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A Qualitative Study of Realtor Knowledge, Attitudes, and Practices Related to Radon Health Effects: Implications for Comprehensive Cancer Control

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Abstract

BACKGROUND: Lung cancer is the leading cause of cancer-related deaths in the United States, and radon exposure is the second leading risk factor. Fewer than 25% of existing U.S. homes have been tested for radon, and only 5%–10% of new homes use some form of radon prevention.

OBJECTIVE: This qualitative study sought to determine radon-related knowledge, attitudes, and practices among Realtors to inform cancer control activities at local and state levels.

METHODS: We conducted focus groups with Realtors in four states to collect information about knowledge, attitudes, and practices regarding radon.

RESULTS: Realtors reported obtaining information on radon in similar ways, being aware of radon and its characteristics, and dealing with radon issues as a normal part of home sales. Differences in attitudes toward testing varied across states. Realtors in states with radon policies generally expressed more positive attitudes toward testing than those in states without policies. Radon mitigation was identified as an added expense to buyers and sellers. Realtors cited concerns about the reliability and credibility of mitigation systems and installers.

CONCLUSIONS: These findings suggest that attitudes and practices vary among Realtors and that additional educational resources about radon as a cancer risk factor may be beneficial. When comprehensive cancer control programs update their plans, they may want to add objectives,

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strategies, or activities to reduce radon exposure and prevent lung cancer. These activities could include partnering with Realtors to improve their knowledge, attitudes, and practices about radon, as well as developing and distributing radon educational resources.

Keywords

radon; cancer; lung; environment

Introduction

Lung cancer is the leading cause of cancer-related death in the United States [1]. Radon exposure is estimated to be the second leading risk factor for lung cancer, causing approximately 21,000 cases of lung cancer per year [2–3]. Pooled studies in the United States, Europe, and China have found that radon is an independent risk factor for lung cancer, regardless of smoking status [4–6]. Radon is an invisible, odorless, and tasteless gas that easily enters homes through cracks in walls, floors, or foundations. The U.S. Environmental Protection Agency (EPA) estimates that 1 in 15 homes in the United States (approximately 7 million homes) have high radon levels [7]. Reducing the number of people living in homes with high concentrations of radon is the focus of two Healthy People 2020 objectives and the subject of a Call to Action from the U.S. Surgeon General [8]. Despite these objectives and recommendations, fewer than 25% of existing homes are estimated to have been tested for radon, and only 18% of homes with radon levels that exceed EPA intervention levels sold during 1990 to 2006 have been mitigated. Only 5%–10% of newly constructed homes have some form of radon prevention in place [9–10].

The Centers for Disease Control and Prevention's (CDC's) National Comprehensive Cancer Control Program (NCCCCP) supports radon control activities across the country [11]. The NCCCCP provides funds and technical support to form cancer coalitions as part of comprehensive cancer control efforts in states, tribes, and territories. Coalitions are composed of government, academic, nonprofit, and volunteer organizations and individuals that work together to develop formal plans to prevent and control cancer in their communities. A 2011 review of comprehensive cancer control (CCC) plans indicated that less than half identified radon as a carcinogen [12]. Since 2011, the NCCCCP has worked to increase awareness of radon among CCC programs through the *Promising Practices Brief for Radon* [13]. As of 2015, 37 plans recognized radon as a carcinogen, and 32 had measurable activities designed to reduce radon exposure [14].

The NCCCCP and CCC coalitions can play an important role in reducing radon exposure by providing education and information to home buyers and owners, and promoting system and environmental changes to ensure that existing radon testing and mitigation policies are followed. Because radon is mainly concentrated in homes, and existing policies are typically enforced during the home-buying process, Realtors can provide valuable insight about radon. However, little is known about their knowledge, attitudes, and practices on this topic. We conducted focus groups with Realtors in four states to better understand their knowledge, attitudes, and practices regarding radon, with the goal of informing future cancer control activities in the NCCCCP.

