Health Effects Message Testing: Detonation of Improvised Nuclear Device

National Center for Environmental Health
Radiation Studies Branch

U.S. Centers for Disease Control and Prevention

January 2012

The **Oak Ridge Institute for Science and Education** (ORISE) is a U.S. Department of Energy facility focusing on scientific initiatives to research health risks from occupational hazards, assess environmental cleanup, respond to radiation medical emergencies, support national security and emergency preparedness, and educate the next generation of scientists. ORISE is managed by Oak Ridge Associated Universities.
This document was prepared for The Centers for Disease Control and Prevention by ORISE through an interagency agreement with the U.S. Department of Energy (DOE). ORISE is managed by Oak Ridge Associated Universities (ORAU) under DOE contract number DE-AC05-06OR23100.

Table of Contents

Executive Summary

Background: In 2009-2010, the Nuclear Detonation Response Communications Working Group, a federal interagency group of communications and radiation technical experts, developed key messages for affected communities, as well as the rest of the nation, to be used during the immediate aftermath of an Improvised Nuclear Device (IND) detonation. The Centers for Disease Control and Prevention (CDC) was part of the interagency group that developed the key messages for communities affected by the detonation of an IND. To help ensure the quality of those messages, CDC, in partnership with the Oak Ridge Institute for Science and Education (ORISE), and funding from the Federal Emergency Management Agency (FEMA), set out to test selected messages specifically related to radiation exposure and health effects with the public.

Methods: In October 2011, twelve 90-minute focus groups were conducted to explore the relevance, comprehensibility, credibility, and effectiveness of the selected health effects messages. A total of 75 adults participated in the focus groups that were conducted in Boston, Massachusetts; Atlanta, Georgia; Denver, Colorado; and Seattle, Washington. Following the focus groups, ORISE staff examined participants' transcribed responses to identify emerging themes. The qualitative responses were entered into qualitative analysis software, QSR International's NVivo 8.0. This software assisted in the identification and analysis of themes from the focus groups. Multiple staff members confirmed similar themes.

Key Themes:
Participants' overall recommendations for the messages included:

- Create messages that address public concerns
- Ensure that messages answer the questions they were meant to address
- Provide prioritized instructions and directions in each message
- Tailor messages by time post-incident
- Tailor messages by distance from the incident
- Tailor messages by delivery method
- The tone of the messages should be urgent and serious, but provide a sense of hope
- Do not use messages that contain perceived contradictions
- Use plain, non-technical language
- Make messages concise
- Avoid or define unknown terms and phrases

Conclusion: Effective and timely communication will play a vital role during an IND emergency. Communication after the IND event must address the public's concerns using simple and concise messages. The findings from this study, combined with findings from previous message testing research, can be utilized by the working group to revise the current messages and communicate with the public more effectively during an IND emergency.

Introduction

Introduction

Detonation of an Improvised Nuclear Device (IND) in a metropolitan area of the United States would be catastrophic. Planning for such an event is critical to the nation's overall preparedness for emergency events. Amidst the calamity ensuing from a nuclear detonation, a crucial task for federal, state, and local authorities will be communicating clear and consistent messages to the public. Effective communications will be a critical factor in saving lives and minimizing injury.

In 2009-2010, the Nuclear Detonation Response Communications Working Group, a federal interagency group of communications and radiation subject matter experts, developed key messages for affected communities, as well as the rest of the nation, to be used during the immediate aftermath of an IND detonation. These messages are intended to provide key life-saving protective action guidance as well as responses to questions anticipated in such an event. Although incident-specific messages will still be needed, these messages will enable decision makers and communicators to provide consistent, well-developed information about a variety of concerns that will arise among the public.

The Radiation Studies Branch of the Centers for Disease Control and Prevention (CDC) provides basic information on radiation and its health effects as well as emergency instructions for individuals and families. CDC is part of the interagency group which developed the key messages for communities affected by the detonation of an IND. To help ensure the quality of those messages, CDC, in partnership with Oak Ridge Institute for Science and Education (ORISE), set out to test them with the public. This document reports on the findings from the third message testing study and focuses on messages related to health effects after an IND incident.

Methods

In October 2011, twelve 90-minute focus groups were conducted to explore the relevance, comprehensibility, credibility, and effectiveness of selected health messages developed by the Nuclear Detonation Response Communications Working Group. The messages tested in this study were selected based on concerns brought up by participants in previous focus groups, as well as public queries to CDC following the 2011 Japanese nuclear power plant emergency. These focus groups were conducted with members of the general public who lived in the following metropolitan areas:

1. Boston, Massachusetts
2. Atlanta, Georgia
3. Denver, Colorado
4. Seattle, Washington

Demographic Characteristics of Respondents

A total of 75 adults participated in the focus groups. Each group consisted of four to eight participants that varied in gender, age, race, and education level. Table 1 summarizes the demographic characteristics of the 75 focus group participants. Graphs of demographic characteristics can be found in Appendix A.

Process

Market research facilities at the four different locations recruited participants under the supervision of ORISE. The screening instrument used is included in Appendix B. Prior to participating in the focus groups, participants received an information sheet providing information on the sponsorship of the study, their rights as participants, risks and benefits in participating, and contacts for additional information (Appendix C). Participants were paid a cash incentive for participation.

Data Collection

Data was collected through a series of focus groups, facilitated by an experienced moderator. All groups were facilitated using a discussion guide (see Appendix D). At the beginning of each focus group session, the moderator played a video depicting an IND detonation scenario. After the video, the moderator played a recording of the selected message and asked participants

Table 1

Number of Participants by Community (N=75)

City	No. of Participants
Boston, Massachusetts	15
Atlanta, Georgia	22
Denver, Colorado	17
Seattle, Washington	21
Total	**75**

Participants Characteristics (N=75)

Demographic Variable	Number	Percentage
Gender		
Females	40	53%
Males	35	47%
Age		
18-24	8	10.67%
25-34	14	18.67%
35-44	20	26.67%
45-54	14	18.67%
55-64	8	10.67%
65-74	7	9.33%
75+	4	5.33%
Race/Ethnicity		
Hispanic/Latino	8	10.6%
White/Caucasian	48	64.0%
African American/Black	12	16.0%
Asian	4	0.05%
Other	3	0.04%
Education		
High school graduate or completed GED	11	16.6%
Some college or technical school	26	34.6%
College graduate	30	40.0%
Some post graduate school	8	10.6%

to share the main idea based on the audio only. Next, the participants received a hard copy and the moderator read the message aloud. Participants were asked to underline important parts of the message and to circle confusing parts of the message. Once the participants completed the activity, the moderator facilitated a discussion with the participants about the elements that they liked, found important, disliked, or found unclear or confusing. During each group, the moderator provided an alternative message for at least two of the messages being tested. The alternatives were read by the moderator and the participants rated the original compared to the alternative message on a scale from one to ten (one being the message had little to no information that would be useful and ten being the message offered valuable information that a person would use during an emergency). Each individual focus group reviewed three to four messages (Appendix E). The messages selected for testing rotated among the different focus groups (Appendix F). Subject matter experts (SMEs) from CDC's Radiation Studies Branch were available to answer questions at the completion of each focus group session.

All sessions were audio recorded, video streamed live (for offsite viewing), and attended by CDC and ORISE staff.

Data Analysis

ORISE staff examined participants' transcribed responses to identify emerging themes. The qualitative responses were entered into qualitative analysis software, QSR International's NVivo 8.0. This software assisted in the identification and analysis of themes from the focus groups. Multiple staff members confirmed similar themes.

Individual Message Findings and Comments

Individual Message Findings and Comments

The findings are broken down by individual message. Click on the message title to link to the complete message text in Appendix E. For each original message, the main idea, perceived strengths, and perceived weaknesses are presented with quotes to support prevalent themes. Additionally, for each alternative message, perceived strengths and perceived weaknesses are presented with quotes to support prevalent themes. The main idea of the messages was consistent in the original and alternative versions. Tables with message content and participant feedback can be found in Appendix G.

Message 55

How much radiation is safe? How much radiation is considered low risk?

Perceived Main Message(s):

Participants thought the main message was to get inside a strong building to shelter from radiation. Participants felt another key message was that low exposures of radiation may result in minimal or no health effects.

- *It's telling you to get inside of a strong building or basement to provide shielding.*
- *If there was any good message, it was one that you're best off being inside and I really don't remember exactly, but let's say go in a cellar or someplace that's secure.*
- *Exposure to the radiation can be harmful.*
- *I guess that not all radiation is bad, depending on the dose.*

Perceived Strengths:

The second half of Message 55 ("getting inside a strong building," "listening to state and local officials," and "advice during an emergency is meant to limit exposure") was the most valuable information to participants. The information provided actions that participants could take to protect themselves and limit radiation exposure.

