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Understand public health workers personal practices about radon gas exposure

Paschal Nwako Ph.D., MPH, REHS, DAAS[1, *]

[1]Camden County Health Officer & Public Health Coordinator

[*]**Corresponding Author:** Paschal Nwako Ph.D., Camden County Health Officer & Public Health Coordinator

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Abstract

This study evaluated whether there are differences in personal practices about radon gas exposure among public health nurses, health educators, health officers, and registered environmental health specialists. Three hundred and eighty-six employees that worked in a public health department participated in the survey. A significant interaction was found (x^2 (12) = 84.75, p<.01). This suggests that there are significant differences in personal practices about radon gas exposure among public health workers. Most public health workers (83.7 %) have not completed a radon test in their homes. 87.8 % of public health workers have not purchased a radon test kit, and 65 % of public health workers do not know how to test for radon. This result shows that public health workers are not testing their homes for radon gas exposure. Efforts should be made to change the personal practices of radon gas exposure among public health workers for their role as change agents to the public to be effective.

Introduction

Radon gas, a known carcinogen, typically gets into houses from the ground through pores in cinder blocks walls, cracks in foundations, and other openings.[1] The concentrations of radon gas in houses is depended on the rate of exchange of air inside the house and the strength of the radon source on the ground.[1] Due to the increase in energy efficiency, this exchange has been reduced, leading to a higher concentration of radon gas in houses. Building airtight homes which come with insulation favor radon build-up in homes.[2] Reports show that low and medium-dose exposure to radon gas caused radon-induced lung cancers. [1,3] Radon levels on the first floor of homes are about half of the level in the basement. [4] The Harvard Center for Risk Analysis ranked radon gas inhalation as the most important potentially fatal hazard in the home. In that study, radon gas estimated annual cause-specific mortality rate is 5.8 per 100,000 people. [5] Radon can also enter homes from other routes. Radon gas can entera house through groundwater and gain access through living spaces and disintegrates into its decay products. The exposure risk of radon gas inhalation from water is usually more significant than radon gas exposure through ingestion of water.[6] When radon gas is inhaled from highly analyzing particles due to the breakdown of Polonium-218 (Po-218) and Polonium -214 (Po-214), it can interact with the biological tissue in the lungs and can damage the DNA, which is a significant step in the carcinogenesis process.[6] One in fifteen homes has been estimated to have elevated radon levels in the United States. [1] It is estimated that radon gas is responsible for about 21,000 deaths each year, leading to 22 % of lung cancer in the United States.[1] There is no threshold value for radon gas exposure; hence DNA damage may occur at any level of exposure. [7] Public health workers are, for the most part, individuals whose activity is to ensure and enhance the health of their communities and take part in activities with the essential aim of upgrading well-being in their communities.**[7]** Public health workers have an exceptional centrality because, as government workers, they are at the forefront for communicating public health education even with changing community desires and dangers to the general well-being of the public. **[8]** Viable correspondence adapted towards an explicit gathering has been observed to be a piece of the hazard investigation process and seen as fundamental for controlling data and conviction identified with real and perceived risks, for example, radon gas exposure. **[9,11]** Viable data spread methodologies are fundamental for evoking wanted results, regardless of expanded mindfulness or attitudinal or social change. **[12]** Giving helpful, applicable, and exact data in a distinct and justifiable dialect and arrangement for a specific gathering of people or hazard aggregate is a primary objective of hazard correspondence. This data may incorporate the idea of the hazard and potential advantages, vulnerabilities, basis for activity, and procedures for overseeing hazard. **[13]** Previous studies have been performed on radon gas exposure perception regarding recognizing relates of hazard recognition, with socioeconomics, for example, gender, age, pay, education, race, property possession and years at the property. **[10,14-16]** Radon gas knowledge has corresponded with different socioeconomics. **[14]** A positive critical relationship exists between mindfulness and worries about radon. **[17]** Furthermore, when information is high, dimensions of concerns remain moderately low. **[17]** This is critical in that public health workers are relied upon to be change agents are expected to have knowledge of radon gas exposure. Understanding how that knowledge translates into testing their home for radon gas is essential in linking knowledge into

personal practice. The most reliable indicators of radon testing expectations found in a study were perceived severity, social impact, and current smoking. **[10]** Members with higher perceived severity were about eighty times bound to plan to test for radon gas in their homes. This study's purpose is to explore potential differences in various public health worker's personal practices about radon gas exposure

Methods

This is a descriptive, cross-sectional study design. The principal investigator explored personal practices of radon gas exposure among public health workers. Seton Hall University Institutional Review Board approved this study design and plan. The study participants were public health workers who are employed by public health departments in New Jersey. The following public health workers participated in this study: Registered Environmental Health Specialists, Health Educators, Health Officers, and Nurses. The study participants completed the survey (questionnaire) via survey monkey.