Methods

This study was reviewed and approved by a CDC Institutional Review Board (protocol #6491) and the Office of Management and Budget (OMB #0920–1051). All participating states deferred to the CDC IRB review.

Study Design

We conducted three focus groups in each of four states, for a total of 12 groups, with an average of 5–10 participants per group. The four states—Illinois, Minnesota, North Carolina, and Ohio—were chosen because they had a variety of radon policies. At the time of the study, Illinois and Minnesota had radon notification policies, Illinois and Ohio had state-managed licensing requirements for radon professionals, and North Carolina had no policies. We used both inductive and deductive approaches within a thematic analysis to identify relevant key themes across the four states [15].

Development of Focus Group Moderator Guide

The goal of this study was to understand the level of radon knowledge among Realtors and to assess whether they were sharing their knowledge with clients. We developed a focus group moderator guide that included open-ended questions on radon, as well as additional probes to stimulate discussion among participants (Table 1). To maintain consistency across the groups, all questions were asked during each focus group session, and the same moderator led all discussions.

Focus Group Recruitment

We worked with each state's board of realtors to recruit focus group participants. Purposeful sampling was used to select states and counties to represent a geographically diverse sample from states with different radon policies (Table 2). We collaborated with the National Association of REALTOR® (NAR) [16], the largest trade association involved in all aspects of the residential and commercial real estate industry, to recruit Realtors to participate in the focus groups. To be eligible, participants had to be members of the NAR or an equivalent state or local organization and be working full-time as a Realtor with clients interested in buying or selling a single-family home in the study catchment area. Limiting eligibility to association members ensured that participants met nationally recognized criteria for professionals in this field. Exclusion criteria were inability to participate in a focus group in English, inability to complete an hour-long focus group in one session, and involvement with radon testing or mitigation as a volunteer or professional. To maximize unbiased participation, potential participants were not told at recruitment that radon would be discussed. Instead, they were asked to participate in a focus group discussing how environmental contaminants may affect potential buyers. Recruitment was done by e-mail. Potential participants were offered a \$30 Visa gift card for their participation in the focus group.

Focus Group Logistics

Focus groups were conducted from June to August 2015. All focus groups were recorded using two recording devices, and written notes were taken during the discussions. To provide

anonymity, each participant was assigned a prepopulated number that was used when referring to them during discussion. Written notes included both verbal (e.g., speaker identification by number) and nonverbal cues (e.g., participants nodding in agreement to a statement or anyone exiting and returning to the room). The audio files were transcribed verbatim by a professional transcription service. All potentially identifying information was omitted during transcription (e.g., client names mentioned by Realtors). Transcribed focus group data were uploaded into Atlas.ti (version 6.2.28) [17] software for analysis.

Codebook Development and Coding

We developed a codebook to code the focus group data to ensure a high level of dependability [18] in the analysis. Similar patterns, codes, and themes were identified, which contributed to the rigor and dependability [19] of analysis. Our approach to coding and analysis was based on currently recommended analytic procedures for focus groups [20] and was an iterative process. Large segments of the data were coded initially by one coder. Over the course of the analysis, codes were reviewed and compared across transcripts to ensure accurate coding. We also limited the number of codes by condensing some of the codes into larger codes, to ensure organization of data for analysis [21] and utility of codes. A constant comparative method was used, in which the coding strategies and findings were compared across transcripts [15]. A second analyst reviewed the codebooks and examples of how the codebook was applied to the focus group data to establish interrater agreement [18, 22]. The second analyst did not identify any discrepancies in the coding.

Results

Analysis of the focus group findings of Realtors' knowledge and attitudes related to radon (Table 3) found the following thematic codes to be most prominent: 1) source of radon information for Realtors, 2) Realtor awareness of radon and its characteristics, and 3) radon's effect on home sales. Realtors reported several common sources of radon information, including professional organizations (e.g., national or state associations), certification or continuing education classes, required radon brochures (for states with a notification policy), Internet (including government websites), and professional experiences (e.g., interactions with inspectors, builders, and other Realtors). Realtors in Ohio said they also received information from the internet, including government websites and electronic professional newsletters.