- *The three bullet points at the bottom are probably the most important part.*
- *Get inside a strong building. Basically, what I have control over, what it is I can do.*
- *I liked that it says "any advice given during an emergency is meant to limit exposure." It makes you feel like they are trying to protect you as much as they can, so listen to what they are saying.*

Perceived Weaknesses:

Although participants understood the main messages, they expressed that the information they would want to hear during an emergency came too late in the message. The first half of the message was considered irrelevant information to participants during an emergency situation and many suggested removing the first two bullet points.

- *The main message came way too late. It should have been the first statement instead of the third or fourth.*
- *The first part of it reminds me of just going back to very informational, and the second part reminds me more of what you would do for an emergency.*
- *I marked out the first two sections. Just give me the rest down at the bottom.*
- *Just give them the information to keep themselves safe, what to do until further notice.*

Participants also stated that the language was too technical and could deter people from listening to the entire message. The general public was unfamiliar with the Health Physics Society and terminology such as hereditary genetic damage, sieverts, and rems. Participants suggested providing definitions for scientific terms to assist with comprehension of the message.

- *The one thing that stuck in my mind where they're citing somebody that's done some research, and they quote some things that don't mean anything to me.*
- *They were talking about things that the average person doesn't know about.*
- *And if they could just put that over here in human words, we could understand.*

The statements "any radiation dose could result in detrimental health effects" and "certain doses result in effects too small to be observed or nonexistent" seemed contradictory to the participants. This message also brought up questions about how participants could determine their radiation dose and how they would know that a building is "strong enough" to provide adequate shielding from radiation.

- *I feel like the first and second thoughts are total contradiction or confusing. [In] one they're saying, "Any dose can be harmful," and the next one saying, "well, this dose isn't even small enough to exist," so it's hard to tell.*
- *Unless you are wearing a Geiger counter and have one of those things that the radiologists have, you don't know your exposure.*
- *What is considered a "strong building"?*

The lead apron for dental x-ray analogy was misinterpreted and did not help participants understand the concept of shielding. Some stated that this concept may cause people to attempt to find a lead apron for protection.

- *Maybe if someone is in an emergency, and they can find something that's similar to lead apron.*
- *In a situation like that, you want to be told of things that are everyday household items that you can find easily as opposed to going on a goose chase for a lead apron.*
- *Who has one of those [lead apron]?*

Alternative Message 55

Perceived Strengths:

Participants favored the alternative message because it was more concise and easier for them to understand in an emergency. Detailed information about populations considered more sensitive to radiation exposure and action steps people should take to limit radiation exposure was valuable to participants.

- *And the second one, it just has straight to the point what is considered low risk.*
- *This has less fluff so it's easier, concise, quick to understand.*
- *For the type of message, it's right to the point. Who's most at risk? What to do initially and then to stay tuned.*

Perceived Weaknesses:

Participants noted that the original and alternative messages did not answer the question of "How much radiation is considered low risk?"

- *I'm not so sure if it's answering everything here. How much radiation is considered low risk? It doesn't tell you that. It just tells you that certain people are more prone to sickness if they're exposed, but it doesn't say how much.*
- *I want to know the answer, too. There are no answers to the questions. Just more info about other stuff.*

Participants thought the information about how "limiting your exposure to radiation can lower your risk of developing health effects"—was obvious and seemed condescending.

- *The thing that just throws me off is the fact that they're like, the less radiation you're exposed to, the lower risk. It's like, OK, duh. I just feel like it's a pointless thing to say.*
- *I think the first sentence is not needed at all because common sense will tell you the less radiation you're exposed to will lower your risk.*

Message 68

What is radiation exposure and how does it occur?

Perceived Main Message(s):

Participants perceived the main messages to contain information about the various methods and levels of radiation exposure. Additional messages recalled by participants were the definitions of radiation exposure and background radiation.

- *The message just basically says how you can be exposed to—or the methods of being exposed to the radiation.*
- *There are different levels of exposure, some that are all around us on a daily basis, and there are some that you get from certain accidents or, I guess, catastrophes or something like that.*
- *I think it gave you the definition of—after mentioning background radiation in the beginning, at the end it finally kind of defines it for you.*

Perceived Strengths:

Information about how radiation enters the body was important to some participants. However, participants wanted more detailed, practical examples of how radiation enters the body through eating, inhalation, injection, or absorption.

- *"We receive exposure from radioactive material ingested during eating, inhalation, injection or absorption"—so it just tells you all the ways that it can enter your body.*
- *It's good to know the ways you're going to be exposed, but much better to tell us the different ways that your air that you're going to breathe is going to be getting the contamination, the food that you're going to eat, the water, etc.*
- *It's telling you the method, but not the practical reason why you would be exposed to it.*
- *There's no practical example of what they're trying to tell you and how you can protect yourself.*

Perceived Weaknesses:

Participants expressed that the message was too long and the tone was more educational than urgent. Several participants mentioned they would like to receive this type of information prior to an incident.

- *This one has way too much information. If you're in a situation, it's almost like you lost me at the first two lines. Too much.*
- *The relevant points were lost in how much content was there.*
- *It's more an education awareness type thing that should be given prior to [incident].*

- *It is great if you are going to take a test on it in the morning.*

The information about "radioactive materials" confused several participants. It made participants question what was considered radioactive materials (i.e., food and water), what are other types of radioactive materials, and if radioactive materials affect people differently.

- *If I was in a disaster situation, I'd want to know what to do about this kind of radiation. Like, right now. In 10 words or less. Not a long paragraph that you have to think and study. Something short and to the point.*
- *So if there's a nuclear explosion of any kind, what kind of materials are we talking about? Are there other choices? More than one thing that would be affecting us? And how would it affect the organs?*
- *…. the different kinds of radioactive materials affect different parts of the body—now you're just throwing another kind. There's more than one kind of radioactive? We're going to think that. That's going to raise the other question. If there's different types of radioactive material, what kind of material am I facing?*

Participants thought that providing examples of radiation sources was irrelevant because the source in this scenario is an IND (e.g., background radiation, accidents, medical imaging, etc.). Participants also mentioned the sentence referring to "accidental release of radiation or intentional acts of aggression" was irrelevant to participants, given the scenario.

- *I am not going to worry about x-rays if there's a nuclear bomb going off.*
- *It's trying to explain it [exposure] with radiation from therapy and from the environment. It clouds the whole message.*
- *Sources could be from accidental release of radiation or from intentional acts of aggression. It doesn't seem pertinent to radiation exposure.*
- *If someone just did a nuclear bomb, of course we know that's from aggression or it was intentional.*

In general, the information provided in this message was irrelevant following an IND event. Participants wanted to know how to determine if they were exposed and protective measures they could take to reduce exposure.

Alternative Message 68

Perceived Strengths:

The tone of the message was thought to be more direct, concise, and practical.

- *It speaks more to an announcement concerning a radiation emergency rather than textbook-type bullet points.*
- *The information is more concise, it's more precise.*
- *They gave a little bit more instruction or a little bit more direction as far as you can receive exposure from materials swallowed, and inhaled, absorbed in your skin.*
- *I thought the second one had much better information in it, more practical information in it.*

Participants liked the statement "follow instructions from state and local officials" because it provided directions on what to do during an emergency.

- *The key points are here: there was radiation exposure and following instructions.*
- *I thought the second one had much better information in it, more practical information in it.*
- *I really liked the last bullet. It has a "what to do" in there.*
- *It tells you what to do in an emergency if it's a radiation emergency. And it tells you to follow the instructions of the state and local officials.*

Perceived Weaknesses:

Participants wanted better examples of exposure routes and additional safety measures they could take to protect themselves from radiation exposure.

- *Better examples of how you can be exposed and how you can avoid it.*
- *I would have liked if there was anything at all about preventing or limiting exposure. Like, even a line saying, "don't go near where the blast happened."*

Message 69
What is radioactive contamination?

Perceived Main Message(s):

Participants felt the main idea of Message 69 was the definition of radiation contamination, how it spreads, and that contamination could easily be removed. In addition, participants expressed that the tone of the message could help to reduce panic during an emergency.