Variables

The independent variables are public health workers working atlocal public health departments in New Jersey. They are Registered Nurses, Registered Environmental Health Specialist (REHS), Health Educators, and Health Officers. A survey instrument was created uniquely for this investigation from topical themes by writers that had mastery in radon and other environmental hazards. Face and content validity were built up utilizing a modified Delphi panel. **[18,19]** The survey instrument (questionnaire) consists of 5 personal practice questions out of 50 items. The dependent variable is the personal practices question scores.

Data Analysis

SPSS version 24.0 was utilized for the data analysis. Five personal practice questions concerning home radon testing were graded as nominal data. The study utilized the Chi-square test of differences to evaluate the differences in public health workers' personal practices regarding radon gas exposure. The variables are independent categorical (nominal; types of public health workers) and dependent categorical (nominal; personnel practices).

Results

Three hundred and eighty-six public health workers completed surveys in this study. 72.30 % of the respondents were females, while 27.70 % were males. Public Health Educators that participated in the study were 22.50 % females and 5.20 % males. Health Officers comprised 8.30 % females and 4.70 % males. Nurses were 22.50 % females and 3.40 % males. Registered Environmental Health Specialists (REHS) were 14.50 % males and 18.90 % females and were the largest group that participated in the study. The study predicted that a significant difference would exist in personal practices about radon gas exposure among public health workers. Chi-square test of differences was utilized to test whether there are differences in personal practices about radon gas exposure in public health workers. The test consisted of the independent categorical variable (nominal; types of public health workers) and a categorical dependent variable (nominal; personnel practices). The analysis compared the frequency of personal practice questions among registered environmental health specialists, health educators, health officers, and nurses. A significant outcome was found (x^2 (12) = 84.75, $p<.01$), suggesting a significant difference in the personal practices of public health workers.

Radon Gas Personal Practices

On the question "I know how to test for radon," the greater part of public health workers reported that they do not know how to test for radon. Thirty-five percent (n=135) answered yes to the personal practice question, and Sixty-five percent (n=251) answered no to the question. Of these, 9.8 % (n=38) were Health Educators, 1.0 %(n=4) were Nurses, 10.6 % (n=41) were Health Officers, and 30.7 % (n=52) were Registered Environmental Health Specialists **(figure 1).** Out of the respondents that did not know how to test for radon, 24.9 % (n=96) were Nurses, 17.9 % (n=69) were Health Educators, 2.3 % (n=9) were Health Officers, and 19.9 % (n=77) were Registered Environmental Health Specialists **(figure 1)**

