



## Indoor radon gas awareness survey among some elite group in the greater Accra region, Ghana

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### ABSTRACT

The aim of the research is to assess the level of awareness of indoor radon gas and its deleterious health effects to the population when accumulated over long periods. 100 questionnaires were distributed among subjects in the study area (Sakumono) out of which 87 were returned. These questionnaires were randomly distributed without recourse to any particular pattern, as the study area was composed of majority elite. The questionnaires sought to elicit information such as; type of house, type of ventilation system practiced, familiarity with radon gas, response to health threats, type of flooring, etc which subjects responded to. 42 out of the 87 respondents were males and 45 were females, which accounted for 48.3% and 51.7% respectively. 82.8% of the respondents had no knowledge of radon gas whereas only about 17.2% responded to having some knowledge of radon gas. By projection, it could be inferred that radon gas awareness in the entire country is shallow, thus this initial survey was intended to extend to cover other parts of the country. Focus group discussions also indicated that, most respondents were concerned about common preventive health behaviours (not smoking, excessive alcohol abuse, cleanliness etc) rather than radon gas preventive attitudes and behaviours. It was therefore concluded that the survey has in a way engendered more concern about health-specific information seeking attitudes among the subjects, not only about radon gas.

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### Introduction

Indoor Radon gas is an invisible, odourless and colourless radioactive gas which can pose significant health risk to portions of the nation. It is a noble gas which is produced from naturally occurring decay of uranium and radium, which are present in underground deposits (Cassondra J.K. et al, 1991). Indoor radon gas is considered the greatest single source of environmental exposure to radiation, much more than all other sources as well as X-rays and nuclear power activities (Cassondra J.K. et al, 1991). However, many factors can contribute to indoor radon gas accumulation in dwellings, such as geographic location, construction of the building and ventilation conditions. Radon gas normally becomes entrapped in homes and buildings that are poorly ventilated and can appreciate to high levels that pose health risks (Radford E.P. 1985).

The health risks are derived from radioactive by-products of decaying radon gas known as radon daughters.

These substances attach to dust particles in the air, and when inhaled into the lungs, become lodged in the bronchi which further undergoes chemical breakdown to release alpha ( $\alpha$ ) particles in the cells of the bronchial linings (Cassondra J.K. et al, 1991). The problem associated with indoor radon gas accumulation is that, high levels of exposure or gradually accumulated low levels of exposure in long term increases chances of developing lung cancer (Akortia et al, 2010). This

survey was conducted in the Sakumono Estates, Tema, an area occupied by majority of elite and educated populace who one would expect some level of knowledge about the effects of radon gas exposure. Additionally, the building stocks in the study area are of similar designs as reported by Akortia et al, 2010.

During an earlier indoor radon measurement study conducted, few pre-tested questionnaires were distributed in order to elicit some information regarding the level of knowledge among the inhabitants. It was gathered that the level of knowledge on radon gas was very shallow which prompted further education even before the track etch detectors (Akortia et al, 2010) were accepted.

Previous researches on radon have focused on indoor levels and health risks (Akortia et al, 2010).

More recently, however, this research has assessed the public awareness and concern regarding indoor radon gas. In the survey, it was also gathered that response to the threat of radon gas was very low and apathetic, as only few elite folks have heard of the gas.

The purpose of this study was to explore the level of public knowledge, attitudes and behaviour regarding radon gas and its health implications among home dwellers in Sakumono estates, Tema. This survey was conducted around December 2009-February 2010.

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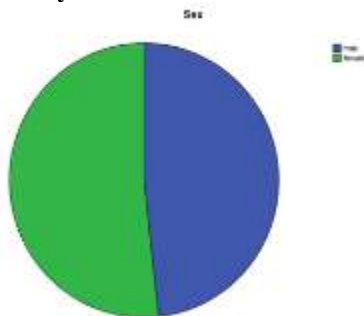
## Method

This survey was informed by an initial research conducted on indoor radon gas level measurements, where it was found out that radon awareness and knowledge was shallow.

Some few pretested questionnaires were initially distributed among the home dwellers in order to elicit some information concerning; type of home, type of ventilation system, type of floors, number of inhabitants, types of windows, familiarity with radon gas, response to health risk etc. Then it was followed by a complete survey in which about one hundred (100) questionnaires were randomly distributed in homes within the Sakumono Estates and its environs. The selection criteria captured both renters and owners of the properties unlike the indoor radon measurement survey which eliminated those who were renting the properties. Thus, these groups (renters) of the population do not reside in the homes for the majority of the year. This was done by basically distributing the questionnaires and allowing about three (3) days to a week for them to be collected and collated. Over 50% response rate was achieved while some could not be accounted for. The SPSS version 15 analytical tool was used in analysing the questionnaires.