- *Explaining to people what radiation contamination is or how you get it.*
- *What it looks like, what you're gonna see, how it's gonna present itself, how it travels.*
- *It's more how it can spread quickly just by carrying it out of the zone, the other areas, where it's on your skin or clothing or tangible items.*
- *They told you if you've gotten contaminated, there are things you can do.*
- *I think, to me, this original message is "don't panic." There's a way of getting rid of it.*

Perceived Strengths:

The analogy of radioactive contamination settling like dust or mud was helpful to participants. Knowing that a person could leave the area and still be contaminated with radioactive material was important information for participants.

- *The 'dust and mud', that was a very powerful visual for me.*
- *I thought it was important to say that the person or thing can leave the area of a release and still be contaminated.*

Providing examples of objects that could be contaminated (purse or car) was well received by participants.

- *I didn't know that it could be absorbed and still carried, and you think you might not have gotten hit by it, but you can still carry it on somewhere else, just by your shoes and your breathing.*
- *[important] Where it said a purse or car, because I think that in an emergency like that you may not think of those things.*
- *They're talking about how it can go, how it can be moved, and then saying it again very specifically, saying it can be on your purse or your car.*

Perceived Weaknesses:

The statement "while radioactive contamination can spread through physical contact, but is not infectious or contagious" seemed contradictory and raised questions and confusion among participants. Participants did not see a difference between spreading radioactive materials through physical contact and it not being infectious or contagious.

- *It means the same thing, really. It can be spread through another person, but it is not infectious or contagious, but that doesn't matter if you can spread it to another person anyway.*
- *I am unclear on how it can be spread, but it is not contagious or infectious.*
- *It's a little confusing, I think, to say radioactive contamination is not contagious. It's saying you can get it from physical contact, but it's not infectious.*

Participants were unable to differentiate between radiation, radiation particles, radioactive material, and radioactive contamination. Many questioned if the terminology related to the same thing; others revealed that they assumed radiation was invisible and referred to examples such as x-ray machines.

- *They're hearing radioactive and they're hearing radiation and they may not be able to differentiate between the two. There's a lot of verbiage that sounds similar—radiation, radiological, radioactive—they're not gonna know the difference. They're just gonna keep hearing the radio and assume that it's all the same thing.*
- *….because it sounds like there's two different things: radioactive elements plus radiation's components as well. And one of them we can probably handle and remove from us.*
- *I didn't realize that it was like a dust. I thought it was completely invisible—like an x-ray machine or something.*

Participants questioned how they could determine if they were contaminated and, if so, how they could determine if they had internal or external contamination.

- *Have I been contaminated? How do I know?*
- *How do they know if you're internally contaminated? Is there a word for that and is there going to be a test for that? How does that work?*

The major weakness identified by participants in this message was the lack of instructions on how to remove the radiation and how to limit its spread. Without specific instructions about removing contamination, many participants were skeptical that it could be "easily" removed.

- *It is good to know it can easily be removed, but if you don't know how, then all it does is upset you and worry you until you find out.*
- *I need to know from this point on how I can fix it and get it off me or cure myself of it.*
- *The second-to-the-last bullet point, says that it can be easily removed. And if that were the case, then you would think that they would be throwing out quickly what you could do to easily remove it.*

Alternative Message 69

Perceived Strengths:

Although very similar in content, participants found the alternative message much more concise and found directions on removing radioactive contamination useful.

- *It's much more useful. The information is more concise and it gives you a plan. If you are contaminated, it gives you some guidance on what you should do.*
- *Like I said, short and concise, it tells you what you need to do. I like the fact that it gives you a list of stuff to do.*

Participants liked the detailed action steps about decontamination. Providing practical action steps to remove radioactive contamination was comforting and calming to participants.

- *I think that they gave more direction as to what to do, as far as washing with warm soap and water and when you're closing a plastic bag and things like that.*
- *It kinda comforts you in a way knowing that you could use soap and water. To know that at the bottom line, at the same time, it tells you how to reduce your exposure and those around you, gives you some advice.*

Perceived Weaknesses:

Participants had questions regarding the decontamination procedure:

- *Maybe there's no lukewarm water. Does that mean you can't use cold water if there's no lukewarm?*
- *There are not always going to be plastic bags around. If there is no power, how are you going to have warm water? If you just have cold water, is it going to do the same thing?*
- *I'm taking off my clothes, but what am I putting on? That indicated I've got another set of clean clothes that aren't contaminated with radiation.*
- *Does the bag have to be sealed or tied up?*
- *And does the bag have to be sealed, or is it just like a grocery bag? I mean, when you leave it open, doesn't the radiation come out of the bag?*

Message 79
What are the health effects of radiation exposure?

Perceived Main Message(s):

Participants perceived the main idea of this message as providing information about the symptoms of radiation exposure and a directive to seek medical attention immediately for certain symptoms.

- *What they were basically saying is "here's the symptoms. This is how long it's going to take, or how long it can take for them to manifest." I think the only really positive thing about it was that it basically said if you've been exposed that in certain cases there can be treatment.*
- *I think the main message there is seek medical attention if you think you've been exposed, and these are the reasons why you might think you've been exposed.*

Perceived Strengths:

It was important for participants to know that symptoms may take time to appear. Also, participants were reassured that there were some treatments available.

- *"Skin burns can take time to present themselves." I thought that was helpful. I didn't know that.*
- *That's the first time we've seen that there are treatments available in any of the messages. I thought that was kind of helpful to end the message with some hopeful news, like there is something that we maybe can do for you.*
- *I also liked that they said there were some treatments available to us. Seems a little more hopeful to me.*

Perceived Weaknesses:

While participants found information on symptoms of large doses of radiation exposure (skin burns, nausea, and vomiting) valuable, they wanted more information on how skin burns caused by radiation might present, and a more definitive timeline of how symptoms could develop.

- *The skin burns and the nausea, does it show up within 2–4 days? Does it show up 6 months later?*
- *It says, "Take time." Well, how much time?*

The mention of flu-like symptoms confused several participants. They were unsure if a person would develop flu-like symptoms from radiation exposure, and they could not understand why a radiation message referenced the flu.

- *Is it saying you'll develop the flu as well, but it won't develop until later?*
- *I thought that they [flu symptoms] appeared over time. Just like radiation sickness.*
- *As far as the "Unlike flu symptoms," what exactly are they trying to say? Like, the statement could be very misunderstood, because I mean I can read it two or three different ways.*

Many participants declared that regardless of preexisting conditions, they would seek medical attention immediately. This led to concerns that the medical system would be overwhelmed during a radiation emergency and treatment would be unavailable. Participants worried that these instructions could lead to chaos at the hospitals.

- *Everybody and their mother is going to be going to see a medical professional.*
- *This is going to make everyone run and panic to [a] hospital.*

The list of radiation-related variables that led to differing presentations of health effects was not valuable to participants without an event-specific context.

- *It goes into a bunch of things assuming you know, the one that said "depends on the amount, the type, the material, the length". And then down below the certain types. "Some treatments for certain types". Well, how would you know? It's assuming you can self-diagnose.*

Alternative Message 79

Perceived Strengths:

Participants found the alternative message more concise. They appreciated the range of health effects from radiation exposure and felt the alternative message provided a more detailed explanation of how the health effects may manifest.

- *It's short, to the point, and it also has more of a danger effect to it.*
- *Gives you more detail about the effects of radiation, which I would want to know.*
- *I like the details—the fact that they highlight specific things—the health effects. It explains health effects with the skin. While cancer or death is a bit—you could be taken aback by it—I think you should know about that.*
- *I do like that they talk about the range of health effects from skin reddening to serious cancer or death.*
- *That health effects can range…there was more of an explanation, it seems to me, more things for me to look out for.*

Perceived Weaknesses:

Participants wanted more information on symptoms and timeline of health effects. They desired more detailed information on how skin burns caused by radiation might present, and a more definitive timeline of how symptoms could develop.

- *Well, did I get the mild version, or am I going to die?*
- *It doesn't say how long the radiation's going to be there.*
- *If one of my kids shows up with lots of reddened spots on their skin, well, that's not actually considered a blister. When they talk about your skin reddening versus the skin burns, it's hard to know when you seek medical attention.*

Questions arose regarding the long-term effects of radiation exposure and if there would be repercussions for future generations. Participants were doubtful that the medical system would be operational in an IND scenario.

- *Would this affect future generations either by passing it down? I mean, will it stay in your body?*
- *Health systems are going to get buried.*
- *I don't think you should be dependent on emergency workers...there's going to be some serious people, emergency medical professionals, that are going to get slammed, and you're telling them all to just go seek this thing for skin burns, nausea, and vomiting. You're going to take away a lot of care for a lot of serious people.*

Message 80
Does radiation cause cancer?

