Promoting Radon Testing Among Mothers of Young Children: A Translational Clinical Trial

This title should include, where possible, information on the participants, condition being evaluated, and intervention(s) studied.

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Principal Investigator: Soojung Kim

Sponsor: University of North Dakota

"Sponsor" indicates an institution, foundation, or individual who takes responsibility for and initiates a clinical investigation; often times this is the university with which the Principal Investigator is affiliated.

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All versions should have a version number and a date. Use an international date format (e.g.,YYYY-MM-DD [2017-12-21] or write out the month (e.g., 21 December 2017).

For the initial submission of a protocol to the IRB, indicate "Not applicable; this is the first version of the protocol." in the table below. For any subsequent amendment being submitted to the IRB, add details of the specific changes that are being implemented in the amendment. Please note that Section 10.4 is a high-level summary of <u>all</u> formal protocol versions/amendments.

CONFIDENTIALITY STATEMENT

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STATEMENT OF COMPLIANCE

The trial will be carried out in accordance with International Council on Harmonisation Good Clinical Practice (ICH GCP) and the following:

- United States (US) Code of Federal Regulations (CFR) applicable to clinical studies (45 CFR Part 46, 21 CFR Part 50, 21 CFR Part 56, 21 CFR Part 312, and/or 21 CFR Part 812).

National Institutes of Health (NIH)-funded investigators and clinical trial site staff who are responsible for the conduct, management, or oversight of NIH-funded clinical trials have completed Human Subjects Protection and ICH GCP Training.

INVESTIGATOR'S SIGNATURE

The signature below constitutes the approval of this protocol and provides the necessary assurances that this study will be conducted according to all stipulations of the protocol, including all statements regarding confidentiality, and according to local legal and regulatory requirements and applicable US federal regulations and ICH guidelines, as described in the *Statement of Compliance* above.

Principal Investigator or Clinical Site Investigator:

Signed:	**Soojung Kim**	**Date:**	**3/1/2026**

Name*: Soojung Kim

Title*: Interim Dean, School of Graduate Studies

Investigator Contact Information

Affiliation*: University of North Dakota

Address: Twamley Hall Room 103
264 Centennial Drive Stop 8178
Grand Forks, ND 58202-8178

Telephone: 701-777-2786

Email: soojung.kim@und.edu

1 PROTOCOL SUMMARY

No text is to be entered in this section; rather it should be included under the relevant subheadings below. It may be useful to complete this section after the relevant sections in the protocol have been completed.

1.1 SYNOPSIS

Title:	Promoting Radon Testing Among Mothers of Young Children: A Translational Clinical Trial
Grant Number:	5P20GM155890-02
Study Description:	The goal of this research is to test the feasibility of the radon app to promote radon testing among mothers of children under 4 when they receive a free radon test kit. The feasibility will be tested on outcomes pertinent to the stages of individuals' cognitive and behavioral responses to radon interventions.
Objectives*:	Primary Objective: The feasibility on outcomes pertinent to the stages of individuals' cognitive and behavioral responses to radon interventions. Cognitive responses include radon knowledge, self-efficacy, and response efficacy. Behavioral responses include returning the kit to the lab for analysis and sharing behaviors, which refers to interpersonal sharing of radon information and recommending others to test their houses for radon.
Endpoints*:	Primary Endpoint: 1. Changes to individuals' cognitive and behavrional responses to radon interventions. 2. Cognitive responses include radon knowledge, self-efficacy, and response efficacy. Behavioral responses include returning the kit to the lab for analysis and sharing behaviors, which refers to interpersonal sharing of radon information and recommending others to test their houses for radon.
Study Population:	Study participants are mothers of children attending any well-child care appointments for children aged four or under at either UND Center for Family Medicine Southwest Campus (Bismarck) or Northwest Campus (Minot). The principal eligibility criterion is that participants are mothers to young children (aged 4 or under). The principal exclusion criterion is previous testing for radon within the past two years.

Phase* or Stage:	Stage 1
Description of Sites/Facilities Enrolling Participants:	Participants will be recruited from the UND Center for Family Medicine Clinics in Bismarck and Minot, ND. Enrolling participants will be completed via an online survey platform, Qualtrics.

Description of Study Intervention/Experimental Manipulation:

We designed a clinical trial with one intervention (i.e., the radon app condition), using a pretest-posttest design. Study participants are mothers of children attending any well-child care appointments for children aged four or under at either UND Center for Family Medicine Southwest Campus (Bismarck) or Northwest Campus (Minot).

After mothers have been brought back to the examination room for their children's appointments, a clinic nurse will invite them to participate in an online survey about radon. The nurse will read a prepared script (which is attached in the recruitment section) and present the recruitment flyer which contains a QR code to scan. The QR code will bring mothers to the online pre-exposure survey with the consent form appearing on the first page. The pre-exposure survey features a list of questions measuring key outcomes, demographics and health status. At the end of the pre-exposure survey, participants will receive instructions to download the radon app via the App Store (for iOS) or Google Play (for Android). They will be asked to install the radon app and use it for the next four months. Participants' download and access history using the radon app will be saved on Triad Interactive Media's server, a collaborator we have used in our previous clinical trials.

Upon the completion of the online pre-exposure survey, the clinic nurse will give participants a goodie bag that contains a free radon test kit that includes a specially bar-coded charcoal canister test, which allows us to track the number of kits returned to the lab, instructions for using it, and a pre-addressed, pre-paid envelope for returning the kit to the lab for analyzing the radon level. The goodie bag will also have 'ROAR' branded promotional items such as hot/cold packs, lip balms, notepads and pens. They will also receive a $20 e-gift card. They will be encouraged to use it to test their houses for radon levels for the next four months. They will also be informed that they will be invited to complete another similar survey in two months via email and receive an additional $20 e-gift card by completing the follow-up survey. At the end of the post-exposure survey, they will be given an opportunity to order an additional free radon test kit if they misplaced it.

