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TARGETING TOWNS FOR ADDITIONAL INDOOR RADON MEASUREMENTS

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ABSTRACT

The New York State Department of Health is mapping the radon levels for every town and city in the State. The maps should be ready for distribution by September, 1998. For many towns, there are few indoor radon measurements and the radon levels for these towns have been determined using correlations to surficial geology. A project has been initiated to target towns for additional measurements that currently have few measurements and that are considered to have above average levels of indoor radon based on the surficial geology of the town. The intent of the project is to obtain about 20 additional measurements for the targeted towns and to compare the measurement results with the predictions based on geology. Initial results for 16 towns will be available by mid-1998. The procedures used to obtain the additional measurements and the comparison of measurement and predicted results will be discussed.

INTRODUCTION

The New York State Department of Health has been distributing indoor radon detectors for over 10 years, accumulating some 45,000 basement short-term (2-4 day) measurements using charcoal canisters. From these data and digitized surficial geologies, the geometric mean and percent of homes with $\geq$ 4 pCi/L of indoor radon are being estimated for each town and city in the State. The methodology for estimating radon potential from a combination of measurements and surficial geology was presented in the 1996 and 1997 AARST meetings (Kunz et al 1995, ibid. 1996). While previous publications have discussed various aspects of the relationship of the surficial geology to indoor radon concentrations in the State (Laymon et al. 1990, Kunz et al. 1988), the two factors that are most important in controlling radon entry from soil into homes and buildings are the soil source strength for emanating radon and the permeability of the soils for gas flow.

Despite efforts to increase indoor radon measurements throughout the State, many towns have an insufficient number of measurements to confirm our estimates of high radon levels. Obtaining additional measurements for these towns would provide a valuable comparison to the radon levels estimated based on surficial geology. While dozens of towns in the State have less than five measurements, scores more have less than the 30 measurements necessary to obtain a standard error of about 20% in the geometric means. An objective of this study was to obtain additional measurements in 31 towns considered to be at high risk for indoor radon to corroborate our estimates.

PROCEDURES

Using our database of over 45,000 measurements, a list was compiled of towns with few measurements ($\leq$5) but containing homes estimated to have geometric mean basement concentrations above 3 pCi/L. As these towns have few measurements, current estimates are based primarily on surficial geology correlations. The 31 selected towns reside in 20 counties distributed over a broad region of the State (Figure 1). Information on single-family homes in each town was extracted from the Real Property tax database. Homes located in the town but with a tax-database mailing address located outside the town were excluded, as these homes are often summer residences or rental properties. As several postal addresses often served a single town, the Real Property addresses were necessary to verify the location of each home in the town. Though 100 participants were sought for each town, low populations of eligible homeowners resulted in the number of applications to be as low as 65. On the average, 96 homes per town were targeted. Mailing addresses were printed from the Real Property database directly to the envelopes. The study is comprised of two mailout campaigns, with 16 towns targeted in February 1998 and 15 towns targeted for October 1998.

Each targeted home received a package containing a cover letter explaining the study, a page describing radon and its' risks, and a dated detector application. Participants returning the applications were sent a 3" charcoal detector which, following exposure, was sent by the homeowner to the contracted laboratory (RTCA) for analysis.

RESULTS

Of the 1532 detector applications sent to homes located in the initial 16 towns, 84 letters were returned due to delivery problems and 583 radon detectors were mailed to responding participants. Only 164 detectors were returned by participants for measurement by the contracted laboratory, resulting in 38% and 11% return rates for the applications and detectors, respectively. Of these only 99 detectors were placed in basements and are included in this study. The number of detectors requested but not returned to the laboratory for analysis was substantial and costly.

Results, summarized in Table 1, were log-normally distributed with a geometric mean of 4.1 pCi/L and maximum of 66 pCi/L. Though the data are limited to less than the desired $\geq$30 participants, for many cases there was fairly good agreement between estimated and measured radon concentrations. In general, geometric means of the measurements are lower than that estimated based on surficial geology. This is expected for towns targeted in high-risk counties where the estimated radon potential is based on correlations to surficial geology units in neighboring towns of high mean concentrations. For counties with high variability in permeability or soil source strength, radon estimates based on geologies in one town may not be applicable to all towns in the county. Due to the few number of measurements obtained, some very high measurements in certain towns resulted in high geometric means and poor agreement with the estimates based on surficial geology.

CONCLUSIONS

This study used analyses of surficial geologies to identify towns with few measurements which are estimated to have a large percentage of homes with ≥4 pCi/L of indoor radon. A mailout campaign targeting 16 towns in 11 counties was conducted in early 1998 to obtain additional measurements for comparison to estimated radon concentrations. An additional 15 towns in nine different counties are targeted for late 1998. The targeting methodology utilized tax addresses from the Real Property database, thus assuring location of the homes in the targeted town. A goal of the study was to gain ≥20 additional measurements in each targeted town. The response from the initial mailout campaign indicates that additional efforts must be made in the second mailout to encourage residents to expose and return the requested detectors to assure a statistically-significant number of measurements are obtained.

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Table 1. Geometric mean indoor radon concentrations (pCi/L) estimated for 16 targeted towns compared to measured values. Starred towns (*) are targeted for October 1998 mailout.