Perceived Main Message(s):

Participants identified the main message to be that radiation exposure could cause cancer and it will take time to appear.

- *Getting cancer is a possibility [from radiation].*
- *Cancer. And about if it's gonna be a delayed reaction, where you [are] gonna have to worry about [it] along the line.*

Perceived Strengths:

Participants appreciated the information about radiation and cancer. Although the information about cancer was unpleasant, it was comforting to some to know what long-term health effects to expect.

- *If you are talking about radiation causing cancer, it is important to know the long-term risks.*
- *The whole message is to calm people down…to make sure they are aware of a possible negative impact.*

Perceived Weaknesses:

Participants considered this a secondary message and were not interested in this information during the first 72 hours of a radiation emergency.

- *My first thought is "do I need to know this know in an emergency?"*
- *In the first few hours, cancer is not really going to be prominent on the forefront of my mind. Talk to me after the crisis situation was contained.*

The term "documented scientific evidence" was not well received and created skepticism among participants. It also caused some participants to view the message as legalese. Moreover, referencing background radiation, routine medical, and environmental sources confused participants, was deemed irrelevant, and led to an overall impression of mistrust among participants.

- *There's "documented scientific evidence linking high-level." I would want the person to just be like "We are aware that a nuclear radiation just took place, and there are studies linking"—rather than saying "documents," "scientific evidence." They seem like they're trying to feed me with something that could or could not be true.*

- *There's a lot of questions that could be raised by the last part. What do these mean? If it's supposed to clarify when is the danger, then you need to know what background radiation, low radiation doses, and even what they mean by environmental sources.*

Participants wanted more information on what was considered a "high level" of radiation exposure based on an IND scenario.

- *At my level of knowledge, I don't know what a high level of radiation is. I don't know what a low level is. If I go in to get an x-ray, I assume that's low, but how [low] in comparison to other levels of radiation. How would it compare?*
- *Is that a high level or a low level in your clothes?*
- *Concrete comparables would help me.*

Alternative Message 80

Perceived Strengths:

Participants felt the alternative was easier to understand and provided factual information. The statement regarding health officials monitoring people affected by radiation emergencies for long-term health effects was reassuring to participants.

- *There are people who don't understand big words. These are just so easy; pretty much everyone can understand that.*
- *It was blunt and straight to the point…telling you the realistic point of it. It gives you that comfort of knowing that people do care, that they'll help out with it. So just keep following instructions from the officials.*
- *It was a "we're here, we understand there is something going on, we will get back to you". Sometimes that is comforting to know that you haven't been left behind, you haven't been forgotten.*
- *I liked that the middle bullet point talked about what health officials will be doing. They will be continually monitoring people for the long-term health effects, including cancer.*
- *It makes you sort of feel like you're not alone. It feels like people are there monitoring, and they're gonna help you. You're gonna have help along the way.*

Perceived Weaknesses:

Although important, information about the correlation between cancer and radiation exposure was not the first thing participants would think about during the first 72 hours of a radiation emergency.

- *I don't think it's relevant to know that I could possibly get cancer within an hour and a half.*
- *You can't do anything about it right now. You need to treat the radiation. You can't start freaking out about the cancer too.*

Message 83

How will people know if they have been exposed to radiation and what happens if they are exposed?

Perceived Main Message(s):

Participants stated the main messages to be "seek medical attention immediately for particular symptoms" and "stay inside."

- *It says "if you have any symptoms you should seek medical attention immediately."*
- *It seems like the key is to stay inside no matter what. "Stay inside until you're instructed to leave" seems to be the key message there.*

Perceived Strengths:

The overall tone of the message provided a sense of urgency for participants. Moreover, the "stay inside" message was something participants could do to protect themselves. It was important for participants to know that symptoms may take time to appear and what type of symptoms they should look for to determine if they have been exposed to radiation.

- *It doesn't feel scientific to me. This is a message I would want to hear immediately afterwards. "Stay inside. You may be exposed."*
- *It sounds urgent, but not too urgent.*
- *It was serious. It told you what to expect, what to look for, and what to do.*
- *It warns you that you may not experience any immediate health effects, which is also useful to know.*
- *What I did like was that it was specific about a large dose of radiation in terms of skin burns, nausea. That gave me specific information about what I was supposed to be looking for.*

Perceived Weaknesses:

The directive to "stay inside" contradicted another directive to "seek medical attention," leaving participants confused as to the correct action.

- *Protect yourself, while exposing yourself.*
- *It doesn't make any sense to me.*

Participants wanted more information on how they could assess their level of exposure and protect themselves from additional exposure. They also desired detailed information on when health effects may appear, if not immediately, what those might be, and when they would most likely present.

- *It doesn't make any sense to me. "A large dose of radiation may cause skin burns." How do you know? What size is the dose you got?*
- *How long from now until whenever can I still get this radiation poisoning?*

Participants expressed concern that the medical system would be overwhelmed and treatment would be unavailable.

- *Can you imagine all the people going "I have to rush to the hospital because I think I have this"? You're going to have chaos.*
- *Is the hospital even standing? Is the hospital packed?*
- *There may not be a hospital.*

Alternative Message 83

Perceived Strengths:

Participants felt this message provided specific action steps to help limit exposure, and liked knowing that state and local officials would be providing more information.

- *I just like how specific it was. It gave me something concrete to do right away—get inside, listen to the officials—so it gave me help. This is exactly what I need to do and I'm going to sit by my radio until I know what to do.*
- *I think it tells you something specific—"get inside a strong building away from windows or in a basement to protect yourself from radiation exposure." They're trying to help you here specifically.*
- *That they know there's something to listen to. I do think that's very important.*
- *I think that it's very important, when you're dealing with any kind of emergency, that people have not only an assurance that they know that something [but also] how people are going to communicate with them. They know there's something to listen to.*

Perceived Weaknesses:

Many participants had questions about how they could assess their potential level of exposure, besides proximity to the incident. They also questioned how they could determine if a building was strong enough to provide adequate protection from radiation exposure.

- *Define "strong building." Big columns like this with a lot of windows—is that strong, is that not?*
- *What does it mean "like a strong building"? So how do I know? How do I determine that?*

Participants found this message to be contradictory, in that it directed everyone to stay inside but also gave instructions to seek medical advice if certain symptoms were present.

- *It's saying if you have those things seek medical help immediately, but stay inside until someone tells you to go out. What do you do if you're sick? Like, do you go out? Or do you stay inside?*
- *I don't think it needs to say "seek medical attention immediately" because I need to stay inside. So that's confusing, so just eliminate that and say "these are the symptoms; wait for further instructions to find out what to do."*

Message 85

Are there any treatments for radiation sickness and removal of radioactive contamination?

Perceived Main Message(s):

Although participants mentioned treatment, there was no consensus on the main message because of the length of the message.

- *I just got treatment out of it, how to treat it.*
- *I guess I saw hope, but I lost myself in the middle of it because there was too much information.*

Perceived Strengths:

Knowing that internal contamination is a small part of total radiation exposure was valuable to participants.

- *Internal contamination is typically a small part of exposure so maybe that needs to be stressed.*
- *You don't necessarily have internal poisoning just because you have external. That's what I got.*

Participants were reassured that local emergency workers and medical professionals will be monitoring the situation to determine treatment.

- *I like the part about local emergency workers. Leave it up to the professionals.*
- *I want to know that there are medical centers or medical doctors out there.*

Perceived Weaknesses:

Participants stated the message was too long and confusing, and it raised their anxiety levels. The message lacked information about what participants could do to prevent infections, maintain hydration (particularly if they were concerned about a clean water supply), treat injuries and burns, and remove contamination.

- *I lost myself in the middle of it because there was too much information.*
- *They need to give more information about what you personally can do to help yourself.*

Information about Potassium Iodide (KI), its effectiveness and availability, was confusing to participants. Some confused KI with radioactive iodine. The majority did not believe that KI would be obtainable during a radiological emergency. Participants were also apprehensive about administration and dosage of KI.

- *I don't think you can buy it. You have to see the doctor.*
- *Take the Potassium Iodide statement out entirely. If it's not something someone's going to have lying around the house, I'd expect it to be administered by those local emergency workers and medical professionals.*
- *How much do you take? I don't think it's giving you enough information for what it is.*

Participants did not like the term "limited medical treatments" and many believed this message would cause people to panic.

- *Give me a little bit of hope. I don't need to know that there's limited treatment for it and you have to get it prescribed by a doctor.*
- *You're going to cause panic if you say there is "limited medical treatment."*

Skin burns, nausea, and vomiting were often seen as unrelated symptoms and not recognized as symptoms of Acute Radiation Syndrome. Some participants said they would not seek medical treatment, as these symptoms seemed to be mild and treatable at home.