Study Duration*: 6 months.

Participant Duration: 2 months.

1.2 SCHEMA

1.3 SCHEDULE OF ACTIVITIES

The schedule of activities:

Category	**Pre-screening (Pre-consent)**	**Visit 1 Day 1**	**Visit 5 Day 60 ±7**
EMR Review Eligibility	X		
Informed Consent		X	
Demographics and socioeconomic status		X	X
Baseline measures		X	
Outcome Evaluation: Cognitive Responses			X
Outcome Evaluation: Behavioral Responses			X
Outcome Evaluation: Utilizing radon test kits			X
Adverse Events Reporting		X	X

2 INTRODUCTION

2.1 STUDY RATIONALE

Radon gas is a form of ionizing radiation that results from the natural decay of uranium present in rocks and soils. It is the largest cause of lung cancer after smoking and may contribute to death from other cancers, e.g., chronic lymphocytic leukemia[1,2] and malignant melanoma.[3] Radon causes more than 21,000 lung cancer deaths per year in the U.S.[4] This number of deaths greatly exceeds those of other, more-publicized causes, e.g., drunk driving (17,400) and the number of homicides involving hand guns.[5]

Radon-related deaths result from a failure to test homes for radon. In part, this failure has a cognitive cause: the public's limited knowledge about radon. Additionally, among radon-knowledgeable individuals, the deaths have a behavioral cause; the failure of individuals to carry out a series of behaviors, including obtaining a radon test kit, using it, returning the kit to the lab, interpreting the results, and (if warranted), remediating their homes.

Many educational interventions concerning radon have been attempted. However, most have performed poorly when measured against real world outcomes like increases in radon testing. Importantly, most previous interventions have employed traditional forms of communication, such as printed brochures.[6-9] Considerable evidence indicates that individuals may be more responsive to health information delivered via electronic media, e.g., the internet and smartphones.[10] We recently designed a radon-education mobile application for smartphones ("the radon app") and pilot-tested it in a clinical trial with 96 individuals.[11] Findings from our pilot trial suggest that the radon app is a promising tool for promoting radon testing.[11]

The overall goal of this research is to test the feasibility of the radon app to promote radon testing among mothers of children under 4 when they receive a free radon test kit. The feasibility will be tested on outcomes pertinent to the stages of individuals' cognitive and behavioral responses to radon interventions.

2.2 BACKGROUND

In collaboration with a media services company (Triad Interactive Media, Greensboro, NC), we developed a radon app for smartphones.[11] Briefly, the app uses a framework in HTML5. The app links to the EPA's radon resources and addresses frequently asked questions about radon. Through the app, users could order a free radon test kit at any time.

We conducted a pilot clinical trial using this app. Ninety six (96) undergraduates at the University of North Dakota in Grand Forks, ND (UND) were assigned to use the radon app for one month and were tested on several aspects of radon knowledge and testing using a pretest-posttest design.[11] We have recently published our findings.[11] We found that the use of the radon app: (1) significantly improved individuals' radon knowledge and generated positive attitudes toward radon testing; (2) significantly increased self-efficacy (i.e., an individual's perceived capability to order a radon test

kit and use it); (3) significantly increased response efficacy (i.e., an individual's evaluation of the effectiveness of radon testing in preventing radon exposure); and (4) resulted in 24% of study participants ordering a free radon test kit. However, only a small percentage of participants actually used the test kit they obtained (i.e., employed the test in their home and returned it to the lab; a total test completion rate of 9%).

In summary, our pilot trial demonstrated that the radon app improved radon knowledge, motivation to test, and stimulated requests for free test kits. Our present research builds and improves upon these preliminary findings.

2.3 RISK/BENEFIT ASSESSMENT

2.3.1 KNOWN POTENTIAL RISKS

The research presents no more than minimal risk, as participants would use a smartphone as they normally do. In other words, there are neither immediate risks nor long-term risks.

2.3.2 KNOWN POTENTIAL BENEFITS

This research would provide a better understanding of how to increase the public's awareness of the radon issue. The immediate potential benefits would include increased awareness of the health threat posed by radon, as indicated in our similar previous study.[11] The long-term potential benefits would include the lower risks of developing lung cancer due to radon exposure.

2.3.3 ASSESSMENT OF POTENTIAL RISKS AND BENEFITS

There are no risks in participating in this research beyond those experienced in everyday life. Yet, just in case participants feel any psychological/emotional distress or discomfort, they will be instructed to withdraw from the study at any time. Given the little to no risks and potential immediate and long-term benefits, the value of the information to be gained outweighs the risks of participation in the study.

3 OBJECTIVES AND ENDPOINTS

OBJECTIVES	ENDPOINTS	JUSTIFICATION FOR ENDPOINTS	PUTATIVE MECHANISMS OF ACTION
PRIMARY: *The primary objective of this research is to compare the effectiveness of radon information delivered via the radon app.*	1. Changes to individuals' cognitive and behavrional responses to	Each measure is the dependent variables to test the primary objective.	

OBJECTIVES	ENDPOINTS	JUSTIFICATION FOR ENDPOINTS	PUTATIVE MECHANISMS OF ACTION
	radon interventions. 2. Cognitive responses include radon knowledge, self-efficacy, and response efficacy. Behavioral responses include returning the kit to the lab for analysis and sharing behaviors, which refers to interpersonal sharing of radon information and recommending others to test their houses for radon.		