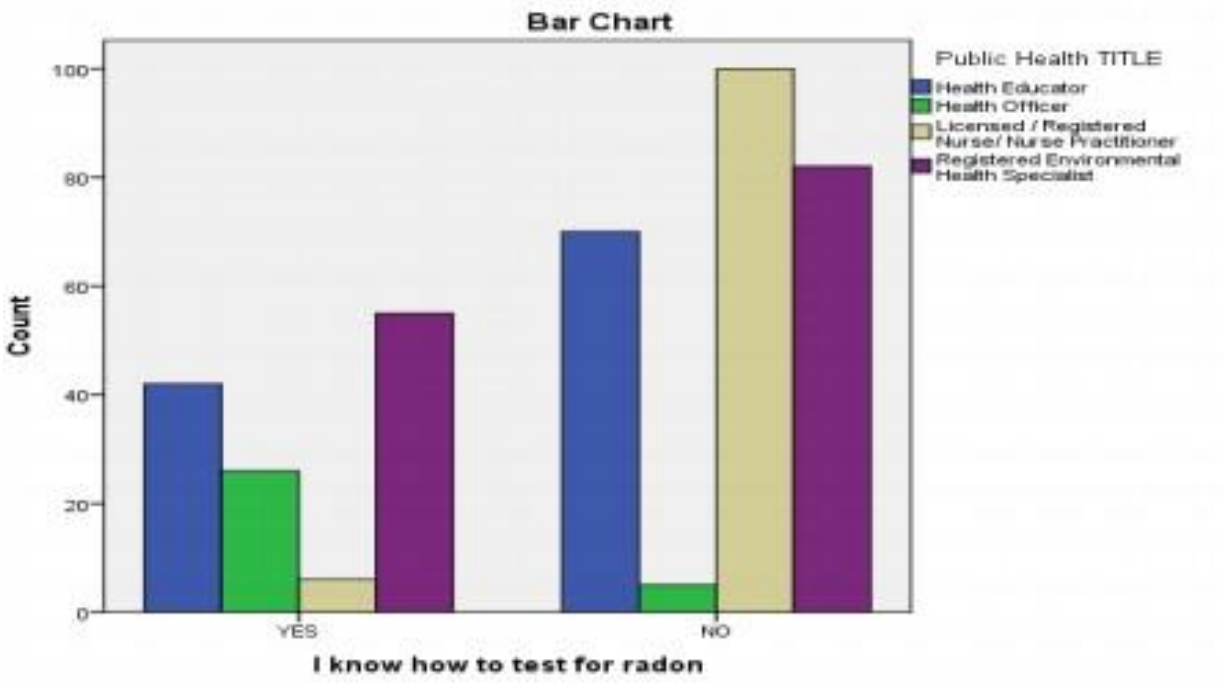

Figure 1: Personal practice question: “I know how to test for radon” Regarding the question, "I have purchased a radon test kit," most respondents had not purchased a radon test kit. 87.8 % (n=339) respondents answered no to the question, while 12.2 % (n=47) answered yes to the question about purchasing a radon test kit. Of the respondents that have purchased a radon test kit, 0.35% (n=1) were Health Officers, 1.0 % (n=4) were Health Educators, 6.0 % (n=23) were Nurses and Registered Environmental Health Specialists were 4.9 % (n=19) **(figure 2).** Out of the respondents that have not purchase a radon test kit, 25.6 % (n=99) were Nurses, 28.5 % (n=110) were Registered Environmental Health Specialist, 26.7 % (n=103) were Health Educators, and 7.0 % (n=27) were Health Officers **(figure 2)**.