- *If you've got a rash, is it the end? Or is this like "you're okay." When you can get to the doctor because everything's devastated…when should I panic?*
- *"Medical attention for burns and vomiting"— I could get that at the beach. It's not a major issue.*

Participants wanted more information about things they could do themselves with materials at hand to treat radiation sickness and remove contamination. They also wanted more information on how to determine if they were internally contaminated.

- *What am I gonna do for myself and my family? I was thinking maybe I need to have some stuff in place already in my house, or already in my care, just in case, because you never know.*
- *Well maybe it's internal? It's external? So people may get confused about what kind they have. Are they having symptoms of external sicknesses? Symptoms of internal?*

Alternative Message 85

Perceived Strengths:

The message provided steps to limit contamination and participants perceived the tone of the message as more authoritative.

- *In the context of it all I picture myself having to do things on my own, having to not depend on others for help. These are things that I can do for myself. And it's clearly bulleted there so I can clearly understand what I can do or even examples. If I can't do specifically what they are [recommending], I can kind of take the examples and do something similar to it.*
- *It was very clear and to the point.*

Perceived Weaknesses:

Participants did not like the term "limited medical treatments."

- *It's constantly saying "limited medical treatments," which is perceived negatively.*
- *I don't like the government admitting that they don't have any treatment for radiation inside your body.*

Participants wanted to know things they could do to prevent infections and maintain hydration. Though participants liked hearing instructions for decontaminating themselves, they wanted more information on the decontamination process.

- *How do you prevent infections? Maintaining hydration and treating major injuries and burns—how?*
- *Maybe there's no lukewarm water. Does that mean you can't use cold water if there's no lukewarm?*
- *If there's some OTC [over-the-counter] medicines you could have that would at least be something.*

Overall Findings and Recommendations

Overall Findings and Recommendations

This research explores the relevance, comprehensibility, credibility, and effectiveness of selected IND health effects messages to the general public. Participants provided rich information that helps develop and communicate clear and consistent messaging during the first 72 hours of an IND incident. Suggestions for improvements aligned with common risk communication principles. Incorporating the recommendations below into the IND health effects messages may help to increase the comprehension and effectiveness of the messages among the general public. An example of how the selected messages could be revised is included in Appendix H.

Create messages that address public concerns.

Questions addressed by the messages are not the questions participants wanted answers to in the first 72 hours. Participants were less interested in hearing definitions of technical radiation terms, and more interested in messages that provided information that had a direct impact on their safety and survival. Some participants mentioned that they would have these questions eventually in the weeks and months following the incident, or that they would be receptive to this information pre-event, but that in the first 72 hours post-IND, these were not questions that were important to them.

- *If this is going out after the attack, then pretty much none of it is that important.*
- *This question is sort of later. Like a couple of years later.*
- *I just don't think this is important after you've already been exposed. This is not the information I would want.*
- *More of an education message. I would rather be listening to this message prior to an event than after.*

Ensure that messages answer the questions they were meant to address.

Many participants stated that even if the question was one they had in the first 72 hours, the information provided did not answer the question adequately. Participants perceived that if a message did not directly answer the question, authorities were hiding information, leading to mistrust of other messages.

- *They don't answer what their titles are. That drives me crazy. You wrote it.*
- *It doesn't answer the question they're asking clearly.*
- *It's just the wording is a little propaganda. It's not like they're not trying to like, they don't seem like they're trying to help me. They seem like they're trying to feed me with something that could or could not be true.*

Provide prioritized instructions and directions in each message.

Participants responded positively to messages that provided them with simple action items they could perform to protect themselves, their families, and homes. Providing instructions led to a sense of self-efficacy among participants and empowered them to help themselves and others. Participants wanted more details and instructional information, and wanted instructions tailored to different environments. Even messages that only instructed participants to stay tuned for additional information were better received than messages that did not contain any instructions. Messages with instructions provided reassurance and comfort to participants. Some participants felt that if messages did not provide instructions, it would create panic in the community.

- *If you give somebody a little bit of control in this situation by giving them measures they can take to help or reduce the exposure that would be a nicer approach.*
- *What I need to know is that something happened and what do I do to protect myself.*
- *There's no practical example of what they're trying to tell you and how you can protect yourself.*
- *I don't have time for all that, because that doesn't tell me anything to do. That doesn't tell me how I'm going to help our situation. That just gives me a bunch of useless knowledge that really doesn't help me.*
- *Tell me something to help me to survive, and then I'll get more trust. Don't tell me things that I don't want to hear and that are useless, because then I won't want to hear.*
- *I'm still in panic mode looking at this because I don't know what to do. I need to know where to go!*

Tailor messages by time post-incident.

Participants thought the messages should be tailored to address the information needs of the public as the event unfolded. In the first few hours, participants wanted short, simple action items that would directly increase their chances of survival. Organizing the messages by time post-event instead of by topic area would ensure that the most critical life-saving messages would be released first. Communicators could then build on these core messages as more information is known.

- *Certain information, you'd need to put that out immediately. Then, as time progresses, you could send out other less pertinent information and just so on and so forth. There would always be something to inform you, but at least those first critical [hours] that first stage within the first hour or so, have the most pertinent information.*
- *I really don't like what they're saying. I mean it's information and it can be beneficial, but it's not the right time.*
- *I think it's the kind of thing that would come up after a week.*

- *I just don't think that's the first thing you're going to want to hear...I want a message that's going to calm me and not make me feel like, why are you telling me all this? I don't need to know all this right now; I just want to know how to get rid of it.*
- *Talk to me in three or four weeks after the crisis situation was then contained or done, then provide this public service announcement.*

Tailor messages by distance from the incident.

Participants felt that different parts of the message may or may not be relevant to them, depending on their distance from the blast. Segmenting messages by both time post-event and distance from the blast using the IND damage zones will help participants to take the appropriate protective actions. Though precise blast characteristics will not be known in the first hours following an IND event, conservative estimates will help communicators target specific messages to the correct audiences.

- *They should draw a line on a map and tell each group, "if you are within this group, then you do this. If you are within that group, then do this."*
- *If you're near an area that's been exposed to radiation…how near is near? I'm still affected by radiation, but to what degree? I don't know to what degree I need to be serious about how much radiation I'm taking in until I know where it's at.*
- *I would rate these on different levels depending on where I was in regards to where it happened. If I was farther away, I'd want to know more details about how I could be exposed, so that would be more important. But if I was right there in the emergency, I'd want to know where to go, how to protect myself, all that, so this would be less important to me.*
- *Which part of the city is exposed at high radiation and which one is exposed to moderate radiation?*

Tailor messages by delivery method.

The information participants wanted to obtain from the messages depended on how the message would be delivered. Participants were often confused by the question and answer format, and were unsure how the information could be effectively communicated through various media. For several messages, participants were unable to recall the main message when just listening to the audio recording. Participants could comprehend more information when messages were presented in a written format. For the most effective communication post IND, message content should be tailored to a variety of delivery methods. Many participants reported that they would seek information through Internet sources and social media.

- *If I was seriously hearing it, just personally I would think I would need it a lot shorter, something easier to follow. But because I know I'm about to have the paper, I can follow up with that.*
- *You should create an app.*
- *Put it on Twitter.*
- *There is a big difference in reading something and hearing it. So you have to put it in a format when it's on Facebook where you're going to get a range of people from 8 years old to 78 years old reading… so you have to put it in a context so they don't panic.*

The tone of the messages should be urgent and serious, but provide a sense of hope.
An IND event was seen as a serious and alarming event, requiring messages that reflected the severity of the situation. Therefore, participants thought the tone of messages should be more directive and authoritative. Many participants found the tone of the messages to be informational and educational, more appropriate for pre-event communications. Messages should create a sense of urgency, but also let people know that there are things that they could do to help themselves and their families survive an IND.