4 STUDY DESIGN

4.1 OVERALL DESIGN

We designed a clinical trial with one intervention (i.e., the radon app condition), using a pretest-posttest design. Study participants are mothers of children attending any well-child care appointments for children aged four or under at either UND Center for Family Medicine Southwest Campus (Bismarck) or Northwest Campus (Minot).

Experimental design. After mothers have been brought back to the examination room for their children's appointments, a clinic nurse will invite them to participate in an online survey about radon. The nurse will read a prepared script (which is attached in the recruitment section) and present the recruitment flyer which contains a QR code to scan. The QR code will bring mothers to the online pre-exposure survey with the consent form appearing on the first page. The pre-exposure survey features a list of questions measuring key outcomes, demographics and

health status. At the end of the pre-exposure survey, participants will receive instructions to download the radon app via the App Store (for iOS) or Google Play (for Android). They will be asked to install the radon app and use it for the next four months. Participants' download and access history using the radon app will be saved on Triad Interactive Media's server, a collaborator we have used in our previous clinical trials.

Upon the completion of the online pre-exposure survey, the clinic nurse will give participants a goodie bag that contains a free radon test kit that includes a specially bar-coded charcoal canister test, which allows us to track the number of kits returned to the lab, instructions for using it, and a pre-addressed, pre-paid envelope for returning the kit to the lab for analyzing the radon level. The goodie bag will also have 'ROAR' branded promotional items such as hot/cold packs, lip balms, notepads and pens. They will also receive a $20 e-gift card. They will be encouraged to use it to test their houses for radon levels for the next four months. They will also be informed that they will be invited to complete another similar survey in two months via email and receive an additional $20 e-gift card by completing the follow-up survey. At the end of the post-exposure survey, they will be given an opportunity to order an additional free radon test kit if they misplaced it.

Participants will be asked to complete a pre-exposure survey that contains a consent form and a list of questions measuring key outcomes, demographics, and health status. At the end of the pre-exposure survey, there will be instructions to download the radon app via the App Store (for iOS) or Google Play (for Android). They will be asked to install the radon app and use it for the next four months. Once the pre-exposure survey is complete, participants will receive a goodie bag containing a free charcoal radon test kit. Participants will be encouraged to use this test kit to test their home at some point within the next four months. Participants will be emailed two months after they sign up for the study with a link to a post-exposure survey. In the post-exposure survey, participants will be asked questions about their radon knowledge. They will also be able to order an additional free radon test kit if they misplaced the original.

Outcome measures. Participants in both groups will complete the pre-exposure online survey at the beginning of the study and a post-exposure online survey at the two-month time point. This knowledge-based survey is similar to one we have used previously.[11] The primary endpoints used to compare the two approaches are:

1. The feasibility of the radon app to promote radon testing among mothers of children under 4 when they receive a free radon test kit.
    a. The feasibility will be tested on outcomes pertinent to the stages of individuals' cognitive and behavioral responses to radon interventions.
    b. Cognitive responses include radon knowledge, self-efficacy, and response efficacy.
    c. Behavioral responses include returning the kit to the lab for analysis and sharing behaviors, which refers to interpersonal sharing of radon information and recommending others to test their houses for radon.

4.2 SCIENTIFIC RATIONALE FOR STUDY DESIGN

The study design is a straightforward clinical trial design with one arm. Participants will be assigned to the single arm. There is no superior design than the one we have chosen. This is a straightforward comparison of radon knowledge pre- and post-intervention, which is the radon app.

4.3 JUSTIFICATION FOR INTERVENTION

Mothers of infants are often very motiavated about the health of their children and uaully are a primary care provider to their children who would bring them to routine doctos vists for preventative health services (i.e., well-child care [WCC] appointments). To address the lack of radon knowledge and awareness, our intervention will be introduced during WCC appointments. This research tests the feasibility of the radon app to promote radon testing among mothers of infants when they receive a free radon test kit.

4.4 END-OF-STUDY DEFINITION

A participant is considered to have completed the study if he/she has completed the baseline assessment and the 2-month follow-up assessment.

The end of the study is defined as completion of the 2-month follow-up assessment shown in the Schedule of Activities (SoA), **Section 1.3**.

5 STUDY POPULATION

5.1 INCLUSION CRITERIA

In order to be eligible to participate in this study, an individual must meet all of the following criteria:

1. Reading the informed consent form
2. Age >= 18
3. Own a smartphone
4. Female mothers of children aged 4 or under
5. Children brought in for an appointment are their biological or adoptive child

5.2 EXCLUSION CRITERIA

An individual who meets any of the following criteria will be excluded from participation in this study:

1. Previous testing for radon within the past two years

2. The mother's child brought in for the appointment is over 4 years of age.

5.3 LIFESTYLE CONSIDERATIONS

N/A

5.4 SCREEN FAILURES

Screen failures are defined as participants who consent to participate in this study but are not subsequently assigned to the study intervention or entered in the study. Individuals who do not meet the criteria for participation in this trial (screen failures) are automatically directed to the end of the pre-exposure survey.

5.5 STRATEGIES FOR RECRUITMENT AND RETENTION

Recruitment efforts will take place at the two UND Center for Family Medicine clinics in Minot, ND, and Bismarck, ND. While mothers are waiting in their exam room for their children's appointments, a clinic nurse will approach them with an invitation to participate in an online survey about radon. The nurse will read a prepared script and present the recruitment flyer with the QR code to scan, which will bring mothers to the online pre-exposure survey with the consent form appearing on the first page. Potential participants will also have an opportunity to discuss radon with their doctor after being presented with the study opportunity.