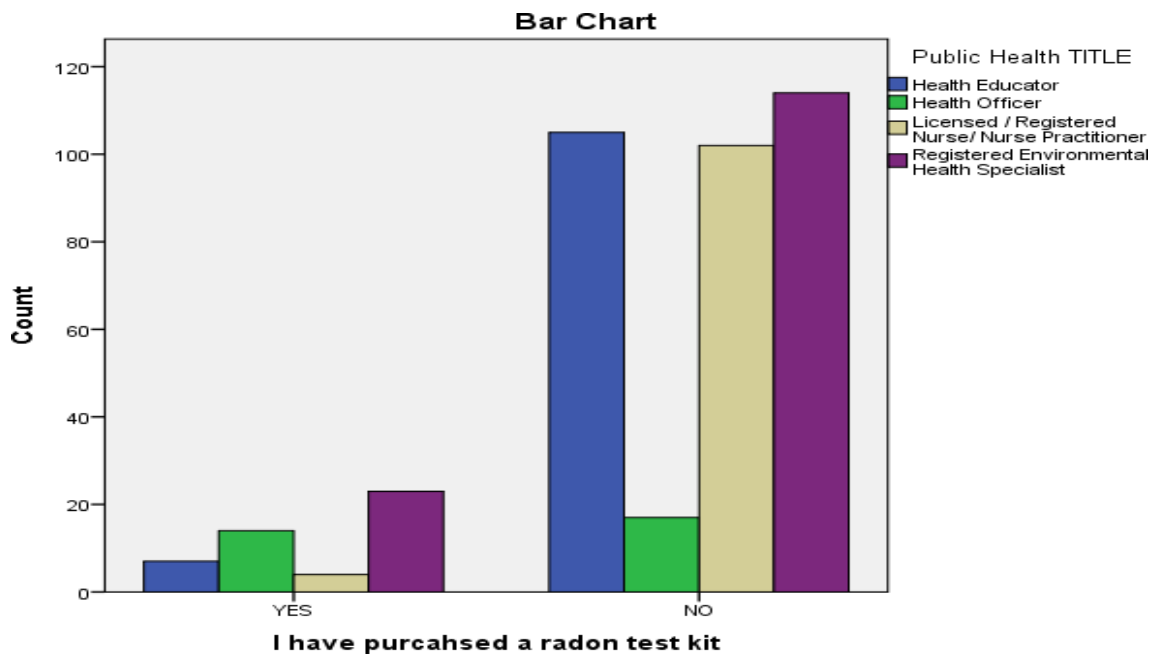

Figure 2: Personal practice question: “I have purchased a radon test kit” Regarding the question, "I plan to perform a radon test in my home," most of the respondents plan to perform a radon test in their homes. 702 % (n=271) agreed (yes), and 29.8 % (n=115) did not plan to test their home for radon. Of the respondents that plan on performing a radon test in their homes, 21.8 % (n=84) were Registered Environmental Health Specialists, 21.2 % (n=82) were Health Educators, 23.3 % (n=90) were Nurses, and 3.9 % (n=15) were Health Officers, **(figure 3)**. Out of the respondents that do not plan to perform a radon test in their homes, 6.5% (n=25) were Health Educators, 11.7 % (n=45) were Registered Environmental Health Specialists, 2.6 % (n=10) were Nurses, and 9.1 % (n=35) were Health Officers **(figure 3)**.

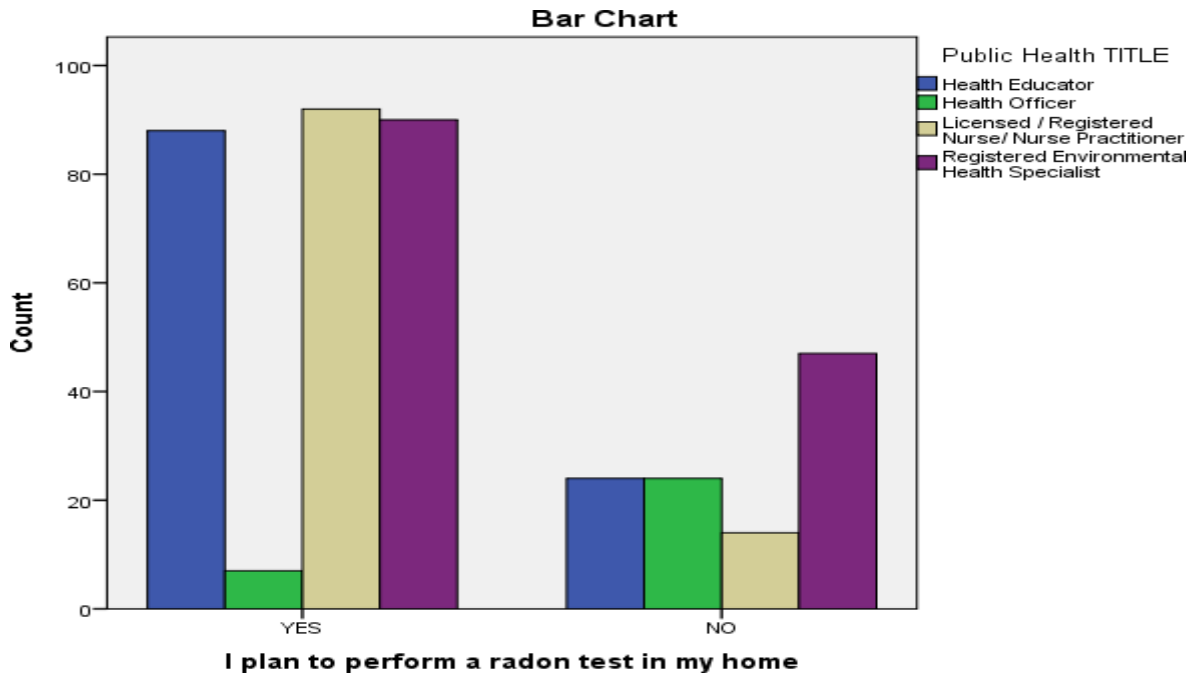

Figure 3: Personal practice question: “I plan to perform a radon test in my home”On the personal practice question, "I have completed a radon test in my home," most respondents answered that they had not completed a radon test in their homes. 83.7 % of the respondents had not completed a radon test in their homes, while16.3 % (n=63) of respondents had completed a radon test. Out of the respondents that completed a radon test, 6.2 % (n=24) were Registered Environmental Health Specialists, 4.9% (n=19) were Health Educators, 0.3 % (n=1) were Nurses and 4.9 % (n=19) were Health Officers **(figure 4)**. Out of the respondents that have not completed a radon test, 8.0 % (n=31) were Health Officers, 22.8 % (n=88) were Health Educators, 27.2 % (n=105) were Registered Environmental Health Specialists and 25.6 % (n=99) were Nurses **(figure 4)**. (**Table 1)** provides a summary of the results concerning public health workers' personal practices about radon gas exposure.