Realtors were aware that radon was an environmental health issue. They were also aware of radon characteristics and home and geographic features that indicate higher risk of the presence of radon. When identifying characteristics of radon, Realtors generally focused on features associated with the presence of radon, such as it being an odorless, colorless gas and its association with lung cancer. Realtors also identified that radon is released from the ground, that basements and sump pumps are entry points for radon in homes, and that homes with limited ventilation can have high levels of radon. For example, in homes where air conditioning is used most of the year, windows may not be opened as often, which could increase radon levels. Realtors also emphasized that certain geographic areas were more affected by radon than others. North Carolina Realtors stated that regions of the state closer

to the mountains have more radon. Ohio Realtors reported that radon is naturally occurring in Ohio because of shale layers in the state. Realtors in Illinois, North Carolina, and Ohio identified other environmental factors that could affect radon levels. For example, one Illinois Realtor stated, “I’ve also heard levels are higher after it rains. I don’t know how that affects radon levels.”

Realtors agreed that radon was an issue that arose during homes sales. They also reported that discussions about radon or its presence in a home did not automatically have a negative effect on home sales. Realtors identified radon testing and mitigation as part of home sales. These obligations were discussed by Realtors as negotiable items during sales that could benefit the interests of both the buyer and seller. Realtors generally discussed radon and homes sales in terms of the financial issues it raised between buyers and sellers. One Realtor stated that “it’s more financial than health.”

Disclosure of radon was identified as an important aspect of home sales by all focus groups, although participants in Ohio reported more skepticism about the issue than those in other states (Table 4). Ohio Realtors said they focus on ensuring that clients are not overly alarmed about disclosure of elevated radon levels, and that their role is to decrease any anxiety that clients may have. They indicated that their radon discussions typically took place during general discussions about the environmental health of a home. Illinois Realtors discussed how they could guide clients to credible radon information so they can make informed decisions during home sales. Realtors in Illinois and Minnesota placed boundaries on their roles in this process. For example, both Illinois and Minnesota Realtors said they were not “experts” and could only guide their clients to more information after the disclosure process. North Carolina Realtors said their discussions varied across the state because of variations in radon levels. They noted that disclosure may be more relevant in areas with high radon levels.

Realtors in Illinois and Minnesota reported that radon tests are necessary, credible, and reliable. Realtors in North Carolina were concerned about the accuracy of results because no clear standard for radon testing exists. This perspective appeared to be based on Realtors’ knowledge of test fluctuations and the different types of tests used, as well as how environmental factors (e.g., ventilation in the home, weather conditions) could affect tests. North Carolina Realtors did not reject radon testing as a recommended process in home sales, but discussed the topic in a way that reflected critical, questioning perspectives. Ohio Realtors were skeptical about radon testing in general, linking it to financial gains for small businesses and questioning the reliability of test results. Methods and motivations of radon testing were called into question. Environmental conditions, identified as skewing test results, were highlighted as challenges to credibility.

Most Realtors felt that it was necessary to mitigate radon, with those in Ohio being more skeptical about this issue. Although Ohio Realtors questioned mitigation, they said it was a necessary part of home sales that they discussed with clients to avoid litigation. Realtors felt that the reliability of mitigation systems and the quality and credibility of mitigation installers varied. They also felt that mitigation costs were expensive, and they noted that some sellers do not want to pay for mitigation. Realtors across all states said they let their

clients do their own research on whether to install mitigation systems and which systems to use.