Upon the completion of the online pre-exposure survey, the clinic nurse will give participants a goodie bag that contains a free radon test kit, instructions for using it, and a pre-addressed, pre-paid envelope for returning the kit to the lab for analyzing the radon level. The goodie bag will also contain 'ROAR' branded promotional items (hot/cold packs, lip balms, sticky notes and pens). They will also receive a $20 e-gift card.

They will be encouraged to use it to test their houses for radon levels for the next four months. They will also be informed that they will be invited to complete another similar survey in two months via email and receive a $20 e-gift card by completing the follow-up survey. At the end of the post-exposure survey, they will be given an opportunity to order an additional free radon test kit if they misplaced it.

6 STUDY INTERVENTION(S) OR EXPERIMENTAL MANIPULATION(S)

6.1 STUDY INTERVENTION(S) OR EXPERIMENTAL MANIPULATION(S) ADMINISTRATION

6.1.1 STUDY INTERVENTION OR EXPERIMENTAL MANIPULATION DESCRIPTION

Participants will be asked to complete a pre-exposure survey that contains a consent form and a list of questions measuring key outcomes, demographics, and health status. At the end of the pre-

exposure survey, there will be instructions to download the radon app via the App Store (for iOS) or Google Play (for Android). They will be asked to install the radon app and use it for the next four months. Once the pre-exposure survey is complete, participants will receive a goodie bag containing a free charcoal radon test kit. Participants will be encouraged to use this test kit to test their home at some point within the next four months. Participants will be emailed two months after they sign up for the study with a link to a post-exposure survey. In the post-exposure survey, participants will be asked questions about their radon knowledge. They will also be able to order an additional free radon test kit if they misplaced the original.

6.1.2 ADMINISTRATION AND/OR DOSING

At the baseline, participants will be asked to install the radon app on their smartphones and use the app for four months. App installation will be verified electronically via data sent to the investigators. Participants will not interact with other participants.

6.2 FIDELITY

6.2.1 INTERVENTIONIST TRAINING AND TRACKING

The fidelity of delivery is monitored by measuring the amount of time persons spend time on the smartphone app and the number of downloads.

6.3 MEASURES TO MINIMIZE BIAS: RANDOMIZATION AND BLINDING

N/A

6.4 STUDY INTERVENTION/EXPERIMENTAL MANIPULATION ADHERENCE

Participants' adherence with study procedures will be tracked based on the back-end data provided by the app development company, Triad Interactive Media. A complete adherence is not expected, however, because participants were asked to use the app occasionally as they would do for other apps.

6.5 CONCOMITANT THERAPY

N/A

6.5.1 RESCUE THERAPY

N/A

7 STUDY INTERVENTION/EXPERIMENTAL MANIPULATION DISCONTINUATION AND PARTICIPANT DISCONTINUATION/WITHDRAWAL

7.1 DISCONTINUATION OF STUDY INTERVENTION/EXPERIMENTAL MANIPULATION

When a subject discontinues from accessing the radon app, but not from the study, remaining study procedures will be completed as indicated by the study protocol. If a clinically significant finding is identified (including, but not limited to changes from baseline) after enrollment, the investigator or qualified designee will determine if any change in participant management is needed. Any new clinically relevant finding will be reported as an adverse event (AE).

The data to be collected at the time of study intervention discontinuation will include the following:

- The reason(s) for discontinuing the participant from the intervention, and methods for determining the need to discontinue.
- If the participant is due to complete assessments within 2 weeks of being discontinued from the study intervention, those assessments will be administered at the time of discontinuation; if the next scheduled assessments are more than 2 weeks from the discontinuation date, the discontinued participant will wait for the next scheduled assessment. Thereafter, the participant will be included in all future scheduled assessments, even though not participating in the intervention.

7.2 PARTICIPANT DISCONTINUATION/WITHDRAWAL FROM THE STUDY

Participants are free to withdraw from participation in the study at any time upon request.

An investigator may discontinue a participant from the study for the following reasons:

- Significant study intervention non-compliance, unless varying compliance is an aspect of the study objectives
- Lost-to-follow up; unable to contact subject (see **Section 7.3, Lost to Follow-Up**)
- Any event or medical condition or situation occurs such that continued collection of follow-up study data would not be in the best interest of the participant or might require an additional treatment that would confound the interpretation of the study
- The participant meets an exclusion criterion (either newly developed or not previously recognized) that precludes further study participation

The reason for participant discontinuation or withdrawal from the study will be recorded by the PI. Subjects who read the informed consent form, and receive the study intervention, and subsequently withdraw, or are discontinued from the study, will not be replaced.

7.3 LOST TO FOLLOW-UP

A participant will be considered lost to follow-up if he or she fails to complete the post-exposure survey and study staff are unable to contact the participant after at least 2 attempts.

The following actions must be taken if a participant fails to complete the post-exposure survey:

- The site will attempt to contact the participant, counsel the participant on the importance of maintaining the assigned visit schedule and ascertain if the participant wishes to and/or should continue in the study.
- Before a participant is deemed lost to follow-up, the investigator or designee will make every effort to regain contact with the participant via a reminder email. These contact attempts will be documented in the participant's medical record or study file.
- Should the participant continue to be unreachable, he or she will be considered to have withdrawn from the study with a primary reason of lost to follow-up.

