A Multifaceted Communication Campaign to Increase Radon Awareness and Testing Among Iowa City Homeowners

Taharat Khan, Joanna Krajewski, Amy Schumacher, Blake Smith, Greg Woods

University of Iowa College of Public Health
## Contents

Executive Summary ............................................................................................................. 1
Significance ............................................................................................................................ 2
Literature Review .................................................................................................................. 3
How Can Theory Help Us? .................................................................................................... 6
Brief Description of Planned Intervention ............................................................................ 9
Goals .................................................................................................................................... 10
Objectives ............................................................................................................................. 10
Target Audience .................................................................................................................. 11
Initial Planning ...................................................................................................................... 12
Formative Research .............................................................................................................. 13
Additional Intervention Components ................................................................................... 21
Evaluation ............................................................................................................................. 23
Unintended Consequences .................................................................................................... 24
Conclusion and Future Plans ................................................................................................. 26
Budget Justification .............................................................................................................. 27
References ............................................................................................................................. 29
Appendices ............................................................................................................................ 34
Tables .................................................................................................................................... 48
Executive Summary

Radon is a colorless, odorless, tasteless radioactive gas that seeps into homes from the ground and causes lung cancer. Iowa residents are especially vulnerable to this health hazard. It is important to target Iowa residents in efforts to encourage testing for radon and radon mitigation. In collaboration with the Iowa Initiative for Sustainable Communities, Johnson County Public Health, and the City of Iowa City, this project developed and conducted a health communication campaign in the Iowa City area to promote awareness of and testing for radon.

As part of this campaign, team members developed and tested informational and promotional materials regarding radon testing, and these materials were modified based on input from the community. These materials were:

- Posters describing the radon problem and the testing solution
- Yard signs to distribute in order to raise awareness in neighborhoods
- A do-it-yourself radon mitigation guide
- A flowchart describing how to understand and respond to radon test results.

The main event of the campaign was a table at the first farmers market of the season in Iowa City. A total of 71 test kits were sold at this event. A table in the entryway of the Iowa City Public Library also directed visitors to the farmers market to buy a test kit. This project also improved signage for the radon test display at Paul’s Hardware Store.

Lessons learned from this campaign:

- The Iowa City farmers market is an excellent location to sell radon test kits. People were often happy to talk about radon, and the table was responded to well.
- Similar events in Iowa City, such as the festivals that occur during the summer and the fall, could also be excellent locations to reach a wide range of Iowa City residents.
Significance

For the past several decades, lung cancer has been the most common type of cancer in the world and the leading cause of cancer mortality (World Health Organization [WHO] & International Agency for Research, 2012). While smoking is the leading cause of lung cancer, exposure to radon, an odorless, colorless, and tasteless gas, is the second leading cause of lung cancer mortality (American Lung Association [ALA], 2015; U.S. Environmental Protection Agency [EPA], 2013). Radon is naturally occurring in the environment, coming from the radioactive breakdown of uranium in soil, rock, and water. While radon gas is present both indoors and outdoors, exposure to indoor radon in homes is especially harmful due to higher levels of concentration and duration of exposure (EPA, 2013).

Radon gas is a problem in homes and buildings across the United States, but risk of radon varies across the country due to differences in the amount of radon-producing uranium in the underlying soil and rock. Every one of the 99 counties in Iowa is identified by the EPA as having the highest potential for indoor radon levels. Iowa has the largest percentage of homes (approximately 70%) in the United States with radon levels above the EPA’s 4 pCi/L (picocuries per liter) designated action level (Johnson County Public Health [JCPH], n.d.; EPA, 2015). Johnson County is no exception, with an average indoor radon level of 4.3 pCi/L (Air Chek, n.d.). However, levels of radon in homes vary due to a variety of factors such as the construction of the house, ventilation habits of the occupants, and sealing of windows, doors, and cracks. Thus, every home should be tested for radon, as this is the only accurate way to know one’s home’s actual level of this harmful gas. If a homeowner finds that his or her home has a high radon level, mitigation can be done to reduce the exposure to radon and its potential health consequences (EPA, 2013).
While testing for radon is relatively easy and inexpensive (approximately $5-$10) (JCPH, n.d.) and will accurately indicate a home’s level of radon, testing is not mandated. Similarly concerning is the fact that adequate knowledge of radon risk and testing behaviors are typically uncommon (Duckworth, Frank-Stromborg, Oleckno, Duffy, & Burns, 2002; Gregory & Jalbert, 2004; Kelley & Brown, 2011). Therefore, concerted efforts to communicate information regarding radon, its prevalence in the state, the need for testing in each home, strategies for mitigation, and the potentially devastating health effects of exposure to high indoor levels of the gas are needed for the safety and health of people living in Iowa. As a public health communication campaign is “purposive usage of communication technology to educate, persuade, and produce social change” (Hornik, 2013, p. 39), a communication campaign is an appropriate way to address the issue of radon in Iowa.

**Literature Review**

**Predictors of Testing: Why Do People Test/Not Test?**

In order to encourage people to test for radon, the factors that make someone more or less likely should first be understood. For example, Sandman, Weinstein, and Klotz (1987) examined predictors and barriers to testing and remediation in a New Jersey population. Perceived likelihood of a high radon level in one’s home predicted testing, while barriers to testing included a low perception of risk and concerns that one did not have the ability to complete the test. Among those who were already testing, predictors of remediation, which were minimally explanatory, were the level of radon on the first floor and beliefs about the home value being lower if remediation were not complete. In a primary care setting, Nissen, Leach, Nissen, Swenson, and Kehn (2012) found that the two most common reasons patients gave for testing
were concern for their health and their children’s health. Common barriers to testing in this situation were a lack of knowledge both of radon and the testing process.

Residence type and householder status can also determine the level of radon awareness and testing (Larsson, Hill, Odom-Maryon, & Yu, 2009). Single family homes/townhomes, especially, were twice as likely to be aware of and have tested for radon compared to residents in apartment/condominiums, mainly due to the latter comprising more renters than owners (Larsson et al., 2009). Similarly, those with a higher income and more education have been found to be more likely to test (Nissen et al., 2012).

A challenge to overcome in a campaign targeting radon testing will be the optimism that people have regarding their own risk. Weinstein, Lyon, Sandman, and Cuite (1998) found that people rate their neighbors’ risk of having high levels of the gas as greater than their own even after being told about radon risks in their area. Similarly, Sandman et al. (1987) found that respondents downplayed both their own risk of exposure and the seriousness of radon. Social factors can also greatly influence radon testing. Sandman et al. (1987) found that believing others in one’s neighborhood are worried about radon (but would view testing positively) predicted radon testing. Sandman et al. (1987) state that knowing others in the neighborhood have tested relieves worries about either being alarmists (if the radon levels are low) or the bearers of bad news (if the levels are high).

**Previous Interventions: What Has Been Done So Far?**

When planning an intervention, it is also helpful to examine what intervention have previous been complete and how successful they have been. We examined the literature and found several interventions that informed our final campaign. Nissen et al. (2012) intervened in a primary care setting and provided coupons for test kits. After interviewing those who tested
with the kits, many indicated that the discounted cost was a key factor in making their decision to take action. Interestingly, although this study found income and education differences in testing behaviors pre-intervention, those differences were not significant post-intervention. Since the intervention overall was not very effective, the authors indicated that one possible improvement would be actually having test kits available for patients instead of just coupons. This intervention demonstrates the importance of the ease of buying test kits in efforts to increase testing.

In another radon campaign, Larsson (2015) effectively utilized a captive audience. The authors studied the effect of digital signage technology in waiting rooms on the sale of radon test kits by promoting that the kits were available at a local public health department. During this campaign there was an increase in the sales of radon tests kits at the advertised location. This intervention was also successful at getting first-time testers and renters to test. The radon messages in this intervention were based on the precaution adoption process model (Larsson, 2015), described below. This intervention brings to mind other potential locations for captive audiences.