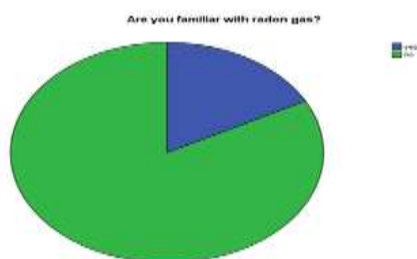
## Results and discussion

### Questionnaire Analysis



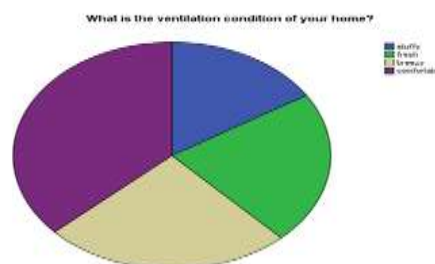
**Figure 1: Sex of respondents**

About 100 questionnaires were distributed out of which 87 were returned. 42 out of the 87 respondents were males and 45 were females, which accounted for percentages of 48.3% and 51.7% respectively as shown in figure 1. Females made up the highest percentage because, they were the ones mostly met in the homes during the survey. Subjects were relatively highly educated and comprised a relatively healthy sample, evidenced by the self-reported health status. Even though the response of subjects were not representative of the Sakumono Estates community as a whole, respondents were probably quite representative of the upper end of the socioeconomic scale, and thus was expected to exhibit more radon knowledge, but was analytically proven wrong through the survey on radon knowledge and concern. Majority of the respondents (100%) indicated they have never tested their homes for radon gas as they do not know how to go about it or thought it was not necessary.



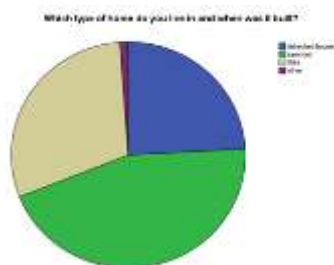
**Figure 2: Radon knowledge of respondents**

Figure 2 shows the percentages of the level of awareness of radon gas in the study area. 82.8% of the respondents in the area were not aware of radon gas and its health effects. Table 1 showed that 72 respondents answered “No” to any knowledge of radon gas. The study area was vastly composed of the elite, and one would expect that some knowledge of radon gas would be available; figure 2 however shows the contrary. This may be due to the fact that most of the respondents were not concerned about radon gas or just didn’t have any idea at all. However, 15 respondents out of the 87 returned questionnaires answered “Yes” to having any knowledge of radon gas, making up 17.2% in figure 2 and table 2. This low percentage may have accounted for the fact that, some respondents in one way or the other were in professions connected to the field of science. Judging from the professions of the respondents, some were teachers, pharmacists, doctors, science biased students etc. These groups may have some knowledge of radon gas, but not necessarily its health effects. The low percentage of radon gas knowledge exhibited by the respondents may also be accounted for by the fact that generally, knowledge of radionuclides among the elite is shallow and it was gathered that there is apathy towards issues concerning nuclear sciences and thus, it was not surprising to find such small section of the public alluding to the knowledge of radon gas. On the whole, the focus group discussions with the inhabitants helped in educating quite some number of the populace, thus it was thought of to extend this survey to a greater part of the country.



**Figure 3: Ventilation condition in respondents' homes**

Figure 3 is an illustration of response of the subjects to the ventilation conditions prevailing in their homes. It was indicated (table 3) that 14 respondents agreed that some of their rooms were stuffy, representing 16.1%. 32 subjects of the 87 valid respondents answered to the ventilation condition of their homes as comfortable, as shown by the large sector of the chart in figure 3. This covered 36.8%. The reason may be due to the fact that the study area was close to the sea, where the breeze blew most of the time, thereby keeping most homes comfortable. 25.3% of the respondents however, agreed that they experienced breezy conditions in their homes shown in figure 3. This could be inferred from the fact that most of the subjects were living in houses closer to the sea than others. 19 respondents answered to the ventilation condition of their homes as fresh, representing 21.8% in figure 3. Thus, in most of these houses, the inhabitants incorporated air conditioning in their ventilation mix, hence the response indicating freshness. Generally, ventilation condition is an important determinant of radon gas levels in most dwellings. During the survey, focus group discussions were held regarding ventilation conditions in the respective homes which most subjects agreed that due to the prevailing weather conditions at the time of the survey, they resorted to natural ventilation which invariably kept indoor environments comfortable.