8 STUDY ASSESSMENTS AND PROCEDURES

8.1 ENDPOINT AND OTHER NON-SAFETY ASSESSMENTS

Once a participant will be directed to the Qualtrics pre-exposure survey link, the consent form will appear on the first page of the survey. Participants will be asked to read it and proceed if they agree. All participants will be asked to answer pre-exposure survey questions measuring key variables, such as radon knowledge, and demographic information to be used in the analyses (e.g., age, gender, home-owner status, smoking status). Demographic questions will be asked, along with providing their email address. Once participants complete the pre-survey, we have the data telling us that they enrolled. After 2 months, we will send the post-exposure survey link to the collected email address individually. Participants' behaviors, which are two primary endpoints (i.e., test kit ordering and utilizing behaviors) will be recorded as they become available during the 4-month period.

In summary, participants will complete an online pre-exposure survey during the baseline phase of the study. Participants will have the opportunity to order a free radon test kit at any time during the four-month period.

8.2 SAFETY ASSESSMENTS

N/A

8.3 ADVERSE EVENTS AND SERIOUS ADVERSE EVENTS

N/A

8.4 UNANTICIPATED PROBLEMS

8.4.1 DEFINITION OF UNANTICIPATED PROBLEMS

This protocol uses the definition of Unanticipated Problems as defined by the Office for Human Research Protections (OHRP). OHRP considers unanticipated problems involving risks to participants or others to include, in general, any incident, experience, or outcome that meets **all** of the following criteria:

- Unexpected in terms of nature, severity, or frequency given (a) the research procedures that are described in the protocol-related documents, such as the Institutional Review Board (IRB)-approved research protocol and informed consent document; and (b) the characteristics of the participant population being studied;
- Related or possibly related to participation in the research ("possibly related" means there is a reasonable possibility that the incident, experience, or outcome may have been caused by the procedures involved in the research); and
- Suggests that the research places participants or others at a greater risk of harm (including physical, psychological, economic, or social harm) than was previously known or recognized.

8.4.2 UNANTICIPATED PROBLEMS REPORTING

The PI will report unanticipated problems (UPs) to the reviewing Institutional Review Board (IRB). The UP report will include the following information:

- Protocol identifying information: protocol title and number, PI's name, and the IRB project number
- A detailed description of the event, incident, experience, or outcome.
- An explanation of the basis for determining that the event, incident, experience, or outcome represents an UP.
- A description of any changes to the protocol or other corrective actions that have been taken or are proposed in response to the UP.

To satisfy the requirement for prompt reporting, UPs will be reported using the following timeline:

- UPs that are serious adverse events (SAEs) will be reported to the IRB within 14 working days of the investigator becoming aware of the event.
- Any other UP will be reported to the IRB within 14 working days of the investigator becoming aware of the problem.
- All UPs should be reported to appropriate institutional officials (as required by an institution's written reporting procedures), the supporting agency head (or designee), and the Office for Human Research Protections (OHRP) within 14 working days of the IRB's receipt of the report of the problem from the investigator.

8.4.3 REPORTING UNANTICIPATED PROBLEMS TO PARTICIPANTS

N/A

9 STATISTICAL CONSIDERATIONS

9.1 STATISTICAL HYPOTHESES

- Primary Endpoint(s): **Ho**: There will be no changes in radon knowledge among participants. **H1**: There will be more positive changes in radon knowledge among participants.

9.2 SAMPLE SIZE DETERMINATION

Sample size determination:

According to the power analysis from the two specific aims, the trial hopes to recruit a total of 100 participants.

Statistical analyses:

Regarding data analysis, differences in radon knowledge, self-efficacy and response efficacy, and sharing intentions will be tested with directional, dependent t-tests. Directional McNemar's tests will be utilized to determine the difference in proportions. The UND Center for Family Medicine clinics will provide the research team with aggregated data from all well-child visits for children aged four and under during the entire recruitment period. The aggregated data will include appointment types, age, gender, and health insurance status. We will then use this aggregated data to compare against the number of participants who signed up for the study. This comparison will help assess how representative our sample is of the clinic population.

9.3 POPULATIONS FOR ANALYSES

All intent-to-treat (ITT) analysis population (i.e., all participants) will be included in the data analyses.

9.4 STATISTICAL ANALYSES

9.4.1 GENERAL APPROACH

- For descriptive statistics, categorical and continuous data will be presented (e.g., percentages, means with standard deviations, median, range).
- Inferential tests will indicate the p-value and confidence intervals for statistical significance (Type I error) and whether one or two-tailed.
- Covariates will be pre-specified in the sections below.
- The checks of assumptions underlying statistical procedures will be performed and whether any corrective procedures will be applied (e.g., transformation or nonparametric tests) if needed.

9.4.2 ANALYSIS OF THE PRIMARY ENDPOINT(S)

Primary endpoints:

1. Data analysis, differences in radon knowledge, self-efficacy and response efficacy, and sharing intentions will be tested with directional, dependent t-tests.. Differences will be described using absolute and relative differences in proportions.

9.4.3 ANALYSIS OF THE SECONDARY ENDPOINT(S)

N/A

9.4.4 BASELINE DESCRIPTIVE STATISTICS

N/A

9.4.5 PLANNED INTERIM ANALYSES

N/A

9.4.6 SUB-GROUP ANALYSES

Primary endpoints will be analyzed based on gender, age, race, smoking status, or geographic location (state/county of birth):

Ho: The difference in the incidence of utilization of radon test kits will not be affected by participants' age, race, smoking status, or geographic location (state/county of birth). **H1**: There is significant interaction between the variables above in terms of the proportion of utilization of test kits. **Statistical test:** We will use multivariate regression analyses predicting incidence of utilization of test, while controlling for age, race, smoking status, location, and time spent using the app with SAS. Interactions will be tested in multivariate models and significant interactions will be described by levels of univariate Z or chi-square tests.