Aside from the location of signage, the source of information therein has also been found to be significant. Information from a trusted local source has been demonstrated to be more effective than from a national campaign. Poortinga, Bronstering, and Lannon (2011) studied the effect local authority involvement and support had on a national radon awareness campaign and found the campaign was much more successful in meeting their objectives in areas where local authorities were involved. Residents reported trusting the campaign more because the people running the campaign were local and well known in the area, and this trust and familiarity lead to an increase in testing and mitigation (Poortinga et al., 2011). Thus, information from a local source can be especially important when attempting to influence residents to test and mitigate.
Lead paint is a problem similar to radon, as it is a health risk inside the home. For this reason, lead paint interventions can also be examined for their generalizability to radon issues. As one component of a successful lead paint intervention, information tables were set up at a local hardware store, and almost 40% of those interviewed during the evaluation recalled seeing the display (McLaughlin, Humphries Jr, Nguyen, Maljanian, & McCormack, 2004). The displays had information about the dangers of lead and ways to decrease its impact, and those who wanted more information were then directed to the local health department. Thus, hardware stores are a possible place for a radon intervention.

**How Can Theory Help Us?**

Health behavior theories are used to help public health practitioners and researchers explain or change behaviors. Each theory contains aspects of a person’s characteristics, behavior, or environment and proposes how each of these aspects influence each other. Theories can be applied to many different topics, but some theories fit some topics better than others. Public health interventions that use theory can be more effective than those that do not use theory (Glanz & Bishop, 2010). Three theories are useful for understanding our intervention. These are the extended parallel process model (EPPM), the precaution adoption process model (PAPM), and uncertainty management theory (UMT).

**Extended Parallel Process Model**

The EPPM is a communication theory that describes what elements need to be in a fear appeal in order for it to be effective. According to the EPPM, a message using fear needs to have information that addresses four components. The first is susceptibility, which how likely it is that the target audience of the message is at risk for a certain health threat (Witte, 1992). In the context of radon, this is how likely it is that someone in Iowa City is being exposed to radon. The
second component is severity, which is how serious the consequences of the health threat are (Witte, 1992). For radon, these consequences can be very severe, including lung cancer and death. Information about susceptibility to and severity of a health risk influences the viewer’s perceived threat of that risk. So, if someone feels they are likely to be exposed to radon and that radon is dangerous to their health, they will have a high perceived threat of radon. How they respond to this threat, and the accompanying fear, depends on the other two components needed in the message. The third component is response efficacy, which is how well the recommended action will work to prevent the negative consequences of the health risk (Witte, 1992). In the context of radon, this would be information regarding how effective tests are at detecting radon and how well mitigation reduces radon levels. The fourth component is self-efficacy, which is how capable one feels to perform that action (Witte, 1992). When dealing with radon, people need to feel that they have the ability to get a test, do it, and respond to the results. If only the fear components (severity and susceptibility) are included in the message, the message will be ignored and the fear suppressed. If all components are included and arouse both fear and the confidence to make changes in the viewer of the message, the viewer will take the recommended action (Witte, 1992). This theory is useful for both understanding what messages to highlight in a campaign (if response efficacy is low, but self-efficacy is high, then response efficacy should be focused on) and in helping to avoid negative responses to a campaign that is all fear and no efficacy.

Theories are works in progress, and the EPPM has been extended by adding response costs of the recommended behavior into the model (Rintamaki & Yang, 2014). Response costs are the drawbacks that are perceived to accompany a behavior (Rintamaki & Yang, 2014). For radon testing, such response costs could be knowing that one has a high level of exposure but
having no money to fix the problem or needing to disclose radon information if trying to sell the home. Thinking about what the response costs of radon testing could be can help determine what other should be done to encourage people to test.

**Precaution Adoption Process Model**

The PAPM has also been used to examine home radon testing in the past (Weinstein et al., 1998). This model recognizes that taking action regarding a health behavior is a process, not a sudden change. People start out unaware of an issue, become aware, become engaged with the issue and consider their options, decide to act, act, and then maintain the behavior (Weinstein et al., 1998). Some people are unaware of radon, and they are not likely to run out and buy a test kit the moment they hear about it. More likely, they will gradually decide that radon is something they are concerned about, make a plan to test their home, and eventually test. Based on this theory, different interventions should be effective for those at different stages of the process (Weinstein et al., 1998). A test kit offered to someone unaware of radon will not be very effective. Similarly, information on the dangers of radon provided to someone who has already decided to test will not be very helpful in moving them towards testing. Weinstein et al. (1998) confirmed that reducing barriers to getting radon test kits prompts those who have decided to test to follow through and do it. However, they also found that reducing those barriers was somewhat effective among those who were undecided about testing, especially when combined with radon risk information. The conclusions from this research are that it is important to have a mix of materials for people at different stages (have information about the risks of radon and make it easy to get a test kit) and making it easy to get a test kit may also convince those who are undecided to test.
Uncertainty Management Theory

Another theory that can help us understand how people feel about testing for radon is uncertainty management theory (UMT). Before someone tests for radon, they have uncertainty as to what the results will be. The results could show that their house has low levels and they are safe. However, the results could instead show that their home has very high levels of radon and that they and their family have been exposed to a health hazard for as long as they have been living there. While this uncertainty might make someone anxious, uncertainty can also be reacted to with emotions such as hope, indifference, or a combination of emotions (Brashers, 2001). Thus, some people may want to maintain uncertainty about their home’s radon level. Those who want to maintain their uncertainty will avoid information that could be distressing (Brashers, 2001). Thus, some individuals might want to avoid information about their home’s radon levels in order to maintain uncertainty and to avoid managing distressing information.

Brief Description of Planned Intervention

This campaign focused on homeowners in Iowa City, IA, and used several channels to communicate the risks of radon exposure and the methods to test for and fix radon in homes. Formative research consisted of a focus group and over 50 intercept interviews. Key informants were also extremely helpful in the development process. This campaign design included both online and interpersonal communication along with small media. Websites and social media, a local store, the local library, and the Iowa City Farmers Market were also involved. Intervention components worked to distribute informational materials (including a flowchart for people who just received their test results and a do-it-yourself [DIY] guide for those who wish to mitigate), sell test kits, and distribute yard signs indicating the occupant has tested for radon. One neighborhood in Iowa City was specifically targeted and was the site of the focus group portion
of the intervention. Both the formative research and campaign were informed by the several health behavior and communication theories described above.

**Partnerships**

This project fulfilled the service learning component of the course “Health Communication Campaigns” (172:246), taught by Dr. Shelly Campo and offered through the University of Iowa’s College of Public Health. The project was conducted in collaboration with and funded by the Iowa Initiative for Sustainable Communities (IISC). The IISC “is a campus-wide effort at the University of Iowa to enhance the capacity of Iowa's communities to be more sustainable” (Iowa Initiative for Sustainable Communities, 2015). The City of Iowa City along with Johnson County Public Health (JCPH) were also partners for this project which was designed to serve their needs, and these organizations provided input and assistance.

**Goals**

This campaign’s overarching goal was to increase the public’s awareness of the dangers of radon as well as the options for testing and mitigating. Utilizing a variety of communication channels in Iowa City, it was also this campaign’s goal to improve and increase the messaging about radon around Iowa City both through increasing number of locations displayed and quality of signage. This campaign aimed to connect with communities in Iowa City on a more personal level (through booths at the farmers market and public library) to encourage open dialogue on the subject of radon testing and mitigation.