- *I personally want to know that…there is some optimism here.*
- *To me, it's less than useless. It raises my anxiety level. It's actually a negative.*
- *I think the overall tone and the structure of the sentence is pretty much what makes it a little bit like a – they're trying to scare you and not inform you. Like I don't trust them, because like, it's not like specifically what I want to hear. It's similar to propaganda.*
- *I mean, look, we're in the middle of some crazy thing, and people are dying all around us…these things come across like they're telling people how to plant petunias. This is a big deal.*
- *Not an appropriate tone. It's an informative tone. It's not like "emergency, take action".*
- *It's great if you want to take a test on it in the morning.*
- *This is like textbook material. Like this is something that would be put against the wall…as you're walking by the doctor's office.*
- *This sounds to me like a public service announcement. You know those commercials to inform you of something? That's what this sounds like.*
- *I think the overall tone and the structure of the sentence is a little bit like they're trying to scare you and not inform you.*

Do not use messages that contain contradictions.
Participants were confused because some of the content created contradictions. For example, in a message about radiation exposure, participants were told stay inside until instructed

otherwise and to seek medical attention if certain symptoms presented. Some of the messages contained information that while technically accurate, was perceived by participants as being contradictory. For example, participants were confused by the mention of flu-like symptoms in a message concerning radiation exposure. Contradictions, whether actual or perceived, damaged the credibility of the message and left participants unsure as to the correct action.

- *I'm unclear on how it can be spread, but it's not contagious or infectious.*
- *They say, "Well it is, but it's not."*
- *It contradicted itself. If you've been exposed go seek medical attention but stay inside.*
- *What exactly are they trying to say? The statement could be very misunderstood, because I can read it two or three different ways.*
- *It's a little contradictory because the first statement is well, the message is to stay away from the radiation, but you're telling someone how much exposure they can stand.*

Use plain, non-technical language.

Participants were often confused by technical terminology. Many were unfamiliar with radiation, and liked examples, such as radioactive contamination settling like dust. However, other analogies (lead aprons, flu symptoms) did not resonate as well. Twenty-eight percent of the original message content was written in the passive voice. Content written in the passive voice is more difficult for people to understand versus content written in the active voice. Using the Flesch-Kincaid grade level test, the original messages are written at a 12.5 grade level, which is well above the average American reading level. Approximately 85% of the participants in this study had completed at least some college and still had difficulty understanding the technical language used throughout the messages.

- *I'm thinking of my grandparents, or my mom. She speaks English, yes, but for her to actually follow a message like that…it would be hard.*
- *If you're going to use a term that probably most laymen don't understand, then you need to also have some sort of definition for us.*
- *I was so busy trying to decode that sentence it pulled my brain out of the message and I stopped listening to what began to be important information.*
- *When you have a disaster happen, you don't want to have to read the dictionary. You want point blank "this is what's happening. This is what you should do".*

Make messages concise.

Participants requested concise and simpler messages. In messages that had no action items, participants often got lost in the content, and struggled to identify the main idea. Messages should be less verbose and more to the point. People recalled messages that contained succinct instructions, even if the message was longer than informational messages.

- *Make it a little shorter, then kind of get to the point. The more serious points.*
- *It was informative, but it gave you almost too much information.*
- *The alternate is a little more concise, and it's less information, but giving you more at the heart of it.*
- *Tightly deliver information…because time is valuable to deliver your message so you've got to make sure that you're conveying as much helpful information as possible.*

Avoid or define unknown terms and phrases.

Many participants were unfamiliar with radiation terminology. If possible, messages should be written using as little technical jargon as possible. If usage is unavoidable, unfamiliar terms and phrases should be defined or explained clearly. Participants were not familiar with the following terms and phrases:

- *Background radiation*
- *Contaminated*
- *Detrimental health effects*
- *Dose*
- *Health Physics Society*
- *Hereditary genetic damage*
- *Internal/external contamination*
- *Low/high radiation levels*
- *Potassium Iodide*
- *Premise*
- *Radiation particles*
- *Radiation protection standards and practices*
- *Radioactive material*
- *Rem*
- *Sievert*

Impact of Japanese nuclear power plant disaster

Participants mentioned the nuclear power plant disaster in Japan in almost every focus group as a frame of reference. Groups in Seattle seemed especially aware of the events, and many reported that they had tried to obtain Potassium Iodide (KI) for themselves or their families in the days following the events.

- *I think that we all have an awareness that maybe we didn't have before Japan.*
- *In Japan when they did those, so many miles out, and things like that, at least you could figure where I was compared to where I am compared to where I need to be. That was, I think it was really helpful to them.*
- *They're having a terrible time with nuclear reactors in Japan. They're leaking radiation, and there are villages, towns that completely have moved. People are surviving that, so that while I don't expect that I would be someone who would survive it if it[IND] goes off really close to me, radiation is not only one thing. If it's an explosion, there's not only one way it can affect you.*
- *Did you try to get Potassium Iodide by any chance after Japan? Did anybody? I did. I got it three weeks, no four weeks after because they were on back order…good luck with getting anything. Good luck with buying kelp or iodide.*

- *I knew about Potassium Iodide because of Japan.*

Recommended Next Steps

Recommended Next Steps

1. **Refine messages using "lessons learned" from message testing research.**
   - Include action items in every message, even if items are as simple as "stay tuned."
   - Empower the public with the knowledge to help themselves.
   - Tailor messages to time and distance from event.
   - Write messages specific to delivery method and target audience.
   - Use an authoritative and urgent tone, but also provide hope.
   - Write messages that do not contradict themselves (even if contradiction is only perceived).
   - Use plain language and focus on what the public needs to do, rather than making the message a science lesson.
   - Write concise and direct messages.
2. **Conduct a card sorting activity with the general public to prioritize and tailor questions.**

Card sorting is a method to involve the target audience in grouping information for a particular product. Participants in a card sorting session are asked to review items and then group these items into categories. Card sorting helps build structure, prioritization, and organization to a product.

There are two types of card sorts: an open card sort and a closed card sort. In an open card sort, participants are asked to sort the cards into groups and then name each group. In a closed card sort, participants are asked to categorize items into pre-defined categories.

ORISE staff recommends a concurrent in-person card sorting technique for future research. Participants will be asked to participate in a closed card sort. Each session will have 6-8 participants. The participants will be paired and instructed to sort the current 88 questions in the "Improvised Nuclear Device (IND) Response and Recovery Communicating in the Immediate Aftermath" Guide using the following categories: pre-event, first hours, short-term, long-term and not important to the general public. The facilitator will debrief the pairs at the end to obtain an explanation for their categories.

3. **Create and test instructions for the public to address specific post-IND threats to health and safety.**

In previous focus group research on communicating with the public post-IND, as well as this study, the most requested information by the participants were action steps they could take to protect themselves and their families. Participants often wanted more information to clarify instructions, or to help them adapt instructions to a particular environment. The

topics below are seen by participants as the most important to ensure their survivability, and could be used as a basis for creating specific instructions for future testing.

- How to shelter and limit exposure
- How to decontaminate
- Symptoms of Acute Radiation Syndrome
- Protect yourself from radioactive contamination in food
- Protect yourself from radioactive contamination in water
- Protect yourself from radioactive contamination in air
- Special populations (specific instructions for pregnant women, nursing mothers, pets)

Conclusion

Conclusion

The research set out to explore the relevance, comprehensibility, credibility, and effectiveness of IND health effects messages to the general public. By conducting focus groups with the public before an IND detonation, the working group was provided with a unique opportunity to strengthen current and future communication efforts with the public.

As in previous research, participants wanted concise, direct messages that provided information on what they could do to protect themselves and their families. Plain, non-technical language combined with a sense of urgency and seriousness created the most effective messages.

Effective and timely communication will play a vital role during an IND emergency. Communication after the IND event must address the public's concerns regarding the radiation emergency using simple and concise messages. The findings from this study, combined with findings from previous message testing research, can be utilized by the working group to revise the current messages and communicate with the public more effectively during an IND emergency.

Technical contacts for this study are located in Appendix I.