Secondary endpoints will not be analyzed based on, age, race, smoking status, or geographic location (state/county of birth).

9.4.7 TABULATION OF INDIVIDUAL PARTICIPANT DATA

Individual participant data will be listed by measure and time point.

9.4.8 EXPLORATORY ANALYSES

N/A

10 SUPPORTING DOCUMENTATION AND OPERATIONAL CONSIDERATIONS

10.1 REGULATORY, ETHICAL, AND STUDY OVERSIGHT CONSIDERATIONS

10.1.1 INFORMED CONSENT PROCESS

10.1.1.1 CONSENT/ASSENT AND OTHER INFORMATIONAL DOCUMENTS PROVIDED TO PARTICIPANTS

Consent forms describing in detail the study intervention, study procedures, and risks will appear in the first page of the online survey questionnaire. Participants will be asked to read and proceed if they consent. The following consent material is submitted with this protocol: IRB-approved consent forms for pre-exposure and post-exposure surveys.

10.1.1.2 CONSENT PROCEDURES AND DOCUMENTATION

The consent form for pre-exposure survey and post-exposure surveys will appear at the very beginning of each online survey. Completion and return of the online survey form implies that they have read the information in this form and consent to participate in the research. Since the research presents no more than minimal risk and includes no procedures for which written consent is normally required outside the research context, the IRB granted the waiver of signature requirement for informed consent.

10.1.2 STUDY DISCONTINUATION AND CLOSURE

This study may be temporarily suspended or prematurely terminated if there is sufficient reasonable cause. Written notification, documenting the reason for study suspension or termination, will be provided by the suspending or terminating party to study participants, investigator, funding agency, and regulatory authorities. If the study is prematurely terminated or suspended, the Principal Investigator (PI) will promptly inform study participants, the Institutional Review Board (IRB), and sponsor/funding agency and will provide the reason(s) for the termination or suspension. Study participants will be contacted, as applicable, and be informed of changes to study visit schedule.

Circumstances that may warrant termination or suspension include, but are not limited to:

- Determination of unexpected, significant, or unacceptable risk to participants
- Demonstration of efficacy that would warrant stopping
- Insufficient compliance of study staff to the protocol (i.e., significant protocol violations)
- Data that are not sufficiently complete and/or evaluable
- Determination that the primary endpoint has been met
- Determination of futility

The study may resume once concerns about safety, protocol compliance, and data quality are addressed, and satisfy the funding agency, sponsor, IRB, Food and Drug Administration (FDA), or other relevant regulatory or oversight bodies (OHRP, DSMB).

10.1.3 CONFIDENTIALITY AND PRIVACY

Participant confidentiality and privacy is strictly held in trust by the participating investigators, their staff, the safety and oversight monitor(s), and the sponsor(s) and funding agency. This confidentiality is extended to the data being collected as part of this study. Data that could be

used to identify a specific study participant will be held in strict confidence within the research team. No personally-identifiable information from the study will be released to any unauthorized third party without prior written approval of the sponsor/funding agency.

All research activities will be conducted in as private a setting as possible.

The study monitor, other authorized representatives of the sponsor or funding agency, representatives of the Institutional Review Board (IRB), regulatory agencies or representatives from companies or organizations supplying the product, may inspect all documents and records required to be maintained by the investigator, including but not limited to, medical records (office, clinic, or hospital) and pharmacy records for the participants in this study. The clinical study site will permit access to such records.

The study participant's contact information will be securely stored at the clinical site for internal use during the study. At the end of the study, all records will continue to be kept in a secure location for as long a period as dictated by the reviewing IRB, Institutional policies, or sponsor/funding agency requirements.

Study participant research data, which is for purposes of statistical analysis and scientific reporting, will be transmitted to and stored in the PI's password-protected computer. This will not include the participant's contact or identifying information. Rather, individual participants and their research data will be identified by a unique study identification number. The study data entry and study management systems used by the study team will be secured and password protected. At the end of the study, all study databases will be de-identified and archived in the PI's password-protected computer.

Measures Taken to Ensure Confidentiality of Data Shared per the NIH Data Sharing Policies

It is NIH policy that the results and accomplishments of the activities that it funds should be made available to the public (see *https://grants.nih.gov/policy/sharing.htm*). The PI will ensure all mechanisms used to share data will include proper plans and safeguards for the protection of privacy, confidentiality, and security for data dissemination and reuse (e.g., all data will be thoroughly de-identified and will not be traceable to a specific study participant). Plans for archiving and long-term preservation of the data will be implemented, as appropriate.

Certificate of Confidentiality

To further protect the privacy of study participants, the Secretary, Health and Human Services (HHS), has issued a Certificate of Confidentiality (CoC) to all researchers engaged in biomedical, behavioral, clinical or other human subjects research funded wholly or in part by the federal government. Recipients of NIH funding for human subjects research are required to protect identifiable research information from forced disclosure per the terms of the NIH Policy (see *https://humansubjects.nih.gov/coc/index*). As set forth in 45 CFR Part

75.303(a) and NIHGPS Chapter 8.3, recipients conducting NIH-supported research covered by this Policy are required to establish and maintain effective internal controls (e.g., policies and procedures) that provide reasonable assurance that the award is managed in compliance with Federal statutes, regulations, and the terms and conditions of award. It is the NIH policy that investigators and others who have access to research records will not disclose identifying information except when the participant consents or in certain instances when federal, state, or local law or regulation requires disclosure. NIH expects investigators to inform research participants of the protections and the limits to protections provided by a Certificate issued by this Policy.