**Objectives**

The objectives of this health campaign were to:

1. increase sales of radon test kits by five percent (15 test kits) at JCPH for fiscal year 2015
2. increase purchases of radon test kits at Paul’s Discount Store by five sales from April to May 2015
3. increase the number of posted radon messages in public places in Iowa City by ten locations as of May 2015
4. provide our partners new radon-related material for their websites by May 2015
5. reach 20 Iowa City residents at each tabling event (120 individuals over 6 events)
6. observe at least five yard signs displayed in yards around Iowa City by May 2015.

Please see Appendix A for a timeline of our campaign planning and implementation and Appendix B for activities-based and theory-based logic models that summarize our campaign plan and message development strategies.

**Target Audience**

This campaign focused on residents of Iowa City who own their homes. Originally, primary attention was paid to those homes within city neighborhood associations. It should be noted that despite this project’s focus on homeowners, renters were not excluded in any aspect of the intervention and were recognized to be a population who are very much in need of public health intervention for radon. Landlords are not required to mitigate radon in their rental properties, even if tests have shown radon at the actionable levels (Nick Benson, personal communication, Jan. 26, 2015). Unfortunately, this leaves renters with very little power to take action other than moving out of a housing situation where high radon exposure is happening. As this is hardly an easy solution, our intervention efforts were geared more toward homeowners who do have the ability to remedy their own situation. Thus, it is our hope and a peripheral goal of our campaign that through increased community awareness and eventual policy-level action, the radon situation for renters will still ultimately be improved.
Initial Planning

Planning for this intervention began by collecting preliminary data on radon levels in the state of Iowa and current legislation surrounding testing and mitigation of radon in multiple types of properties (homes, rentals, schools etc.). Iowa City, in particular, was investigated through various forms of media (newspaper, internet, etc.) to assess the city laws and building codes that relate to radon. Selection of a target population, as mentioned above, has followed a non-linear path. Neighborhood associations were selected as the initial target population for this intervention, and publicly available data was examined for demographic differences between areas of the city. Neighborhood association leaders were initially considered for their potential influence in their communities and for the possibility of utilizing resources already present to help the intervention. Neighborhood associations have been shown to be useful in the literature. For example, Donnelly and Kimble (2006) studied neighborhood revitalization campaigns organized by neighborhood associations and found that actions instigated and promoted by neighborhood association members were utilized and enhanced the quality of life for those living in the neighborhood.

To begin communication with the different neighborhoods, the head neighborhood outreach coordinator, Marcia Bollinger, was contacted (Marcia Bollinger, personal communication, February 12, 2015). She has been a valuable asset for information about the neighborhood associations in Iowa City as well as the city in general. An e-mail giving a brief background on radon and the dangers thereof and asking if any neighborhoods would wish to learn more or potentially participate in the planned campaign was sent out to all the head neighborhood associations in Iowa City through Bollinger. Judith Pfohl (of the Ty’n Cae neighborhood association in western Iowa City) was recruited through this email. She proved to
be a useful key informant, and a focus group with an intervention component located at her home was conducted in early April. Details of the key informant interview and focus group can be found below.

**Formative Research**

**Key Informant Interviews**

**Key Informant Interview with Judith Pfohl.** While connecting with the neighborhood association coordinators has proven more difficult and less successful than expected, one neighborhood association president, Judith Pfohl of the Ty’n Cae neighborhood became a key informant of the study. During our initial in-depth interview with Pfohl, she provided her personal perception of radon awareness in Iowa City and her neighborhood, ideas and feedback on potential messaging channels for our campaign, and a demonstration of how her husband was able to mitigate their own home’s radon problem. As the leader of her neighborhood association and as an active member of their community, Pfohl estimated that only about six or seven homes (of the 156 total) have mitigated for radon in her neighborhood. Pfohl was supportive of our idea to use yard signs as a cue-to-action messaging strategy, and she showed us her own makeshift yard sign which has helped advertise neighborhood events in the past. Finally, while Pfohl was initially hesitant to endorse our partnership idea with hardware stores, she did suggest that we try a local, family-owned entity rather than corporate conglomerate such as Menards.

Pfohl also presented us several campaign ideas directly from her neighbors prior to our arrival for the interview. Some of their suggestions were: To connect with local parent-teacher associations (PTAs); partner with Iowa City hospitals to provide radon information in the new parent brochures; connect with the local homeschooling associations; contact the Iowa City Public Library to reserve a potential meeting room; and also to garner media attention through
establishing a social networking presence or contacting a local newspaper (Judith Pfohl, personal communication, March 11, 2015).

James Lacina, JCPH. In order to understand further the process of test kits, testing, and awareness levels, JCPH was contacted, and James Lacina provided valuable information (James Lacina, personal communication, March 18, 2015). His descriptions of the testing process proved useful later in our intervention, allowing us to field a variety of common questions from test kit buyers. In addition, Lacina was asked about using the JCPH webpage as part of the web-based component. He explained that JCPH has a Facebook page, run by Cody Shafer, which we could utilize. Lacina mentioned radon information could also be uploaded onto the Johnson County website, which currently does not have a separate radon information webpage (James Lacina, personal communication, March 24, 2015).

Pilot Testing Materials

Following the campaign development methodology used by Sorensen et al. (2008), Lindsey et al. (2009) and Noar et al. (2014), we pilot tested all of the materials developed for use in our campaign. These materials included yard signs, an informational “flow chart” to help people interpret what their test results mean and what their next steps should be, a do-it-yourself guide for potential radon mitigation, and radon awareness posters. The material development process and pilot testing procedure for each follows below.

Yard Signs. Based on our class discussion, and our initial in-depth interview with Pfohl, we designed six potential yard signs. These were originally created following a review of other radon-related campaigns’ promotional materials including the EPA’s “A Citizen’s Guide to Radon,” the Canadian campaign “Take Action on Radon,” the environmental health fact sheet from the Illinois Department of Health, and the website from Superior Water and Air, a utility
company based in Utah. This review helped inform our use of a variety of backgrounds and also informed the content of some of our messages. Additionally, we developed four of the potential messages based on several different frames which could be used to communicate about radon. Framing gives a message a central organizing idea and involves highlighting or promoting a particular aspect of an issue in order to make it easier for a particular audience to understand (Scheufele, 1999). The particular frames we chose to use and their corresponding messages were: Family - “I Tested for Radon to Keep My Family Safe”; community/civic responsibility - “Doing My Part to Make Iowa City Radon Free”; self-efficacy - “Radon Can Kill, But Testing is Easy”; and stress-reduction - “Testing for Radon = Peace of Mind.”

The six original yard sign mock-ups (see Appendix C) were created in PowerPoint for ease of future editing and were shown to all pilot testing participants as color printed, letter-sized, paper handouts. It was explained to all participants that each background and message was interchangeable—thus, we were hoping for feedback on both the background and message components individually for each yard sign. Questions such as “Which one do you like best?”, “Which ones do you like the best?”, and “What would you change about each sign?” were asked to each participant, based in part on Sorensen et al.’s (2008) focus group moderator guide.

The pilot testing of the yard signs occurred at the initial focus group at Pfohl’s home and each session of intercept interviews (described below). Based on the responses from each testing period, we determined that two different messages and backgrounds were consistently preferred, and based on our large target audience, we elected to produce two final versions of the yard sign (see Appendix D). The final versions were created by an integral partner for our campaign, professional graphic designer Jared Salasberry, who developed our materials at a discounted hourly rate.
Flowchart. Based on lecture material regarding health literacy (S. Campo, personal communication, Spring 2015) our initial conversation with Pfohl, and personal experience using radon test kits, we elected to produce a supplemental document to give people. The document, which is formatted as a flowchart, explains what steps to take after conducting a radon test. This was created as a flowchart so people could easily follow the appropriate course of action depending on their actual test result. Despite the seemingly simple guideline of four pCi/L as the acceptable limit, the actual recommended actions following a radon test are more complicated and include multiple additional tests regardless of initial result (EPA, 2013). Neither the Air Chek test kit material nor test results provide a simplified “here is what to do next” type of instruction.

