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LETTERS TO THE EDITOR

RE: "RESIDENTIAL RADON GAS EXPOSURE AND LUNG CANCER: THE IOWA RADON LUNG CANCER STUDY"

In their study of residential radon gas and lung cancer risk in Iowa, Field et al. (1) reported a substantially higher excess relative risk of lung cancer at the US Environmental Protection Agency (EPA) action level (4 pCi/liter (148 Bq/m^3)) than was previously reported by Lubin and Boice (2) in a combined analysis of eight case-control studies. Using categorical analysis, Field et al. (1) reported excess relative risks ranging from 0.50 for all cases to 0.83 for live cases only, while Lubin and Boice (2, 3), using combined analysis, reported a summary odds ratio of 0.18 at 4 pCi/liter. Field et al. conjectured that the "enhanced radon dosimetry" of their study (including minimizing the need to impute missing values through the imposition of a 20-year residency requirement, accounting for spatial differences in radon concentration in the home and outside the home, and conducting the study in Iowa, the state with the highest radon levels) reduced random exposure misclassification, thereby more accurately quantifying lung cancer risk from residential radon exposure.

We reached a similar conclusion in our 1999 report (4), in which we observed a significant excess relative risk of 0.95 at the EPA action level when radon was measured with surface monitors. Surface monitors take advantage of the fact that, following recoil, a known portion of the first long-lived radon progeny, lead-210 (half-life: 22 years), becomes embedded in glass surfaces in homes (5). The alpha activity of polonium-210, a decay product of lead-210, is measured in glass objects in the home and serves as a long term cumulative exposure meter for residential radon. In this way, we eliminated the need to impute radon levels in previous homes or account for year-to-year variability.

All residential radon studies prior to those carried out by Field et al. (1) and Alavanja et al. (4) made the implicit assumption that a measurement made in the present accurately reflects conditions over the previous 20–40 years. This may be somewhat problematic (6). Substantial year-to-year variability in radon concentrations has been routinely observed in homes (7), making it clear that a radon measurement made at a single point in time, even if measurement continued for an entire year, can result in increased exposure misclassification. We demonstrated, through a Monte Carlo simulation, that an excess relative risk as large as ours could be reduced and even disappear at exposure misclassification levels of 60 percent and 170 percent, respectively (4).

Ongoing field testing of surface monitors by our group and by other researchers should soon help us evaluate the accuracy of this technique in different environments. With these and other etiologic studies just emerging from the field, it is still too soon to conclude that the 18,600 lung cancer deaths per year attributed to residential radon exposure in the United States (8) is a substantial underestimate. However, the two most recent epidemiologic studies of residential radon that have used techniques to minimize cumulative radon exposure misclassification (1, 4) suggest that it might be.

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THE AUTHORS REPLY

We thank Alavanja et al. (1) for their supportive comments regarding the need to minimize retrospective radon exposure misclassification in case-control studies that examine the risk posed by residential radon exposure. We are in agreement concerning the potential usefulness of glass-based retrospective radon progeny (RRP) detectors (2, 3). These novel detectors may further increase the accuracy of RRP exposure estimates. The Iowa Radon Lung Cancer Study used both traditional radon gas detectors and glass-based radon RRP detectors. However, the initial study find-

ings (4) utilized data generated by contemporary radon gas measurements linked to retrospective subject mobility. Following future field and laboratory calibration of the glass-based detectors in varying depositional environments, we plan to conduct a reanalysis of risk estimates for the Iowa Radon Lung Cancer Study based on the glass-based RRP measurements. The glass-based detector calibrations and ongoing detector intercomparisons (5) between studies provide a basis for both further improvement of RRP exposure estimates and pooling between studies of similar design that utilize glass-based RRP detectors.

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