

US EPA ARCHIVE DOCUMENT

Iowa Radon Lung Cancer Study

Note: EPA no longer updates this information, but it may be useful as a reference or resource.

"Residential Radon Gas Exposure and Lung Cancer"

American Journal of Epidemiology, June 2000
by: R. William Field, Daniel J. Steck, Brian J. Smith, et al

Study Population

Female Iowa residents, age 40-84 years, both non-smokers and ever smokers, who had lived in their current home for at least 20 consecutive years and completed year-long radon measurements. Included 413 lung cancer cases (86.4% ever smokers) and 614 controls (32.5% ever smokers)

Background

The Iowa radon lung cancer study had four major components: 1) rapid reporting of cases; 2) a mailed questionnaire followed by a face-to-face interview; 3) a comprehensive radon exposure assessment; and, 4) independent histopathologic review of lung cancer tissues

The rapid case reporting allowed personal interviews with a high percentage (69 %) of cases, providing much more accurate information than can be obtained by interviewing relatives. This study represents the most detailed attempt, to date, to reconstruct total individual radon exposure. Exposure reconstruction included on-site measurements of home radon with year-long tests on every level of the home, in current & historical bedrooms, and in "in-home" work areas. These in-home measurements were linked with individual movements within the home. Outside exposure, as well as exposures in other buildings, was included in the reconstruction. The independent tissue review (performed on 96% of lung cancer tissues) provided a reliable classification of lung cancer cases.

Results

"The risk estimates obtained in this study suggest that cumulative [total] radon exposure in the residential environment is significantly associated with lung cancer risk." After adjusting for age, smoking, and education, and using categorical radon exposure levels, a 15 year exposure at levels equivalent to EPA's action level of 4 pCi/L yielded excess odds of 0.50 i.e., an increase in lung cancer risk of 50% (95% confidence interval: 0.004, 1.81) for total cases and excess odds of 0.83 for cases with personal interviews i.e., an increase in lung cancer risk of 83% (95% confidence interval: 0.11, 3.34). The higher risk found for cases with personal interviews vs. the total cases most probably reflects the more accurate exposure assessment obtained from interviews with cases vs. interviews with relatives.

EPA's View of the Study

The Iowa study is exceptionally well designed and well executed. It adds to the body of knowledge which designates residential radon as the second leading cause of lung cancer. It supports EPA's position and the National Academy of Sciences' Institute of Medicine's 1999 report that radon exposure in homes is a public health problem. It confirms EPA's, the Center for Disease Control's, and the Surgeon General's positions that all homes should be tested for radon, and all homes testing over 4 pCi/L should be fixed. In terms of scientific advancements, the study breaks new ground in estimating total individual radon exposure.

Link to Study

University of Iowa Center for Health Effects of Environmental Contamination Press Release
www.cheec.uiowa.edu/misc/radon.html contains the Press Release; Abbreviated Findings; Study Methodology; Questions and Answers About the Study; and, Study Contact and Additional Radon Information.

Quotes

To: R. William Field, Ph.D.
College of Public Health, Department of Epidemiology
University of Iowa, Iowa City, Iowa

I wanted to commend you on your Iowa Radon Lung Cancer Study. I believe the methods you used to reduce the inherent random error associated with ascertaining long-term residential radon exposure are critical to validly assessing the lung cancer risk from this source. As you correctly point out the random error in estimating radon exposure has the potential to substantially underestimate the slope of the dose-response curve. Your estimates of risk are similar to my own in our study of lung cancer among Missouri women, where we used historic estimates of radon exposure from cumulative measures of radon progeny in glass. I believe that most studies published to date have been ineffective in reducing measurement error and their dose-response results have suffered from a bias toward the null. I look forward to the discussion your results will generate and urge you to complete the analysis of you radon progeny in glass measurements data. Along with your current manuscript, that data should help clarify the true nature of the dose-response curve between residential radon and lung cancer risk. Again congratulations on a job well done.

Signed:
Michael Alavanja, Dr. P.H.
Senior Investigator, Division of Cancer Epidemiology and Genetics, National Cancer Institute

"The Iowa Study is a significant addition to our already strong understanding of indoor radon and lung cancer. Its particular importance lies in the careful methodologic work done by the investigators on some nagging scientific issues--particularly the estimation of lifetime exposure to radon."

Signed: Dr. Jonathan Samet, Professor and Chairman, Department of Epidemiology, School of Hygiene and Public Health, Johns Hopkins University, Baltimore, Maryland.