**Figure 4: Type of houses occupied by respondents**

Figure 4 (table 4) shows the response to the type of home inhabited by the subjects. It could be inferred (Fig. 4) that a greater portion of the respondents lived in semi-detached houses constructed in the '90s. These are the predominant type of houses found in the study area. 39 respondents lived in semi-detached houses, representing 44.8% (fig. 4). However, 29.9% of the respondents lived in the flats, also constructed in the '90s (fig. 4). Additionally, 21 respondents lived in detached-houses comprising plush apartments which were constructed at varied periods mainly after the semi-detached houses and the flats. This represented 24.1% (fig. 4). The cluster houses were represented by the sector "other", making up a percentage of 1.1%. The cluster houses were mainly occupied by various family units who have rented these properties, thus majority of them do not live in these homes throughout the year. The construction of the houses was done by the same estate developer, thus has a standardised design for the semi-detached houses and a similar type for the flats. This may have accounted for the majority of the respondents living in semi-detached houses, even though this could not account for the number of all the semi-detached houses in the study area. Majority of the inhabitants have lived in their homes since its construction but have never tested for radon gas accumulation.

#### Conclusion

The aim of this survey was to provide an initial data on the knowledge of the inhabitants of Sakumono and its environs on radon gas and its possible health concerns. The results showed that most respondents had never encountered or engaged in radon-information seeking campaign nor tested their homes for possible radon gas accumulation. It could be deduced from the findings that as much as 82.8% (Fig. 2) of the subjects interviewed had no knowledge of radon gas but were however concerned about other environmental hazards. By projection, it could also be inferred that radon gas awareness in the entire country is shallow and thus this initial survey was intended to extend to cover other parts of the country as regards the indoor radon gas measurements conducted (Akortia et al, 2010; Quashie et al, 2011). Focus group discussions also indicated that, most respondents were concerned about common preventive health behaviours (not smoking, excessive alcohol abuse, cleanliness etc) rather than radon gas preventive attitudes and behaviours. However, some of the subjects were smokers

who were not concerned about the relationship between radon gas and smoking despite findings of the National Research Council, which indicated that smokers may be at much greater risk from the harmful effects of radon gas (Samet JM, 1989; Hart et al, 1989). As radon gas cannot be detected by human senses, and exposure invariably produces no significant side effects before the onset of lung cancer, an apathetic response from the subjects was not surprising. It could therefore be concluded that this survey has in a way engendered more concern about health-specific information seeking attitudes among the subjects, not only about radon gas. The findings of this survey indicated there is the need for more education about radon gas in general and its health effects in particular. Additionally, further research is needed to develop a different educational strategy to reach the illiterate sector of the population who may not even know or think their homes may have a radon problem. This way, subjects would understand the underlying motives for taking action regarding health risks from an environmental source, as this would also aide effective radon gas measurement in homes of all kinds that has been initiated in parts of the country (Akortia et al, 2011, Quashie et al, 2011, Oppon et al 1990).

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#### Appendix: Results

**Table 1: Sex of respondents**

Sex of Subjects	Frequency	Percent	Valid Percent	Cumulative Percent
male	42	48.3	48.3	48.3
female	45	51.7	51.7	100.0
Total	87	100.0	100.0	

**Table 2: Radon knowledge of respondents**

Response	Frequency	Percent	Valid Percent	Cumulative Percent
yes	15	17.2	17.2	17.2
no	72	82.8	82.8	100.0
Total	87	100.0	100.0	

**Table 3: Ventilation condition of respondents**

Ventilation conditions	Frequency	Percent	Valid Percent	Cumulative Percent
stuffy	14	16.1	16.1	16.1
fresh	19	21.8	21.8	37.9
breezy	22	25.3	25.3	63.2
comfortable	32	36.8	36.8	100.0
Total	87	100.0	100.0	

**Table 4: House types of respondents**

Type of house occupied	Frequency	Percent	Valid Percent	Cumulative Percent
detached house	21	24.1	24.1	24.1
semi det	39	44.8	44.8	69.0
flats	26	29.9	29.9	98.9
other	1	1.1	1.1	100.0
Total	87	100.0	100.0	