Discussion

Our findings indicate that radon attitudes, knowledge, and practices vary among Realtors in the United States. Although most had heard of radon, knew where to get radon information, and followed existing policies that pertained to them, some were concerned about the quality, value, and cost of radon testing and mitigation. Specific types of radon-related activities identified in cancer plans include, improving awareness of radon as a risk factor for lung cancer, increasing residential radon testing, supporting radon mitigation, supporting education or increasing implementation of existing radon policy, and evaluation of existing radon policies [12, 14] Given these findings, increased dissemination of accurate and timely information that reduces skepticism and anxiety may help establish and maintain a productive dialogue about radon testing and mitigation between Realtors and clients. In addition, easily accessible and factual information on reliable testing methods and standards for radon mitigation could also be made available and disseminated to increase awareness of appropriate standards of radon control. Realtors have reported on past surveys that they find the most value in technology tools that help them conduct business effectively and conveniently. For example, one survey found that 93% of Realtors use smartphones to conduct business [23]. Therefore, the most efficient way to get information to Realtors, as well as to people buying and selling homes, may be electronically through smartphone applications. However, because potential for radon exposure can differ by geographic area [10], this approach may not work in all areas.

Another approach is to distribute information through local CCC programs and coalitions. These programs and coalitions are established in their communities and are working to eliminate health disparities at local levels [11]. There are federal and state programs to help fund radon reduction in homes that are affordable to limited income families (www.epa.gov/radon/sirgprogram.html). One way to reduce disparities would be to leverage existing resources [7–8, 10, 13] to reduce radon exposure in areas with high concentrations of low-income residents. For example, CCC programs and coalitions could use these resources to educate residents on the risks of radon exposure, test residences and buildings (including schools), remediate residences where necessary, and educate community leaders about radon testing and radon-resistant building designs [12]. Efforts made to increase radon testing and mitigation can be easily measured and evaluated through educational sessions, policy evaluation activities, or test kit distribution.

In 2014, a total of 155,526 people in the United States died from lung cancer, making it the deadliest type of cancer [1]. However, the participants in the focus groups in our study focused on financial concerns, not radon as a health issue, indicating the need for increased communication about the harmful health effects of radon and its association with cancer. Radon is the second leading cause of lung cancer [24]. The NCCCP can continue to communicate the relationship between radon exposure and lung cancer, thereby increasing the visibility of radon as an important health issue. These efforts could lead to an increase in radon testing and mitigation, ultimately reducing radon-related lung cancer.

This study is subject to some limitations. As with all qualitative research, our findings are only representative of those who participated in the focus groups and may not be generalizable to all Realtors within or outside the states examined. In addition, an inherent limitation of focus groups is that participants may feel pressure to agree with other participants or give a socially desirable answer.

Conclusion

CCC programs and coalitions could work to leverage existing resources to prevent radon exposure in their communities. When programs update their CCC plans, they could add objectives, strategies, and activities to reduce radon exposure and prevent lung cancer. These efforts could include partnering with Realtors and Realtor associations to improve knowledge, attitudes, and practices among Realtors about the risks of radon exposure. CCC programs could also develop and distribute radon educational resources to this population. In areas with high radon exposure, programs could consider adding specific objectives and strategies to reduce exposure and prevent lung cancer and allocate their resources accordingly. Cancer programs could also collaborate with their state radiation control program to further leverage existing partnerships and help create new partnerships to expand outreach and education to Realtors.

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Table 1.

Sample focus group questions and probes.

| Question | Probe |
|---|--|
| What do you know about radon? | Have you heard or read anything about whether exposure to radon is harmful? |
| Has radon ever been an issue in your decisions as a Realtor during the home-buying process? | Tell me more about how it came up and how it affected you. |
| Have you ever had to interact with a home inspector or other person who tested or treated a home for radon? | Did certification of a radon tester affect your or your clients' decisions related to radon in any way? |
| What laws have you heard about regarding radon in homes? | Has radon ever been a factor in your clients' decisions during the home-buying process? |
| | After distributing a notification sheet and informational brochure specific to radon that is required in Illinois: How do you think it would affect the home-buying process if you, the buyer, and the seller reviewed and had to sign a notification sheet? How do you think the information from this radon packet would affect your clients during the closing process? |

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Table 2.

