 166 (Pt 2):278-288 PMID: 27554707

Moldovan M et al 2014 – *Radon and radium concentration in water from North-West of Romania and the estimated doses* Radiat Prot Dosimetry 162(1-2):96-100 PMID: 25031036

Moreno V et al 2016 – *Soil radon dynamics in the Amer fault zone: An example of very high seasonal variations* J Environ Radioact 151 Pt 1:293-303 PMID: 26551588

Műllerová M et al 2016 – *Indoor radon survey in Visegrad countries* Appl Radiat Isot 110:124-128 PMID: 26774389

Műllerova M et al 2014 – *Preliminary results of indoor radon survey in V4 countries* Radiat Prot Dosimetry 160(1-3):210-3 PMID: 24723197

Műllerova M et al 2014 – *Daily and seasonal variations in radon activity concentration in the soil air* Radiat Prot Dosimetry 160(1-3):222-5 PMID: 24714111

Nafezi G et al 2014 - *Radon levels and doses in dwellings in two villages in Kosovo, affected by depleted uranium* Radiat Prot Dosimetry 158(3):331-9 PMID: 24051175

Navaranjan G et al 2016 – *cancer incidence and mortality from exposure to radon progeny among Ontario uranium miners* Occup Environ Med 73(12):838-845 PMID: 27651479

Nursan C et al 2014 - *Parent's knowledge and perceptions of the health effects of environmental hazards in Sakarya, Turkey* J Pak Med Assoc 64(1):38-41 PMID: 24605711

Oh SS et al 2016 – *Radon exposure and lung cancer: risk in nonsmokers among cohort studies* Ann Occup Environ Med Mar 9;28:11 PMID: 26962458

Olszewski J et al 2015 – *[Occurrence of radon in the Polish underground tourist routes]* Med Pr 66(4):557-63 PMID: 26536972

Oner F et al 2013 – *Measurements of radon concentrations in spa waters in Amasya, Turkey* Radiat Prot Dosimetry 157(2):221-4 PMID: 23685534

Otahal P et al 2014 – *Radon in private drinking water wells* Radiat Prot Dosimetry 160(1-3):235-8 PMID: 24714110

Pedersen C et al 2014 – *Distance to High-Voltage Power Lines and Risk of Childhood Leukemia – an Analysis of Confounding by and Interaction with Other Potential Risk Factors* PLoS One 9(9):e107096 PMID: 25259740

Petersell V et al 2017 – *Radon in the soil air of Estonia* J Environ Radioact 166(Pt 2):235-241 PMID: 27554705

Peterson E et al 2013 - *Lung cancer risk from radon in Ontario, Canada: how many lung cancers can we prevent?* Cancer Causes Control 24(11):2013-20 PMID: 23982909

Pirsaheb M et al 2016 – *The influence of internal wall and floor covering materials and ventilation type on indoor radon and thoron levels in hospitals of Kermanshah, Iran* Iran Red Crescent Med J 18(10):e25292 PMID: 28180013

Pirsaheb M et al 2013 - *A systematic review of radon investigations related to public exposure in iran* Iran Red Crescent Med J 15(11):e10204 PMID: 24719680

Rapaglia J et al 2015 – *A GIS typology to locate sites of submarine groundwater discharge* J Environ Radiact 145:10-18 PMID: 25863321

Rauch SA & SB Henderson 2013 - *A comparison of two methods for ecologic classification of radon exposure in British Columbia: residential observations and the radon potential map of Canada* Can J Public Health 104(3):e240-5 PMID: 23823889

Rossetti M & M Esposito 2015 – *Radon levels in underground workplaces: a map of the Italian regions* Radiat Prot Dosimetry 164(3):392-7 PMID: 25183837

Ruano-Ravina A et al 2014 - *Residential radon exposure and esophageal cancer. An ecological study from an area with high indoor radon concentration (Galicia, Spain)* Int J Radiat Biol 90(4):299-305 PMID: 24460133

Schram-Bijkerk D et al 2013 - *The burden of disease related to indoor air in the Netherlands: do different methods lead to different results?* Occup Environ Med 70(2):126-32 PMID: 23204013

Schwartz GG & MG Klug 2016 – *Incidence rates of chronic lymphocytic leukemia in US states are associated with residential radon levels* Future Oncol 12(2):165-74 PMID: 26515766

Serke M et al 2013 - *[Gender-specific difference in lung cancer]* Pneumologie 67(5):270-9 PMID: 23677552

Signorelli C & RM Limina 2002 – *[Environmental risk factors and epidemiologic study]* Ann Ig 14(3):253-62 PMID: 12162123