10.1.4 FUTURE USE OF STORED SPECIMENS AND DATA

Data collected for this study will be analyzed and stored in the PI's password-protected computer. After the study is completed, the de-identified, archived data will continue to be stored in the PI's password-protected computer, for use by other researchers including those outside of the study.

10.1.5 KEY ROLES AND STUDY GOVERNANCE

Principal Investigator
Soojung Kim, PhD, MPH, Interim Dean, School of Graduate Studies
University of North Dakota
Address: Twamley Hall Room 103, 264 Centennial Drive Stop 8178, Grand Forks ND 58202-8178
Phone Number: 701.777.2786
Email *soojung.kim@UND.edu*

The research team included Drs. Gary Schwartz and Michael Minnottee, both from the University of North Dakota. Dr, Schwartz is within the School of Medicine and Health Sciences and Dr. Minnottee is within the Mathematics department.

10.1.6 SAFETY OVERSIGHT

Safety oversight will be under the direction of the study team based on its self-assessments guided by sub-components of a Quality Management Plan (see Section 10.1.8).

10.1.7 CLINICAL MONITORING

N/A

10.1.8 QUALITY ASSURANCE AND QUALITY CONTROL

The clinical site will perform internal quality management of study conduct, data collection, documentation and completion.

Quality control (QC) procedures will be implemented as follows:

Informed consent --- Study staff will review both the documentation of the consenting process as well as a percentage of the completed consent documents. This review will evaluate compliance with GCP, accuracy, and completeness. Feedback will be provided to the study team to ensure proper consenting procedures are followed**.**

Source documents and the electronic data --- Data will be initially captured on source documents (see **Section 10.1.9, Data Handling and Record Keeping**) and will ultimately be entered into the study database. To ensure accuracy site staff will compare a representative sample of source data against the database, targeting key data points in that review.

Intervention Fidelity — Consistent delivery of the study interventions will be monitored throughout the intervention phase of the study. Procedures for ensuring fidelity of intervention delivery are described in **Section 6.2.1, Interventionist Training and Tracking**.

Protocol Deviations – The study team will review protocol deviations on an ongoing basis and will implement corrective actions when the quantity or nature of deviations are deemed to be at a level of concern.

Should independent monitoring become necessary, the PI will provide direct access to all trial related sites, source data/documents, and reports for the purpose of monitoring and auditing by the sponsor/funding agency, and inspection by local and regulatory authorities.

10.1.9 DATA HANDLING AND RECORD KEEPING

10.1.9.1 DATA COLLECTION AND MANAGEMENT RESPONSIBILITIES

Data collection will be the responsibility of the clinical trial staff at the site under the supervision of the site investigator. The investigator will be responsible for ensuring the accuracy, completeness, legibility, and timeliness of the data reported.

All source documents will be completed in a neat, legible manner to ensure accurate interpretation of data. Electronic data will be saved in excel spreadsheets and Qualtrics where the pre-exposure and post-exposure surveys were hosted. They will be saved on the PI's password-protected computer.

10.1.9.2 STUDY RECORDS RETENTION

Study documents will be retained for a minimum of 2 years after the last approval of a marketing application in an International Council on Harmonisation (ICH) region and until there are no

pending or contemplated marketing applications in an ICH region or until at least 2 years have elapsed since the formal discontinuation of clinical development of the study intervention. These documents should be retained for a longer period, however, if required by local regulations. No records will be destroyed without the written consent of the sponsor/funding agency, if applicable. It is the responsibility of the sponsor/funding agency to inform the investigator when these documents no longer need to be retained.

10.1.10 PROTOCOL DEVIATIONS

This protocol defines a protocol deviation as any noncompliance with the clinical trial protocol, International Council on Harmonisation Good Clinical Practice (ICH GCP), or Manual of Procedures (MOP) requirements. The noncompliance may be either on the part of the participant, the investigator, or the study site staff. As a result of deviations, corrective actions will be developed by the site and implemented promptly.

These practices are consistent with ICH GCP:

- Section 4.5 Compliance with Protocol, subsections 4.5.1, 4.5.2, and 4.5.3
- Section 5.1 Quality Assurance and Quality Control, subsection 5.1.1
- Section 5.20 Noncompliance, subsections 5.20.1, and 5.20.2.

It will be the responsibility of the site investigator to use continuous vigilance to identify and report deviations within 14 working days of identification of the protocol deviation, or within 14 working days of the scheduled protocol-required activity. All deviations will be addressed in study source documents, reported to National Institute of General Medical Sciences Program Official and the University of North Dakota. Protocol deviations will be sent to the reviewing Institutional Review Board (IRB) per their policies. The site investigator will be responsible for knowing and adhering to the reviewing IRB requirements.

10.1.11 PUBLICATION AND DATA SHARING POLICY

This study will be conducted in accordance with the following publication and data sharing policies and regulations:

National Institutes of Health (NIH) Public Access Policy, which ensures that the public has access to the published results of NIH funded research. It requires scientists to submit final peer-reviewed journal manuscripts that arise from NIH funds to the digital archive PubMed Central upon acceptance for publication.

This study will comply with the NIH Data Sharing Policy and Policy on the Dissemination of NIH-Funded Clinical Trial Information and the Clinical Trials Registration and Results Information Submission rule. As such, this trial will be registered at ClinicalTrials.gov, and results information from this trial will be submitted to ClinicalTrials.gov. In addition, every attempt will be made to publish results in peer-reviewed journals. Data from this study may be

requested from other researchers 3 years after the completion of the primary endpoint by contacting Soojung Kim at *soojung.kim@und.edu*. Considerations for ensuring confidentiality of these shared data are described in Section 10.1.3.