The flowchart was tested during the initial focus group and at the first two intercept interview sessions. Initially, we had developed this flowchart to be included in the same document as the DIY guide to mitigation (detailed below), however, following our pilot testing, we created this as a separate document. See Appendix E for the first two renditions of the flow chart and Appendix F for the final version.

DIY Guide. In order to have an option for those who wish to mitigate but may not have the means, we sought to develop a do-it-yourself guide for installing the pipe and fan. This idea came from our key informant interview with Judith Pfohl after seeing the work that her husband had done 30 years ago to install his own mitigation system for substantially less cost than a professional. A thorough internet search of past projects informed us on the style and popular building materials, and searches of the radon fan manufacturers helped to determine which are needed for the different square footages of homes’ basements. Val Riedman, who helps people install systems themselves, was also contacted via phone. A certified mitigation specialist and
owner of www.indoor-air-health-advisor.com, Riedman advised us on assembling the step-by-step directions as well as a few commonly-overlooked details, and he walked us through the initial assessment that he does when he’s faced with a new project. The DIY guide was tested during the focus group and the first two rounds of intercept interviews. See Appendix G for initial version and Appendix H for the finalized guide.

Providing a DIY guide is also supported by the concept of response costs mentioned earlier in the context of the EPPM. Response costs are the downsides that people perceive to a behavior (Rintamaki & Yang, 2014), which here would be testing for radon. If concerns about the price of mitigating in the event of a high radon level are preventing someone from testing, a DIY guide with more affordable options could overcome that barrier to testing. Also, once someone with a high radon level takes a small step like sealing cracks in a basement floor, they may be more likely to take a larger step like putting in a mitigation system. Research demonstrates the presence of a foot-in-the-door effect, in which those who are asked to do a small task first are more likely to later agree to do a large task than those who are not asked first to do the small task (Perloff, 1993). Giving people small ways to combat radon can help get over barriers to testing and can encourage more comprehensive actions in the future.

Posters. Finally, in an effort to reach the Iowa City community beyond our focus group, intercept interviews, and farmers market locations, we developed a poster for use by any local entities who would be interested in displaying it, including Paul’s. Previous literature regarding fear appeals (Witte & Allen, 2000; Witte, 1992) suggested to us that some of the signage currently used in Paul’s may not be as effective as it could, potentially sending people into fear control processing rather than danger control processing. Fear control processing results in message avoidance and rejection, whereas danger control processing contributes to message
acceptance and even behavior change (Witte & Allen, 2000). Thus, again working with Jared Salasberry, we developed three potential posters. Each poster had a similar background scheme and use of statistics and efficacy-based messages; however, they had three different main taglines: “Radon is the #2 cause of lung cancer” (this was called “lung,” see Appendix I), “Test for radon, important everywhere, most important here” (called “radon,” see Appendix J), and “More people die from radon than drunk driving” (called “drunk,” see Appendix K). These were tested during the second two rounds of intercept interviews, and the two most preferred options were both displayed during the farmers market.

Focus group

At the Ty’n Cae focus group, general awareness of radon was assessed along with theoretically informed concepts such as efficacy to test and mediate. This was accomplished using pre- and post-meeting surveys. The pre- and post-tests contained a measure each of severity, susceptibility, response efficacy, and self-efficacy that were based on a scale from Witte, Meyer, and Martell (2001). Current radon knowledge, the channels from which radon information would be trusted, and responses to the currently selected channels were discussed. Concepts for yard signs were presented with each member in attendance giving opinions on both message and background. As we did not feel comfortable potentially raising worry about radon without providing information and reducing barriers to testing, early drafts of aforementioned informational materials were distributed around a radon awareness presentation, and radon test kits were available for purchase (provided at a low cost [$5] by JCPH). As mentioned above, having test kits actually available instead of providing a coupon is recommended (Nissen et al., 2012). Responses to these items helped inform selection of materials and messages for later
aspects of the intervention. Additionally, we sold seven test kits, and three participants requested yard signs once they were finished.

The focus group yielded many valuable results. Conclusions from the yard sign discussion were that there should be multiple choices for signs and that signs should be easy to read while driving and should not be unreasonably frightening for neighborhood locations. Focus group participants expressed interest in policies regarding radon, especially in schools and regarding renting. Several participants expressed surprise at how cheap radon testing could be. General suggestions for campaign activities included working with 4-H or the Boy Scouts and having tables at local farmers markets and events.

Pre- and post-tests were given to three attendees of the focus group, as two members were Judy Pfohl and her husband. All of the respondents had heard of radon, but only one had tested. Agreement to four EPPM measures increased from pre-test to post-test (Table 2). In the post-test, all respondents said that they were likely or very likely to test their home for radon in the next two weeks.

**Intercept interviews**

Additional formative research took place at three locations: Robert A. Lee Rec Center in Iowa City, the Iowa City Public Library, and at the nearby outdoor pedestrian mall in downtown Iowa City. These interviews were similar in content to the focus group described above where the concepts for yard signs, posters, the DIY guide, and the flow chart were presented along with questions about general radon knowledge and EPPM concepts. The library was visited on both a weekend day and weekday, as different populations are present those days (Kara Logsdon, personal communication, March 24, 2015).
Data from the intercept interviews were entered into Excel 2013 and analyzed in SAS 9.3. A total of 52 individuals responded to the intercept interviews. The distribution among the sites and times is available in Table 3. Almost 90 percent of the sample had heard about radon (Table 4), but only 32 percent had tested for radon (Table 5). Reasons given for not testing included living in an apartment, not knowing about radon, living in a basement, not being forced to test, and blissful ignorance. Mentions of blissful ignorance reflect the desire to maintain uncertainty discussed above in relation to uncertainty management theory. Reasons given for testing included having heard that levels of radon are high in Iowa and reasons related to selling and buying a house.

Table 6 contains the mean responses to the EPPM variables. Responses are coded as 1 for strongly disagree and 5 as strongly agree, with higher means indicating higher levels of perceived severity, susceptibility, response efficacy, and self-efficacy. Both those who had tested and those who had not had similar levels of severity and susceptibility, with severity higher than susceptibility. Response efficacy and self-efficacy differed between those who had and had not tested, with those who had tested having higher response efficacy and self-efficacy than those who had not tested. Thus, efficacy is an important area to target for testing.

Table 7 contains the results for the yard signs, and Table 8 contains the results for the posters. Reactions to yard signs and posters were coded as 1 for a positive response, -1 for a negative response, and 0 for a neutral or no response. Poster responses could also take half values. Among those who had tested, the fourth yard sign was the most popular followed by the first yard sign and the sixth yard sign. Among those who had not tested, the first yard sign was the most popular, followed by the fourth yard sign and then the second yard sign. Thus, the fourth yard sign - “Testing for Radon = Peace of Mind” - and the first yard sign – “I know my
family is safe, I tested for radon” (house background) – were chosen. The most popular posters among both groups were the first and third posters, and thus these two were chosen. They reference lung cancer and drunk driving, respectively.

**Additional Intervention Components**

**Store displays.** A local hardware store was targeted as a point of intervention, as a hardware store had been used in previous similar campaigns (McLaughlin et al., 2004). This particular hardware store, Paul’s Discount, had an existing display of radon and other test kits for sale with various outdated signage. After speaking to the owner of Paul’s, the store agreed to let the authors of this paper change the signage with the final yard sign designs, removing the outdated signage completely (Joel Edenberg, personal communication, March 24, 2015). Paul’s continues to keep track of the sales of the kits since the placement of the new signage.