Appendices

A. Demographic Information

B. Screening Instrument

C. Participant Information Form

D. Moderator's Guide

E. Messages

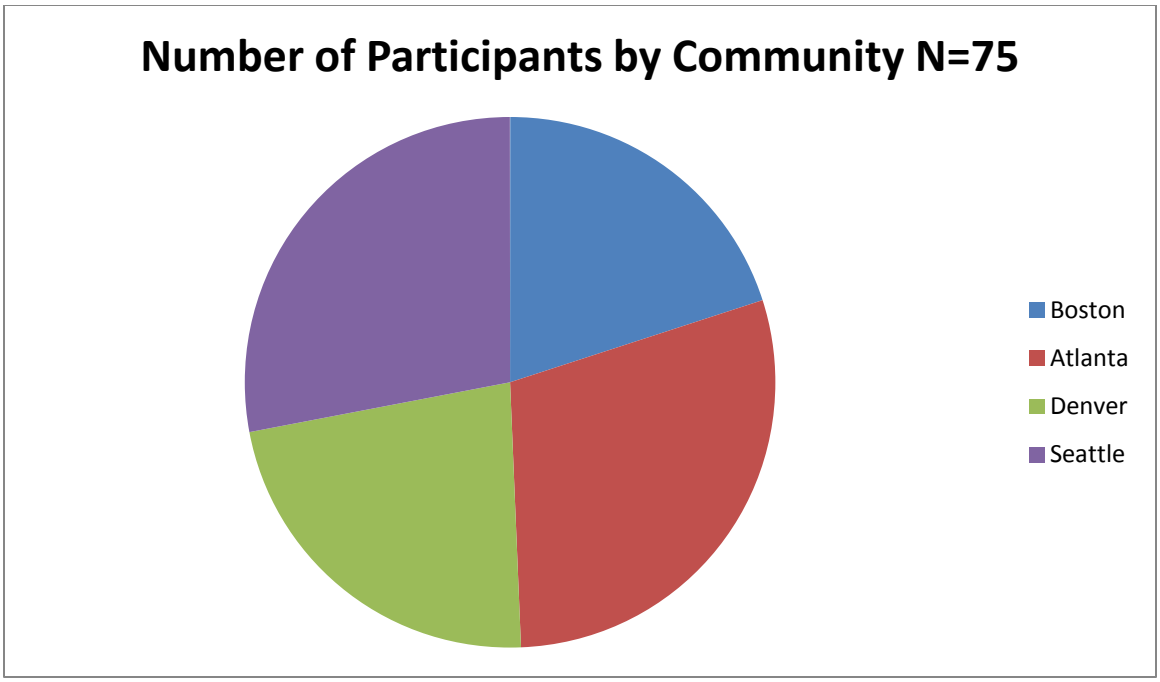
F. Message Rotation Schedule

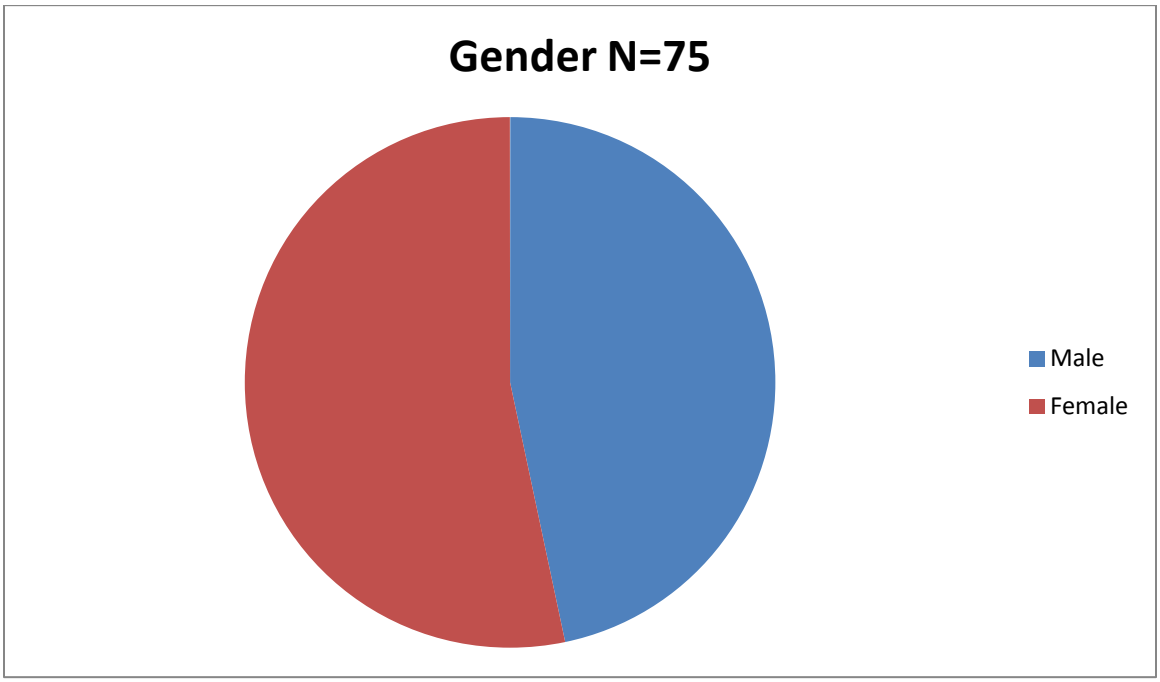
G. Participant Feedback Tables

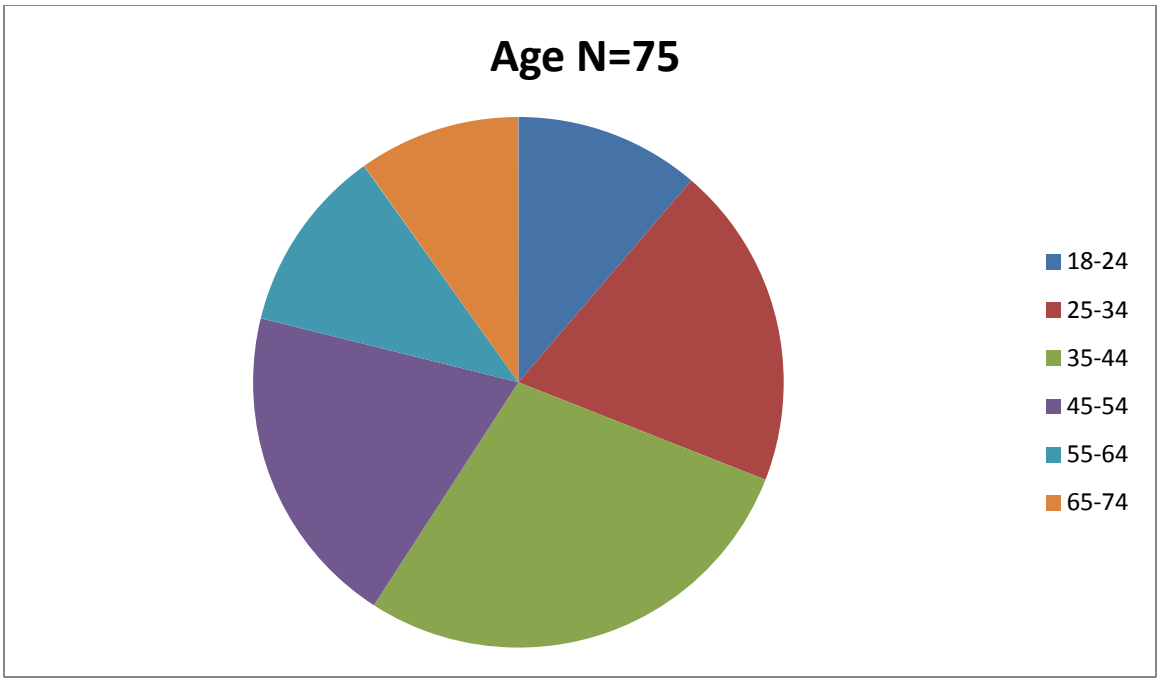
H. Sample Revised Messages

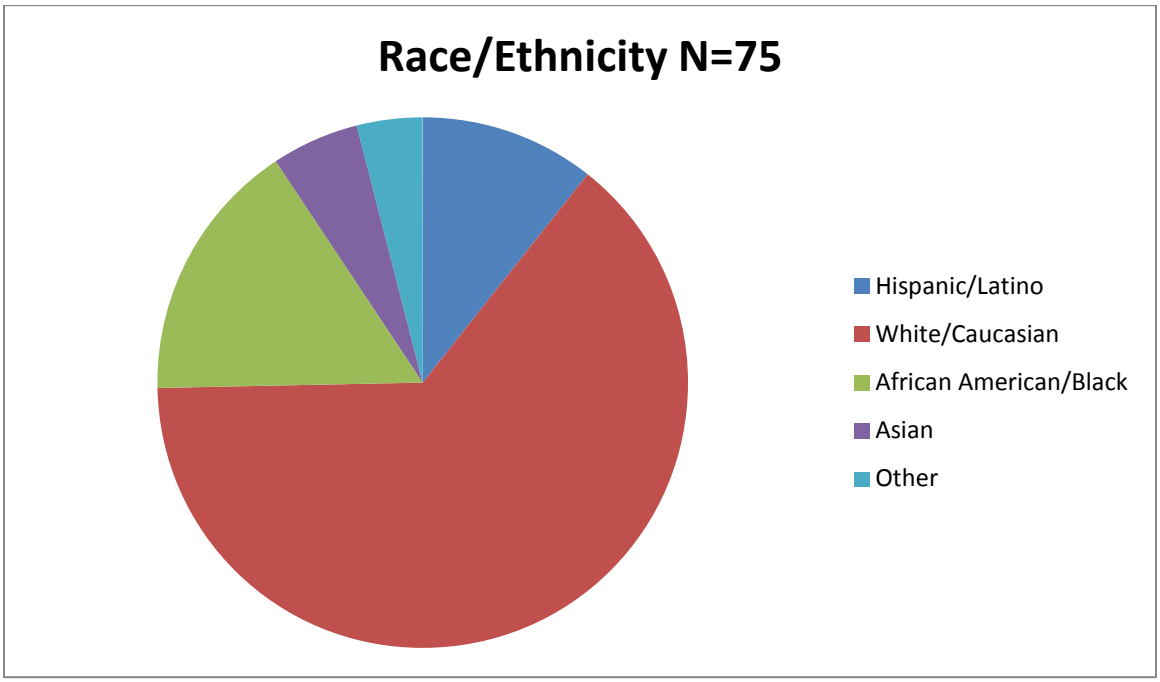
I. Contacts for More Information

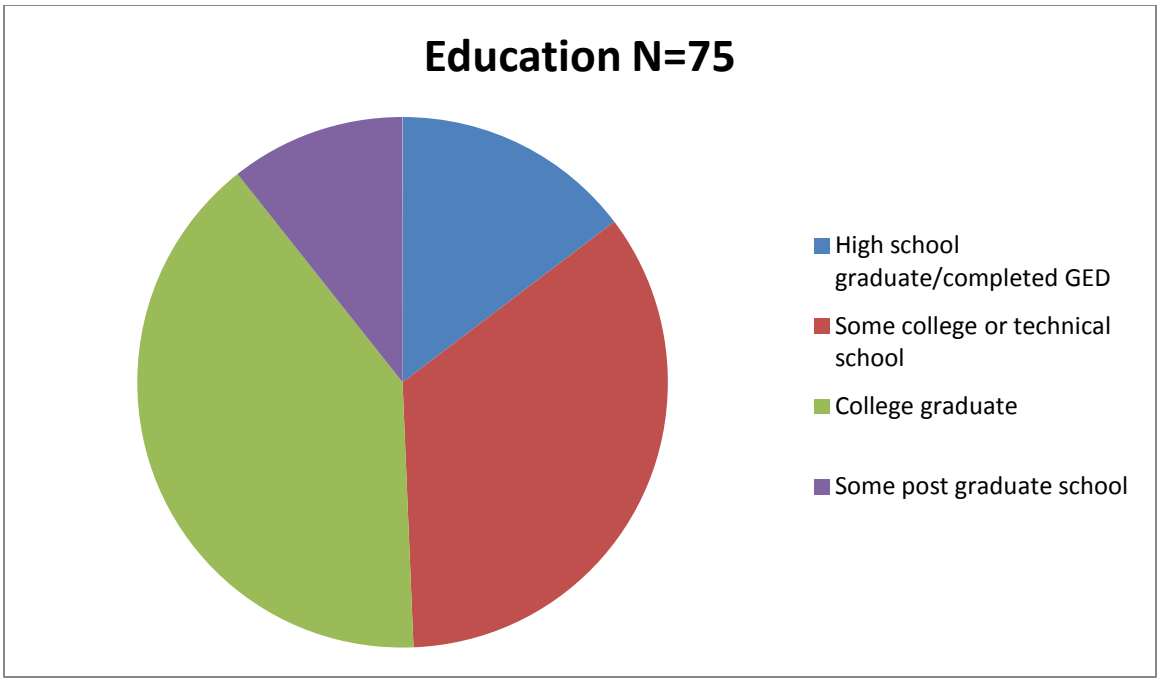
Appendix A: Demographic Information


Number of Participants by Community N=75
Boston
Atlanta
Denver
Seattle


Gender N=75
Male
Female


Age N=75
18-24
25-34
35-44
45-54
55-64
65-74


Race/Ethnicity N=75
Hispanic/Latino
White/Caucasian
African American/Black
Asian
Other


Education N=75
High school graduate/completed GED
Some college or technical school
College graduate
Some post graduate school

Appendix B: Screening Instrument

CDC Study

Screening Instrument

Recruit

- 3 groups
  - 3:30 – 5:00 pm local time Group
  - 5:00 – 6:00 Dinner Break
  - 6:00 – 7:30 Group
  - 8:00 – 9:30 Group
- Recruit 8 per group
- Numbers in parentheses in each question correspond to question numbers in "Health Message Testing System: Question Bank" – February 2011
  - Recruiters need not attend to these numbers.

Good evening. My name is _____ and I am calling from _____, a market research firm. Today we are talking with people as part of a study for the Centers for Disease Control and Prevention. We are not selling anything. We have a few brief questions that will take just two – three minutes of your time, and if you qualify and are interested, we will invite you to take part in a discussion group with other people in your area that will take place at a later date.

1. Have you participated in a focus group, intercept interview, telephone survey, and/or online survey in which you were asked your opinions regarding a product, a service, or advertising within the past six months? (B.2.b)

   01 Yes **[THANK AND TERMINATE]**
   02 No

2. Do you, or does any member of your household or immediate family work (B.1.b):

   01 For a market research company
   02 For an advertising agency or public relations firm
   03 In the media (TV/radio/newspapers/magazines)
   04 As a healthcare professional (doctor, nurse, pharmacist, dietician, etc.)

   [IF YES TO ANY, THANK AND TERMINATE]

3. What is your current job title? What term would you use to describe your current profession? (A.11.a)

_____

[IF ANY OF THE FOLLOWING, THANK AND TERMINATE

- **Employee of U.S. Department of Health and Human Services**
- **Employee of state or local health department**