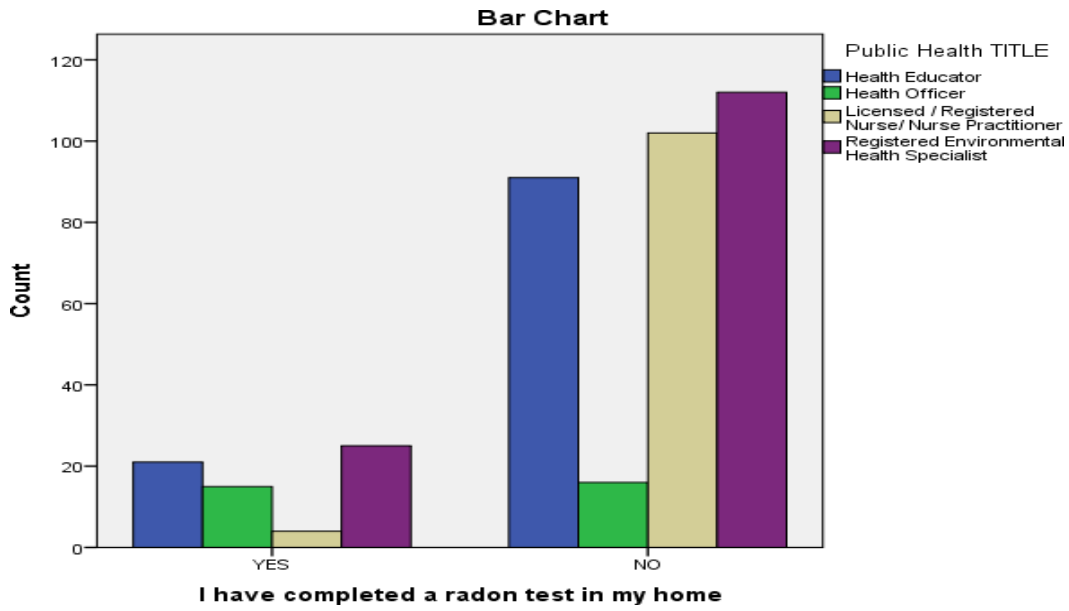

Figure 4: Personal practice question: "I have completed a radon test in my home"

Table 1: Participant Personal Practices about Radon (n=386)

Response	Frequency	Percent
I know how to test for radon.		
YES	135	35.0
NO	251	65.0
I have purchased radon test kit		
YES	47	12.2
NO	339	87.8
I plan to perform a radon test in my home		
YES	271	70.2
NO	115	29.8
I have completed a radon test in my home		
YES	63	16.3
NO	323	83.7

Discussion

Majority of the respondents stated that do not plan to perform radon test in their homes, have not ever purchased a radon test kit, do not know how to test for radon, and have not completed a radon test in their homes. Even though public health workers work in public health departments across the country, they are members of the public. The result of this study shows that the public health workers are not testing for radon which is consistent with the previous study where respondents agreed that they did not think about testing their homes for radon, even with existing radon knowledge and awareness. **[11]** Another study found that 15 % of residents who were aware of radon tested for radon gas in their homes. **[20]** There are generally low testing levels of radon in homes around the country regardless of if homeowners are public health workers or not. Efforts should be geared into more public health awareness programs among public health workers to inform members of the public about the dangers of radon and emphasize the need for testing. A study has shown that offering free radon testing through a public utility billing system is effective in getting homeowners to test for radon. **[21]**

Policy and Practice Implications

Public health workers are change agents in the community they serve. Understanding their personal practices about radon gas exposure provides a baseline to further create more awareness in public. This study hopes to provide guidance that will enable local health departments to understand the personal practices of staff members that will be creating awareness in public regarding radon gas exposure. Training staff members about the dangers of radon gas exposure could lead to changing their personal practices about radon gas exposure which in turn could lead to their being ambassadors of radon testing in the communities they serve.

Limitations

As a cross-sectional study, it is hard to determine temporal relationships between exposure and outcome. Finding's generalizability is limited to the sample surveyed. Since this study utilized Survey Monkey to gather data from public health workers, respondents that require help with completing the survey are not taken into consideration. The language of the scale items might be ambiguous even though the scale instruction was made simple for respondents to understand. Scales use and interpretation differ among people. Respondents self-reported the data.

Directions for future research

Performing a longitudinal study is ideal to better understand public health worker's responses over some time to determine if reactions changed. It is recommended to conduct a countrywide radon gas exposure survey since radon is a countrywide issue.

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