**Development of local online radon resources.** The campaign also included a web-based component with plans to add a new page to the city’s website highlighting radon awareness and the resources to get tested or to mitigate. Finalized components submitted to different online entities in and around Iowa City included the two final yard sign designs, two posters, the DIY guide, and the flow-chart. While extensive radon information is available from the Environmental Protection Agency’s website, http://www.epa.gov/radon, and some information is available from the Iowa Department of Public Health’s website, http://www.idph.state.ia.us/radon, there is little local information specifically for Iowa City. As mentioned above (Poortinga et al., 2011), local sources of information can be very important for convincing people to test for radon.

**Tables at important local places/events.** On May 2nd, intervention materials were presented at two locations. A booth was set up at the first Iowa City Farmers Market of 2015, where test kits were sold and anyone could take copies of the finalized versions of the DIY
guide, flow-chart, and two yard signs. Finalized versions of the two posters were also on display, and informational booklets on radon were provided by the Iowa Cancer Consortium. The booth was in operation for four and a half hours, and for many of those, another booth was being operated in the atrium of the public library (although test kits could not be sold here due to library regulations [Kara Logsden, personal communication, March 24, 2015]). Those interested in purchasing a test kit were directed to the farmers market booth. A table was provided by the College of Public Health, and table coverings were provided both by the college and by the Iowa Initiative for Sustainable Communities.

The use of tables at the public library and the farmers market was inspired by communication with a key informant. Key informants are essential when designing a campaign, as these individuals allow one to be better informed on the community’s needs, attitudes, and beliefs around the target issue (Jennett et al., 2003). Pfohl, our key informant from a local neighborhood association, suggested setting up a table at the public library. Similarly, our professor, Dr. Campo, suggested setting up a table at the farmers market. While there has not been formal research examining the effects of radon informational tables at such locations, this will not be the first time a farmers market has been used as part of a radon intervention (Erie County Legislature, 2013).

**Media/outreach.** This portion of our intervention began when the final designs for the posters and yard signs were chosen. Digital versions of these, the DIY guides, and flowchart were sent along with an official press release to several local entities including the University of Iowa College of Public Health, JCPH, and the IISC. The IISC also forwarded these materials to several local newspapers, including the Daily Iowan and the Iowa City Press Citizen. All of these locations posted about the campaign on various social media platforms (Twitter, Facebook, and
weekly email newsletters), mentioning either the upcoming farmers market or summarizing the project. The finalized materials were also sent to the web designers for JCPH, IISC, and the Iowa Cancer Consortium for use on their websites.

**Evaluation**

**Implementation Evaluation: How Did It Go?**

Implementation evaluation allows for the project team to determine how well intervention components are being received, make adjustments as needed, and understand how well goals are being accomplished (Robert Wood Johnson Foundation [RWJF], 2004). For the intervention table at the farmers market and the library, the number of visitors to the tables were counted and responses to the table and to radon testing in general were recorded. In total, team members talked to 187 people at the farmers market and 29 people at the library on May 2nd. Reactions to the table were overwhelmingly positive, including questions as to whether or not we would be returning to the farmers market in ensuing weeks. As predicted by uncertainty management theory, several people mentioned that they just did not want to know whether their home had radon and that “Ignorance is bliss.” Seventeen yard signs were distributed, 11 of the “Peace of Mind” sign and six of the “I Tested” sign. In total, 83 flowcharts and 83 DIY guides were distributed. The yard signs also allow for implementation evaluation in a second way, as the presence or absence of them in yards around Iowa City will indicate whether the signs were accepted. So far, three signs have been sighted, but these are all in the yards of friends, teachers, or parents of team members.

**Outcome Evaluation: Did we meet our objectives?**

Outcome evaluation allows for the effectiveness of a campaign to be determined (RWJF, 2004). Outcome evaluation for this project corresponded to the objectives introduced earlier.
Objective 1: increase sales of radon test kits by five percent (15 test kits) at JCPH for fiscal year 2015

Current Status: A total of 78 test kits have been sold, 71 at the farmers market and seven at the focus group.

Objective 2: increase purchases of radon test kits at Paul’s Discount Store by five sales from April to May 2015

Current Status: pending

Objective 3: increase the number of posted radon messages in public places in Iowa City by ten locations as of May 2015

Current Status: pending

Objective 4: provide our partners new radon related material for their websites by May 2015

Current Status: completed

Objective 5: reach 20 Iowa City residents at each tabling event (120 individuals over six events)

Current Status: A total of 273 people were reached. 187 individuals were spoken to at the farmers market, 30 at the library event, and 56 during the formative research process.

Objective 6: observe at least five yard signs displayed in yards around Iowa City by May 2015.

Current Status: Three yard signs have been observed.

Unintended Consequences

There were three unintended consequences in the radon campaign. The first unintended consequence occurred after the focus group. One participant was outraged at the lack of policies concerning radon in Iowa City. As a result, this participant wrote a letter to the editor in two newspaper publications: The Gazette and Press Citizen. The participant detailed in the writing how there is a lack of mitigation in public buildings or rentals, and that passive mitigation may
not reduce radon to safe levels. The participant also wanted readers to ask the city and state when they will regulate this public danger. Following this result, we reflected as a group and decided we need to be very clear in future communications with the public that we are partnered with JCPH and the City of Iowa City for the explicit purpose of addressing the radon problem in our community.

The second unintended consequence occurred at the farmers market event. In a sense, our group members all acted as opinion leaders, and when we went to various food vendors throughout the event, the vendors would then begin talking amongst themselves, conversations potentially overheard by customers standing in line. Thus, the vendors became both an unintended audience of the campaign and a potential avenue for diffusion of our message. We noticed conversations among the vendors that we encountered.

Finally, our third unintended consequence occurred as a result of our yard sign use at the farmers market. While these yard signs were meant to be given away with test kits, they actually more served to attract people to visit our table. Unfortunately, some customers would observe the yard signs but would have no interest in learning more about radon or buying a test kit. They thought it was a way to promote our booth, instead of a tool that they could use to raise awareness about radon.

Limitations

One limitation we encountered was the difficulty of measuring awareness as an outcome. We did not survey community members during or after the farmers market so we were not able to analyze the effect that our campaign had on this measure. A second possible limitation of replication of our intervention is that while our association with the University of Iowa College of Public Health increased our credibility among community members in Iowa City, in other
areas of Iowa where the University of Iowa is not as heavily favored this effect might not be present. This could especially be true in more agricultural areas where Iowa State University may be seen as a more credible source. Third, our reliance on email to recruit neighborhood association leaders was problematic. Using this avenue of communication only allowed us to connect with one leader. Using a more direct approach such as a phone call or meeting could have increased the participation rate.

**Conclusion and Future Plans**

Despite the project’s limitations, and current the pending status for several objectives, we consider the campaign a success. Each step of the planning and implementation process informed our subsequent actions toward campaign material development, formative research/pilot testing procedures and locations, and our final Farmers Market intervention. We feel confident that the materials developed for the campaign reflect appropriate theoretical components necessary for effective radon messaging, as well as reflecting the interests of our target audience. It is our hope that the yard signs and posters will continue to be utilized and displayed around Iowa City and continue to serve as cues-to-action for radon testing. The Farmers Market intervention proved to be a vital component of our campaign in terms of outreach and radon test kit sales but also it serves as a potential lesson for public health practitioners more broadly. This type of event should be considered for use by radon campaigns across the country and also should be considered for public health campaigns or interventions dealing with other issues. We are grateful both for the opportunity the campaign provided to work with each of our community partners and to and all of the Iowa City residents who participated. We hope that our work will contribute to improving radon awareness and testing and will ultimately help improve the overall health of Iowa City residents.
Suggestions for future evaluation of the intervention:

- Neighborhood intercept interviews could be performed to determine if people are seeing and responding to the signs.

- If tabling events are used at other locations, surveys could be given out to visitors to the table, perhaps with a discount on the price of a test kit, as suggested by a focus group member.

- Conduct additional formative research with individuals who wish to maintain uncertainty (those who preferred not to know their radon levels), and develop materials which specifically address this population segment.