10.1.12 CONFLICT OF INTEREST POLICY

The independence of this study from any actual or perceived influence, such as by the pharmaceutical industry, is critical. Therefore, any actual conflict of interest of persons who have a role in the design, conduct, analysis, publication, or any aspect of this trial will be disclosed and managed. Furthermore, persons who have a perceived conflict of interest will be required to have such conflicts managed in a way that is appropriate to their participation in the design and conduct of this trial. The study leadership in conjunction with the National Institute of General Medical Sciences has established policies and procedures for all study group members to disclose all conflicts of interest and will establish a mechanism for the management of all reported dualities of interest.

10.2 ADDITIONAL CONSIDERATIONS

N/A

10.3 ABBREVIATIONS AND SPECIAL TERMS

AE	Adverse Event
CFR	Code of Federal Regulations
CLIA	Clinical Laboratory Improvement Amendments
CMP	Clinical Monitoring Plan
COC	Certificate of Confidentiality
CONSORT	Consolidated Standards of Reporting Trials
CRF	Case Report Form
DCC	Data Coordinating Center
DHHS	Department of Health and Human Services
DSMB	Data Safety Monitoring Board
DRE	Disease-Related Event
EC	Ethics Committee
eCRF	Electronic Case Report Forms
FDA	Food and Drug Administration
FDAAA	Food and Drug Administration Amendments Act of 2007
FFR	Federal Financial Report
GCP	Good Clinical Practice
GLP	Good Laboratory Practices
GMP	Good Manufacturing Practices
GWAS	Genome-Wide Association Studies
HIPAA	Health Insurance Portability and Accountability Act
IB	Investigator's Brochure
ICH	International Council on Harmonisation
ICMJE	International Committee of Medical Journal Editors
IDE	Investigational Device Exemption
IND	Investigational New Drug Application
IRB	Institutional Review Board
ISM	Independent Safety Monitor

ITT	Intention-To-Treat
LSMEANS	Least-squares Means
MedDRA	Medical Dictionary for Regulatory Activities
MOP	Manual of Procedures
NCT	National Clinical Trial
NIH	National Institutes of Health
NIH IC	NIH Institute or Center
OHRP	Office for Human Research Protections
PI	Principal Investigator
QA	Quality Assurance
QC	Quality Control
SAE	Serious Adverse Event
SAP	Statistical Analysis Plan
SMC	Safety Monitoring Committee
SOA	Schedule of Activities
SOP	Standard Operating Procedure
UND	University of North Dakota
UP	Unanticipated Problem
US	United States
WWC	Well-child care appointment

10.4 PROTOCOL AMENDMENT HISTORY

Version	Date	Description of Change	Brief Rationale

11 REFERENCES

1. Oancea SC, Rundquist BC, Simon I, et al. County level incidence rates of chronic lymphocytic leukemia are associated with residential radon levels. *Future Oncol.* 2017;13(21):1873-1881.
2. Schwartz GG, Klug MG. Incidence rates of chronic lymphocytic leukemia in US states are associated with residential radon levels. *Future Oncol.* 2016;12(2):165-174.
3. Vienneau D, de Hoogh K, Hauri D, et al. Effects of Radon and UV Exposure on Skin Cancer Mortality in Switzerland. *Environ Health Perspect.* 2017;125(6):067009.
4. EPA. Health Risk of Radon. 2019; *https://www.epa.gov/radon/health-risk-radon*.
5. EPA. A Citizen's Guide to Radon: The Guide to Protecting Yourself and Your Family from Radon. 2016; *https://www.epa.gov/sites/production/files/2016-12/documents/2016_a_citizens_guide_to_radon.pdf*.
6. Larsson LS. The Montana Radon Study: social marketing via digital signage technology for reaching families in the waiting room. *Am J Public Health.* 2015;105(4):779-785.
7. Hahn EJ, Wiggins AT, Rademacher K, Butler KM, Huntington-Moskos L, Rayens MK. FRESH: Long-Term Outcomes of a Randomized Trial to Reduce Radon and Tobacco Smoke in the Home. *Prev Chronic Dis.* 2019;16:E127.
8. Lichtenstein E, Andrews JA, Lee ME, Glasgow RE, Hampson SE. Using radon risk to motivate smoking reduction: evaluation of written materials and brief telephone counselling. *Tob Control.* 2000;9(3):320-326.
9. Niemeyer S, Keller B. Radon Publication Information: Impact on Readers' Knowledge, Attitudes and Intentions. *Housing & Society.* 1999;26(1-3):54-62.
10. Valle J, Godby T, Paul DP, 3rd, Smith H, Coustasse A. Use of Smartphones for Clinical and Medical Education. *Health Care Manag (Frederick).* 2017;36(3):293-300.
11. Kim S, Brewster MS, Schwartz GG. Communicating radon risk via a smartphone app: a pilot intervention study. *BMC Public Health.* 2020;20(1):547.
12. Vogeltanz-Holm N, Schwartz GG. Radon and lung cancer: What does the public really know? *Journal of Environmenal Radioactivity.* 2018;192:26-31.
13. National Association of Realtors. Families using creativity when buying, selling homes: 2019 buyers and seller survey. 2019; *https://www.nar.realtor/newsroom/families-using-creativity-when-buying-selling-homes-2019-buyer-and-seller-survey*.