



# Indoor Radon and Lung Cancer: National Radon Action Plans Are Urgently Required

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Radon has recently caused concern in Korea due to mattresses that were found to release radon at levels exceeding those stipulated in safety standards. Radon is a colorless, odorless, radioactive gas that forms naturally from the decay of uranium, which is found in different amounts in soil, rock, and underground water throughout the earth's crust. Radon decay produces radioactive progeny and emits significant levels of alpha radiation, the predominant form of radiation emitted as a result of radon decay. Alpha particles can attach to aerosols, which readily settle within the airways. These decay products can cause significant biological damage in exposed tissue.<sup>1,2</sup> In 1988 the International Agency for Research on Cancer, which is part of the World Health Organization, deemed that radon could cause human lung cancer in light of evidence of an increased risk of lung cancer in radon-exposed miners and classified it as "carcinogenic to humans."<sup>3</sup>

Outdoor radon concentrations are generally low because of rapid dilution by atmospheric mixing; however, radon can accumulate to harmful levels in confined, spaces such as homes and office buildings. Accordingly, indoor radon poses a substantial public health risk. Radon concentrations can vary greatly depending on a number of factors, including geographical location, temperature, and geology.<sup>1</sup> According to a distribution survey of indoor radon concentrations in most of the 30 member countries of the Organization for Economic Co-operation and Development in 2000, the average concentration in Korea (53 Bq/m<sup>3</sup>) was higher than the worldwide average concentration (39 Bq/m<sup>3</sup>).<sup>3</sup> Nevertheless, Korean population-based studies on whether indoor radon exposure affects lung

cancer incidence or mortality are scarce.

In the article that accompanies this editorial, the authors first conducted a study to quantify the public health hazard and disease burden from lung cancer deaths attributable to indoor radon exposure in Korea.<sup>4</sup> They reported that 12.5–24.7% of all lung cancer deaths in 2010 were attributable to indoor radon exposure and that those premature deaths inflicted a considerable disease burden. These values are higher than the percentage of indoor radon attributable to lung cancer deaths in the United States (10–14%) and other countries (3.3–6% in the United Kingdom, 5–12% in France, 7.8% in Canada, 5% in Germany, and 8.3% in Switzerland).<sup>3</sup> Surprisingly, the average indoor radon concentration in the present study was 92.0 Bq/m<sup>3</sup>, which was higher than the average of 53 Bq/m<sup>3</sup> reported in 2000. These results indirectly indicate that effective and feasible national strategies for indoor radon control in Korea are needed.

A recent meta-analysis of indoor radon and lung cancer risk that included 25 lung cancer case-control studies with 13569 cases and 22701 controls showed that indoor radon exposure is significantly associated with an increased risk (relative risk 1.19) of lung cancer.<sup>5</sup> Radon exposure is the second leading cause of lung cancer following smoking and much more likely to cause lung cancer in people who smoke. A synergism between lung cancer risk, radon exposure, and smoking may affect not only active smokers, but also second-hand smokers.<sup>2</sup> Therefore, efforts for radon mitigation should be accompanied by a general anti-smoking policy. The authors estimated that 3.2–4.7% of all lung cancer deaths may be prevented annually if all homes in Korea with radon levels above 148 Bq/m<sup>3</sup> are effectively remediated. Furthermore, the authors suggested that effective mitigation strategies aimed at lowering indoor radon concentrations could help reduce lung cancer deaths and disease burden.

Indoor radon exposure is clearly an important environmental health hazard to the general population. The present article pertaining to Korea is an important contribution that indicates the need to be aware of indoor radon exposure because of its potential to cause lung cancer and will stimulate further re-

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search. The study also indirectly suggests that effective national action plans for indoor radon mitigation as a means to protect public health are urgently required.

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