- Landlords and renters are additional groups who should be considered for future research.

Budget Justification

Salaries and Wages

A graphic designer was paid for 10 hours of work at $40 per hour totaling $400 in wages. The graphic designer produced our posters and yard signs used in this campaign, and his rate for hour for this campaign was discounted in comparison for his work for other public health efforts.

Equipment

Equipment and supplies totaling $395.56 were used for this campaign. Equipment totals are divided up between the major activities of our campaign (focus group, intercept interviews, farmers market, and other media).

Focus group. Equipment for the focus group cost $25.23. Drinks ($5.23) were provided at our focus group to incentivize participation and thank participants for their time. Utensils
($7.50) were provided for participants to use as they ate the food ($12.50). In kind contributions consisted of the printed materials for pilot testing.

**Intercept Interviews.** Equipment for intercept interviews cost $12.84. Food and drinks ($8.26) were provided to help attract people to our booth and to thank those who participated. Clipboards ($4.58) were used by group members for completing surveys as they stood with participants.

**Farmers Market.** Equipment totaling $305.10 were used at our farmers market event. Two display boards ($3.15) were purchased so we could advertise our posters, yard signs, and test kits on our booth table. Permanent markers ($4.21) were used to draw signs advertising our yard sign and test kits for sale. Poster tape ($5.27) was used to tape posters to the poster boards. Yard signs ($241.15) were given out at the farmers market to people who bought test kits. Wooden stakes ($19.04) were stapled to the back of the yard signs so that they could be inserted into the ground and displayed. Handouts of the flowchart and DIY instructions ($32.28) were printed and handed out to community members to inform them how to test and mitigate for radon.

**Other Media.** Posters totaling $52.39 were printed and distributed to various businesses and organizations around Iowa City to promote radon awareness. Four of the posters were also used at the library and farmers market to help advertise at our booth.
References


## Appendix A: Proposed Campaign Timeline

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Contacted potential target populations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contacted Marcia Bollinger</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decided to Focus on Neighborhood Associations</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sent Mass E-mail to Marcia Bollinger</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Judy Pfhol Contacted Us</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sent Second E-mail to Marcia Bollinger</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Met with Judy to Discuss Campaign</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Contacted Val- Radon Guy</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Started Designing DIY Mitigation Guide</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contacted Various Hardware Stores</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Paul's Hardware Store Agreed to Utilize Messages</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Met with Paul's Hardware Store</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Contacted Johnson County Public Health About Test Kits</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Contacted Partners about Interest in Website Material (Marcia and JCPH)</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Contacted Bill Fields</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Initial Contact with Brenda Nations about Farmers Market</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Initial Contact with Iowa City Public Library (ICPL)</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Contacted Connie Muttel</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Contacted Mary Masher</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Initial Contact with Jared Salasberry (graphic designer)</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Started Designing Yard Signs</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Started Designing Flow Chart</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Started Designing Posters</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Picked up Test Kits from JCPH</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Picked up Brochures from Iowa Cancer Consortium</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Contacted UI Printing</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Designed Pre/Post-Survey for Focus Group</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Met with Focus Group</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Designed Survey for Intercept Interviews</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Contacted Locations for Intercept Interviews</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Iowa City Public Library Intercept Interviews</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Iowa City Pedistrian Mall Intercept Interviews</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Robert A. Lee Intercept Interviews</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Calculated Statistics on Intercept Interviews</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Submitted Final Products to UI Printing</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Contacted College of Public Health (CPH) and IISC for Utilizing Tablecloths</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Wrote and Submitted Press Release to CPH and IISC</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Submitted Website Materials to Partners</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Picked Up Final Products from UI Printing</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Final Event Promoted by Various Media Outlets</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Farmers Market and ICPL</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>
### Appendix B: Activities-based Logic Model and Theory-based Logic Model

#### Activities Based Logic Model

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Activities</th>
<th>Output</th>
<th>Outcomes</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>College of Public Health; Health Communication Campaigns – group</td>
<td>Contacting key informants</td>
<td>Increased radon awareness</td>
<td>Increased radon testing</td>
<td>Reduced morbidity and mortality from lung cancer</td>
</tr>
<tr>
<td>UI Sustainability Initiative: funding</td>
<td>Focus group, intercept interviews</td>
<td>Increased sales of radon test kits</td>
<td>Increased public concern for radon overall (in other buildings)</td>
<td></td>
</tr>
<tr>
<td>Johnson County Public Health</td>
<td>Contacting partnership organizations</td>
<td>Process evaluation at library, farmers market, Paul’s</td>
<td>Increased perceived response efficacy (mitigation and testing)</td>
<td>Increased community health</td>
</tr>
<tr>
<td>Key Informants/ Experts: Marcia Bollinger, Bill Field, Judy Pfohl</td>
<td>Press release</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partners: IC Neighborhood Associations, Paul’s, IC Library, Farmers Market</td>
<td>Social media and online presence</td>
<td></td>
<td>Decreased barriers to testing</td>
<td></td>
</tr>
<tr>
<td>Graphic designer: Jared Salasberry</td>
<td>Yard signs – design and testing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radon expert: Val Riedman</td>
<td>DIY handouts for mitigation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yard signs displayed</td>
<td></td>
<td>Increased homes mitigated</td>
<td></td>
</tr>
<tr>
<td>External Stimuli</td>
<td>Message Processing</td>
<td>Outcomes</td>
<td>Process</td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------</td>
<td>----------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td>Campaign Materials:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. Yard signs
2. Posters |
| Message Components |
Self-efficacy, response efficacy, susceptibility, severity |
| Other Factors |
Farmers Market attendance, intercept interview participation, focus group participation, neighborhood yard signage, poster placement, personal relevance |

PERCEIVED EFFICACY
Self Response

PERCEIVED THREAT
Severity Susceptibility

FEAR

Protection Motivation: Message Acceptance

Defensive Motivation: Message Rejection

Danger Control: Buy test kit, test for radon

Fear Control: No change toward radon testing
Appendix C: Pilot tested yard signs

1. I know my family is **SAFE**
   I tested for **RADON**

2. Radon Can Kill, But Testing is Easy

3. I tested for **Radon**
   To keep my **Family** Safe

4. I know my family is **SAFE**...
   I tested my home for **RADON**

5. Testing for **RADON** = Peace of Mind

6. Doing my part to make **Iowa City Radon Free**
Appendix D: Final yard signs

Testing for RADON =

Peace of Mind
For more information visit:
http://www.epa.gov/radon

My family is SAFE

I tested for RADON
For more information visit:
http://www.epa.gov/radon
Appendix E: Flow chart original and second iteration

So You’ve Tested for Radon. Now What?

Your radon level is at or above 4.0 pCi/L

- Receive results from radon test
- Follow-up with another test and average the two results
- If your average is at or above 4.0 pCi/L
  - Consider mitigating your home for radon
  - Consult a qualified mitigator to get an estimate
- If your average is below 4.0 pCi/L
  - Your home is below the EPA’s action level. However, consider testing your home again in the future.

Your radon level is below 4.0 pCi/L

- Your average was still at or above 4.0 pCi/L
  - Consult installing a mitigation system
- Your average was below 4.0 pCi/L
  - Refer to the back of this page for a DIY mitigation option

Things to keep in mind when testing:
- Any radon level in your home poses some risk even if it is below 4.0 pCi/L.
- Radon levels can vary by season, so try testing at different times during the year.
- There are short-term and long-term radon tests, each with their own pros and cons, so be sure to consider which is best for your situation when purchasing.

For more information visit epa.gov/radon

So you’ve tested for Radon. Now what?