Summary of radon focus groups conducted in four state.

| State | No. of Focus Group Participants^a | Sex of Participants | Average Length of Focus Group |
|----------------|--|----------------------------|--------------------------------------|
| Illinois | 18 | 4 men, 14 women | 43 minutes |
| Minnesota | 15 | 7 men, 8 women | 52 minutes |
| North Carolina | 30 | 10 men, 20 women | 50 minutes |
| Ohio | 23 | 8 men, 15 women | 45 minutes |

^aAcross all three focus groups held within each state.

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Table 3.

Radon knowledge and attitudes among focus group participants

| State ^a | Realtor source of radon information | Realtor awareness of radon characteristics | Radon effect on home sales |
|--------------------|--|---|--|
| Illinois | <ul style="list-style-type: none"> Professional organizations: national or state associations^b CDC or Illinois Environmental Protection Agency Professional experience Realtor licensure classes Realtors do their own research (media, Internet) Professional networks of Realtors | <ul style="list-style-type: none"> Aware of radon characteristics, home and geographic features, and radon as an environmental health issue^b | <ul style="list-style-type: none"> Radon creates concerns^b Disclosure laws did not change how Realtors did business during home sales^b Issues surrounding radon could “shut down” sale^b Seller must disclose during sale^b Buyer may want lower price if radon present^b |
| North Carolina | <ul style="list-style-type: none"> Professional organizations: national or state associations^b Realtor licensure classes Continuing education classes Professional networks of Realtors | <ul style="list-style-type: none"> Aware of radon characteristics, home and geographic features, and radon as an environmental health issue^b Identified that regions of the state closer to the mountains have more radon | <ul style="list-style-type: none"> Mitigation system can create concern in homes sales: does not guarantee low levels of radon^b Mitigation system may also be selling point in homes^b Radon testing does not negatively affect home sales^b |
| Minnesota | <ul style="list-style-type: none"> Real estate classes^b Continuing education State required disclosure form Home inspectors Realtors do their own research (media, Internet) Professional networks of Realtors | <ul style="list-style-type: none"> Aware of radon characteristics, home and geographic features, and radon as an environmental health issue^b | <ul style="list-style-type: none"> “Not out of the norm” to address radon issues during home sales^b Radon should be addressed up-front in home sales for safety and resale of home^b |
| Ohio | <ul style="list-style-type: none"> Internet^b U.S. Environmental Protection Agency website^b | <ul style="list-style-type: none"> Aware of radon characteristics, home and geographic features, and radon as an environmental health issue^b Reported that radon is naturally occurring in Ohio because of shale layers in the state | <ul style="list-style-type: none"> Uncommon for radon to negatively affect or shut down home sale^b Radon affects decision of buyers^b Homes sales not affected because Realtor informs client that mitigation is available^b |

^aIllinois and Minnesota have radon notification policies, Illinois and Ohio have state-managed licensing requirements for radon professionals, and North Carolina has no radon-related policies.

^bConsensus was achieved for this statement among participants during each focus group.

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Table 4.

Radon-related practices among focus group participants

| State ^a | Radon Disclosure | Radon Testing | Radon Mitigation |
|--------------------|---|--|---|
| Illinois | Important to disclose information and direct client to correct information to make informed decision. | Credible, reliable, necessary. | Necessary to mitigate. Could affect home sales because of cost. Need to be negotiated during home sales. |
| North Carolina | Disclosure more important in some regions of state than others because of variations in radon across the state. | Concerns regarding testing; no clear standards. | Questions regarding effectiveness of mitigation systems. Could affect home sales because of costs. Need to be negotiated during home sales. |
| Minnesota | Important to disclose information and direct client to correct information to make informed decision. | Credible, reliable, necessary. | Necessary to mitigate. Could affect home sales because of cost. Need to be negotiated during home sales. |
| Ohio | Skeptical, but important to have discussion regarding radon for client and Realtor liability. | Skeptical regarding testing processes and results. | Skeptical regarding mitigation. However, necessary part of home sales. |

^aIllinois and Minnesota have radon notification policies, Illinois and Ohio have state-managed licensing requirements for radon professionals, and North Carolina has no radon-related policies.