Singh P et al 2016 – *Theoretical modelling of indoor radon concentration and its validation through measurements in South-East Haryana, India* J Environ Manage 171:35-41 PMID: 26874612

Smetsers RC et al 2016 – *Ingredients for a Dutch radon action plan, based on a national survey in more than 2500 dwellings* J Environ Radioact 165:93-102 PMID: 27668987

Smyth R et al 2017 – *Radon testing in rapid access lung clinics: an opportunity for secondary prevention* Ir J Med Sci 186(2):485-487 PMID: 27083463

Søstrand P et al 2016 – *100 kBq m-3 radon activity concentration in the atmosphere of a bathroom supplied with groundwater from a gneissic rock area with consanguineous intrusions* Health Phys 111(6):559-561 PMID: 27798479

Sousa SI et al 2015 – *Radon levels in nurseries and primary schools in Bragança District – Preliminary assessment* J Toxicol Environ Health 78(13-14):805-13 PMID: 26167747

Stojanovska Z et al 2016 – *Variation of indoor radon concentration and ambient dose equivalent rate in different outdoor and indoor environments* Radiat Environ Biophys 55(2):171-83 PMID: 26943159

Tait DR et al 2013 – *Enrichment of radon and carbon dioxide in the open atmosphere of an Australian coal seam gas field* Environ Sci Technol 47(7):3099-104 PMID: 23444905

Tamari Y et al 2016 – *A report that Fukushima residents are concerned about radiation from Land, Food and Radon* J Radiat Res 57(4):418-21 PMID: 26983979

Tejado JJ et al 2016 – *Assessment of occupational exposure in a granite quarry and processing factory* J Radiol Prot 36(3):641-652 PMID: 27517327

Teras LR et al 2016 – *residential radon exposure and risk of incident hematologic malignancies in the Cancer Prevention Study-II Nutrition cohort* Environ Res 148:46-54 PMID: 27015563

Torres-Durán M et al 2015 – *Small cell lung cancer in never-smokers* Eur Respir J 47(3):947-53 PMID: 26699724

Torres-Durán M et al 2013 - *Residential radon and lung cancer in never smokers. A systematic review* Cancer Lett 345(1):21-6 PMID: 24333737

Truta LA et al 2014 – *Lung cancer risk due to residential radon exposures: estimation and prevention* Radiat Prot Dosimetry 160(1-3):112-6 PMID: 24751985

Tushe KB et al 2016 – *First step towards the geographical distribution of indoor radon in dwellings in Albania* Radiat Prot Dosimetry 172(4):488-495 PMID: 26656073

Valmari T et al 2014 – *Radon measurement and mitigation activity in Finland* Radiat Prot Dosimetry 160(1-3):18-21 PMID: 24729562

Vasilyev A & I Yarmoshenko 2017 – *Effect of energy-efficient measures in building construction on indoor radon in Russia* Radiat Prot Dosimetry 174(3):419-422 PMID:27358394

Vasilyev AV & MV Zhukovsky 2013 - *Determination of mechanisms and parameters which affect radon entry into a room* J Environ Radioact Jun 26;124C:185-90 PMID: 23811128

Vuckovic B et al 2016 – *Indoor radon and thoron concentrations in some towns of central and South Serbia* J Environ Manage 183(Pt3):938-944 PMID: 27681871

Yakut H et al 2017 – *Soil gas radon measurement around fault lines on the western section of the north Anatolian fault zone in Turkey* Radiat Prot Dosimetry 173(4):405-413 PMID: 26903173

Yang Q et al 2014 - *Uranium and Radon in Private Bedrock Well Water in Maine: Geospatial Analysis at Two Scales* Environ Sci Technol 48(8):4298-306 PMID: 24655434

Yarahmadi M et al 2016 – *Estimation of the residential radon levels and the annual effective dose in dwellings of Shiraz, Iran, in 2015* Electron Physician 8(6):2497-505 PMID: 27504164

Yarmoshenko IV et al 2014 – *Indoor radon problem in energy efficient multi-storey buildings* Radiat Prot Dosimetry 160(1-3):53-6 PMID: 24723188

Zhou X et al 2015 – *Environmental impact of CO2, Rn, Hg degassing from the rupture zones produced by Wenchuan M s 8.0 earthquake in western Sichuan, China* Environ Geochem Health 38(5):1067-82 PMID: 26486131

Zhukovsky MV & AV Vasilyev 2014 – *Mechanisms and sources of radon entry in buildings constructed with modern technologies* Radiat Prot Dosimetry 160(1-3):48-52 PMID: 24729591

Zunić ZS et al 2014 – *High variability of indoor radon concentrations in uraniferous bedrock areas in the Balkan region* Appl Radiat Isot 94:328-37 PMID: 25305525