Your reading was at or above 4.0 pCi/L

- Perform another test and average the two results.
- Your average was still at or above 4.0 pCi/L
  - Consult installing a mitigation system
- Your average was below 4.0 pCi/L
  - Refer to the back of this page for a DIY mitigation option

Your reading was below 4.0 pCi/L

- Your home is below the EPA’s action level, but consider testing your home again in the future.
- Your average was still at or above 4.0 pCi/L
  - Consult installing a mitigation system
- Your average was below 4.0 pCi/L
  - Refer to the back of this page for a DIY mitigation option

Make your own mitigation system

Radon mitigation can seem like an intimidating process, but with some planning, it’s a very doable job for an avid Do-It-Yourselfer. If you are not comfortable using power tools or are unsure about your house’s construction, call a mitigation specialist.

The system involves venting radon from under your house up through the roof using a pipe and a fan. A simple first step is to seal all of the cracks in your basement floor and walls using waterproof polyurethane caulk or radon sealant caulk. For larger gaps, use foam backer rod at the bottom before filling the rest of the gap with sealant. Curing of the sealant can take 48 hours. See reverse for detailed instructions.

Local mitigation specialists

- Adam Beck, Midwest Radon Mitigation: 563-564-1915
- Dean Berchenbrite, GeoServices Inc.: 319-431-3445, 888-642-5165
- Tony Carson, Radon Solutions of Iowa: 319-325-9220
- Larry Ellis, Ellis Home Improvement: 319-393-8322
- Jim Hoeger, Complete Home Repair & Remodeling: 319-399-1728
- Mark Alan Mitchell, Mitchell Radon Mitigation: 319-338-9033
- Craig Steed, All Pro Home Inspections: 319-337-6614
Appendix F: Final flow chart document

Your radon test results came back. Now what?

Your reading was **at or above 4.0 pCi/L**

Perform another test and average the two results.

Your average was still **at or above 4.0 pCi/L**

Consider installing a mitigation system

Make your own mitigation system

Radon mitigation can seem like an intimidating process, but with some planning, it’s a very doable job for an avid Do-It-Yourselfer. If you are not comfortable using power tools or are unsure about your house’s construction, call a mitigation specialist.

Your reading was **below 4.0 pCi/L**

Your home is **below** the EPA’s action level, but consider testing your home again in the future.

Local mitigation specialists
- Adam Beck, Midwest Radon Mitigation: 563-564-1915
- Dean Berchenbrite, GeoServices Inc.: 319-431-3445, 888-642-5165
- Tony Carson, Radon Solutions of Iowa: 319-325-9220
- Larry Ellis, Ellis Home Improvement: 319-393-8322
- Jim Hoeger, Complete Home Repair & Remodeling: 319-399-1728
- Mark Alan Mitchell, Mitchell Radon Mitigation: 319-338-9033
- Craig Steed, All Pro Home Inspections: 319-337-6614
Tips for DIY Radon Mitigation

Under Construction

If you already have a sump pump basin, this is an ideal location for the pipe and should also allow you to determine the material beneath your house (dirt, gravel, sand, clay etc.) and whether you have a drainage system in place. If there's no drainage system or gravel under the concrete (common in homes built before the 1970s), consider consulting an expert on your options.

Once you wish to install a pipe, consider where the pipe can rise through the different floors of the house and where it can exit (through the roof or the side of the house).

The ideal location for a fan is in the attic, since installation standards require the fan to be located outside of the living spaces in a home. The fan could also be placed outside of the home or in a garage, but not on top of the roof. The attic of an attached garage will also work. The pipe must exit 12" from the surface of the roof and be more than 10ft away from the nearest window (horizontally). If the pipe ends above a window, it must be at least two feet above the window. The pipe will need a screen/cap to prevent debris from falling inside (right).

Drill a hole slightly larger than four inches in either the sump basin’s cover or into the concrete floor to accommodate a four-inch PVC pipe. If drilling through concrete, you can rent or buy a 5" cement drill from a local hardware store, otherwise you could drill smaller holes in a circular pattern (left). After passing through the concrete, scooping out soil/gravel may be necessary for as far as you can reach inside of the hole. When the pipe is put inside, it should not be touching the ground and should have plenty of space around it for air to collect.

Using PVC cement to connect pieces of pipe, direct the piping upward, making sure to support it every four feet horizontally and every 7-8 feet vertically. Any time the pipe passes through a wall from one room to another, a fire collar/Nelson barrier is required.

The type of fan needed varies depending on factors like the size of your basement and the type of substrate under the concrete. For basements <1000ft², an RP140 or XP201 can be used (both of which can be found on Amazon or on indoor-air-health-advisor.com), for 1001-1500ft², the RP145 or XP151 will suffice, and for larger basements, use RP- and XR260s (and above).

The fans will also need to be near a power source, but many of the fans’ output powers are less than 100 watts. Some fans don’t have a full power cord, so one must be added onto existing electrical connections on the fan in order to plug it into the wall.

After installation, make sure that all joints and openings around the pipe are sealed. A DynaMeter u-tube manometer is also recommended on a lower section of pipe. This detects pressure differences between the outside and inside of the system and can easily and quickly show whether or not the fan is working. Furthermore, a carbon monoxide detector is also recommended to check for proper airflow in kitchen appliances and other flues. A smoke pen may also help to detect airflow patterns to ensure everything is functioning properly.

Tips for DIY Radon Mitigation

Radon mitigation can seem like an intimidating process, but with some planning, it's a very doable job for an avid Do-It-Yourselfer. If you are not comfortable using power tools or are unsure about your house’s construction, call a mitigation specialist.

What you’ll need

- Tape measure
- Saw
- Waterproof polyurethane caulk
- Ear protection
- 5" cement drill attachment + drill
- 4" PVC pipe segments
- Pipe supports + screws + screwdriver
- PVC cement
- Fire collar/Nelson barriers
- Drill + bits
- Radon fan
- Power cord for fan (optional)
- PVC/Metal vent cap
- u-Tube Manometer
- Smoke pen
- Carbon monoxide detector

- Seal all cracks in your basement floor and walls using waterproof polyurethane caulk or radon sealant caulk. For larger gaps, use foam backer rod at the bottom before filling the rest of the gap with sealant. Curing of the sealant can take 48 hours.

- Once you wish to install a pipe, consider where the pipe can rise through the different floors of the house and where it can exit (through the roof or the side of the house). The ideal location for a fan is in the attic, since installation standards require the fan to be located outside of the living spaces in a home. The fan could also be placed outside of the home or in a garage, but not on top of the roof.

- The attic of an attached garage will also work, but make sure to adhere to these building codes: The pipe must exit 12" from the surface of the roof and be more than 10ft away from the nearest window (horizontally). If the pipe ends above a window, it must be at least two feet above the window. The pipe will need a screen/cap to prevent debris from falling inside (right). This can be purchased or made.

- If you already have a sump pump basin, this is an ideal location for the pipe and should also allow you to determine the material beneath your house (dirt, gravel, sand, clay etc.). The pipe can be installed right through the sump pump cover. If there's no drainage system or gravel under the concrete (common in homes built before the 1970s), consider consulting an expert.

- If you don't have a sump, drill a hole slightly larger than four inches in the concrete to accommodate a four-inch PVC pipe. You can rent or buy a 5" cement drill from a local hardware store, otherwise you could drill smaller holes in a circular pattern (right).
• After passing through the concrete, scooping out soil/gravel may be necessary for as far as you can reach inside of the hole. When the pipe is put inside, it should not be touching the ground and should have plenty of space around it for air to collect.

• Using PVC cement to connect pieces of pipe, direct the piping upward, making sure to support it every four feet horizontally and every 7–8 feet vertically. Any time the pipe passes through a wall from one room to another, a fire collar/Nelson barrier is required.

• The type of fan needed varies depending on factors like the size of your basement and the type of substrate under the concrete. For basements <1000ft², an RP140 or XP201 can be used (both of which can be found on Amazon or on indoor-air-health-advisor.com), for 1001-1500ft², the RP145 or XP151 will suffice, and for larger basements, use RP- and XR250s (and above).