County	Town	# Measurements	Estimated	Measured
Allegany	Willing	13	3.9	13.8
Cattaraugus	Machias	0	3.1	*
Cayuga	Sempronius	3	4.5	*
Chautauqua	Cherry Creek	1	3.1	*
Chenango	Coventry	22	3.1	1.5
Chenango	McDonough	7	3.2	1.9
Columbia	Gallatin	15	4.2	2.9
Cortland	Cuyler	9	4.7	2.6
Cortland	Harford	8	6.4	1.3
Delaware	Kortright	2	3.3	*
Delaware	Tompkins	3	3.2	*
Greene	Lexington	10	3.0	3.0
Herkimer	Webb	16	3.2	1.8
Livingston	Ossian	1	3.6	*
Livingston	Sparta	3	3.7	*
Madison	Lincoln	10	2.9	2.3
Oneida	Bridgewater	3	4.0	*
Oneida	Western	2	3.2	*
Otsego	Pittsfield	16	3.9	4.1
Otsego	Plainfield	12	3.8	2.2
Otsego	Roseboom	12	3.5	4.6
Saratoga	Hadley	3	3.2	*
Schoharie	Broome	11	3.0	2.3
Schuyler	Cayuta	11	3.4	6.0
Steuben	Bradford	1	6.4	*
Steuben	Fremont	4	6.2	*
Steuben	Troupsburg	1	5.3	*
Washington	Granville	13	4.0	3.9
Washington	Hampton	13	3.6	2.3
Wyoming	Middlebury	5	3.4	*
Wyoming	Pike	1	4.8	*

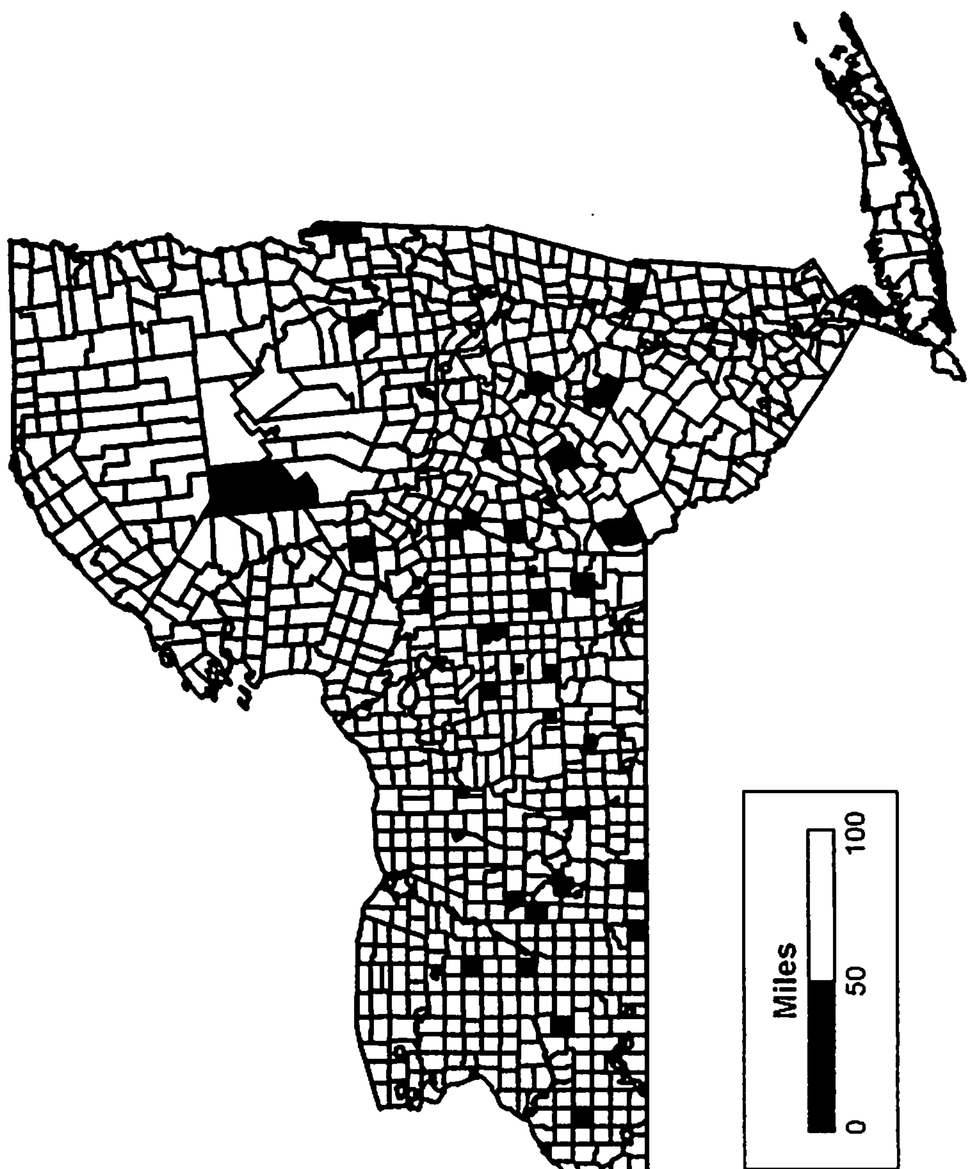

Figure 1. Location of 31 high-risk towns targeted for additional indoor radon measurements.