• The fans will also need to be near a power source, but many of the fans’ output powers are less than 100 watts. Some fans don’t have a full power cord, so one must be added onto existing electrical connections on the fan in order to plug it into the wall.

• After installation, make sure that all joints and openings around the pipe are sealed.

• A DynaMeter u-tube manometer is also recommended on a lower section of pipe. This detects pressure differences between the outside and inside of the system and can easily and quickly show whether or not the fan is working.

• Furthermore, a carbon monoxide detector is also recommended to check for proper airflow in kitchen appliances and other flues. A smoke pen may also help to detect airflow patterns to ensure everything is functioning properly.
Appendix I: “Lung” Poster

RADON is the #2 cause of lung cancer

Radon is an odorless, colorless, radioactive gas found in the soil.

Levels are especially high in Iowa where it rises from underground to get into your home.

But testing is easy!

- Buy a test kit
- Follow instructions
- If results are over 4, TEST SOME MORE!

To get your test kit, contact Johnson County Public Health or visit local hardware stores

Test for RADON

www.epa.gov/radon
Appendix J: Poster “Radon”

Test for **RADON:**

Important anywhere, most important **HERE**

Radon is found in every state with a particularly high rate right here in Iowa

Radon can enter your home from the earth through cracks, gaps, or other enterances.

Test for radon **TODAY!**

For more information visit:

[http://www.epa.gov/radon](http://www.epa.gov/radon)
RADON kills more people each year than drunk driving

Radon is an odorless, colorless, radioactive gas found everywhere, ESPECIALLY in Iowa.

It rises from the soil to get into your home and is the #2 cause of lung cancer behind smoking.

But testing is easy!
- Buy a test kit
- Follow instructions
- If results are over 4, TEST SOME MORE!

To get your test kit, contact Johnson County Public Health or visit local hardware stores

Test for RADON

www.epa.gov/radon
## Appendix L: Final Campaign Budget

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Focus Group</strong></td>
<td></td>
</tr>
<tr>
<td>Drinks</td>
<td>5.23</td>
</tr>
<tr>
<td>Eating utensils</td>
<td>7.50</td>
</tr>
<tr>
<td>Food</td>
<td>12.50</td>
</tr>
<tr>
<td><strong>Intercept Interviews</strong></td>
<td></td>
</tr>
<tr>
<td>Food</td>
<td>3.94</td>
</tr>
<tr>
<td>Drinks</td>
<td>4.32</td>
</tr>
<tr>
<td>Clipboards (3ct)</td>
<td>4.58</td>
</tr>
<tr>
<td><strong>Farmers Market</strong></td>
<td></td>
</tr>
<tr>
<td>Display board (2ct)</td>
<td>3.15</td>
</tr>
<tr>
<td>Permanent markers</td>
<td>4.21</td>
</tr>
<tr>
<td>Poster tape</td>
<td>5.27</td>
</tr>
<tr>
<td>Yard signs (50ct)</td>
<td>241.15</td>
</tr>
<tr>
<td>Wooden stakes (50ct)</td>
<td>19.04</td>
</tr>
<tr>
<td>Handouts (200ct)</td>
<td>32.28</td>
</tr>
<tr>
<td><strong>Other Media</strong></td>
<td></td>
</tr>
<tr>
<td>Posters (20ct)</td>
<td>52.39</td>
</tr>
<tr>
<td><strong>Salaries and Wages</strong></td>
<td></td>
</tr>
<tr>
<td>Graphic designer</td>
<td>$400</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>$795.56</strong></td>
</tr>
</tbody>
</table>
### Tables

#### Table 1: Test Kit Sales from JCPH by Year

<table>
<thead>
<tr>
<th>Year</th>
<th># units sold</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>183</td>
</tr>
<tr>
<td>2012</td>
<td>233</td>
</tr>
<tr>
<td>2013</td>
<td>235</td>
</tr>
<tr>
<td>2014</td>
<td>289</td>
</tr>
</tbody>
</table>

#### Table 2: EPPM Variable Response for Focus Group

<table>
<thead>
<tr>
<th>Question</th>
<th>Pre-Test Means</th>
<th>Post-Test Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severity</td>
<td>4.67</td>
<td>4.67</td>
</tr>
<tr>
<td>Susceptibility</td>
<td>3.33</td>
<td>4.67</td>
</tr>
<tr>
<td>Response efficacy</td>
<td>4</td>
<td>4.67</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

#### Table 3: Location, Dates, and Number of Intercept Interviews

<table>
<thead>
<tr>
<th>Location</th>
<th>Date</th>
<th>Number of Surveys</th>
</tr>
</thead>
<tbody>
<tr>
<td>Library</td>
<td>4/11/15</td>
<td>22</td>
</tr>
<tr>
<td>PedMall</td>
<td>4/17/15</td>
<td>7</td>
</tr>
<tr>
<td>Library</td>
<td>4/21/15</td>
<td>18</td>
</tr>
<tr>
<td>Rec Center</td>
<td>4/22/15</td>
<td>4</td>
</tr>
</tbody>
</table>

#### Table 4: Have you heard of radon?

<table>
<thead>
<tr>
<th>Response</th>
<th>N</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>6</td>
<td>11.76%</td>
</tr>
<tr>
<td>Yes</td>
<td>45</td>
<td>88.24%</td>
</tr>
</tbody>
</table>
### Table 5: Have you tested for radon?

<table>
<thead>
<tr>
<th>Response</th>
<th>N</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>30</td>
<td>60%</td>
</tr>
<tr>
<td>Unsure</td>
<td>4</td>
<td>8%</td>
</tr>
<tr>
<td>Yes</td>
<td>16</td>
<td>32%</td>
</tr>
</tbody>
</table>

### Table 6: EPPM Variable Responses by Testing Status

<table>
<thead>
<tr>
<th>Question</th>
<th>Mean among those who have tested (n = 29)</th>
<th>Mean among those who have not tested (n = 16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severity</td>
<td>4.31</td>
<td>4.17</td>
</tr>
<tr>
<td>Susceptibility</td>
<td>3.38</td>
<td>3.38</td>
</tr>
<tr>
<td>Response efficacy</td>
<td>4.63</td>
<td>3.87</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>4.38</td>
<td>3.55</td>
</tr>
</tbody>
</table>

### Table 7: Yard Sign Preferences

<table>
<thead>
<tr>
<th>Yard Sign</th>
<th>Mean among those who have tested (n = 29)</th>
<th>Mean among those who have not tested (n = 16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yard Sign 1: House</td>
<td>0.44</td>
<td>0.33</td>
</tr>
<tr>
<td>Yard Sign 2: Lungs</td>
<td>-0.38</td>
<td>0.13</td>
</tr>
<tr>
<td>Yard Sign 3: Safe Ground</td>
<td>0.06</td>
<td>0.07</td>
</tr>
<tr>
<td>Yard Sign 4: Peace</td>
<td>0.50</td>
<td>0.17</td>
</tr>
<tr>
<td>Yard Sign 5: Radon Gas</td>
<td>-0.13</td>
<td>0.10</td>
</tr>
<tr>
<td>Yard Sign 6: Iowa City</td>
<td>0.44</td>
<td>0.10</td>
</tr>
</tbody>
</table>

### Table 8: Poster Preferences

<table>
<thead>
<tr>
<th>Poster</th>
<th>Mean among those who have tested (n = 29)</th>
<th>Mean among those who have not tested (n = 16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poster 1: Lung</td>
<td>0.80</td>
<td>0.58</td>
</tr>
<tr>
<td>Poster 2: Radon</td>
<td>0.25</td>
<td>0.36</td>
</tr>
<tr>
<td>Poster 3: Drunk</td>
<td>0.55</td>
<td>0.50</td>
</tr>
</tbody>
</table>