- **Employee of Department of Homeland Security**
- **Employee of state or local emergency management agency**
- **Nuclear power plant employee, Radiation Safety Officer, health physicist or other radiation-related occupation**

4. In which of the following categories does your age fall? (A.2.a)

01 under 18 years of age **[THANK AND TERMINATE]**
02 18-24 years of age
03 25-34 years of age
04 35-44 years of age
05 45-54 years of age
06 55-64 years of age
07 65-74 years of age
08 75 years of age or older

[DOCUMENT ON GRID]
[RECRUIT A MIX WITHIN EACH GROUP]
[RECRUIT SO THAT GROUPS TOGETHER ARE REFLECTIVE OF THE COMMUNITY]

5. What is the highest level of education you have completed? (A.4.a)

01 Grade school **[THANK AND TERMINATE]**
02 Less than high school graduate/some high school **[THANK AND TERMINATE]**
03 High school graduate or completed GED
04 Some college or technical school
05 Received four-year college degree
06 Some post graduate studies
07 Received advanced degree **[THANK AND TERMINATE]**
08 Other: _____ **[THANK AND TERMINATE]**

[DOCUMENT ON GRID]
[RECRUIT A MIX WITHIN EACH GROUP]
[RECRUIT SO THAT GROUPS TOGETHER ARE REFLECTIVE OF THE COMMUNITY]

6. Document gender. (A.1.a)

01 Male

02 Female

[DOCUMENT ON GRID]

[RECRUIT ABOUT A 50/50 MIX]

7. Please indicate your race or ethnic background. Are you (A.6.a)

01 Hispanic or Latino

02 Non-Hispanic

01 White/Caucasian

02 Black or African-American

03 American Indian or Alaska Native

04 Native Hawaiian or Other Pacific Islander

05 Asian

- 06 Vietnamese
- 07 Cambodian
- 08 Filipino
- 09 Japanese
- 10 Korean
- 11 Chinese

[DOCUMENT ON GRID]

[RECRUIT A MIX ACROSS GROUPS REFLECTIVE OF THE COMMUNITY]

8. Number of children (under the age of 18) living in your household? (A.14.a)

01 None

02 1-2 children

03 3-4 children

04 5 or more children

[DOCUMENT ON GRID]

[NOT A SCREENING CRITERION]

9. **ASSESS AND VERIFY ABILITY TO SPEAK AND UNDERSTAND ENGLISH**

That is all of my questions. You do qualify for our discussion group and we would like to invite you to join us on _____ at _____ PM. The discussion will last about 90 minutes; it will be recorded (audio only) to be sure we get all the information. In appreciation for your time, you will be paid $XX at the time of the discussion.

Are you willing to participate?

01 yes

02 no

Prior to the start of the group discussion, you will receive an information sheet with such information as sponsorship of the study and contacts for more information. If after we hang up, you have a question about this group discussion or decide you can't participate, please contact me at _____.

*Name*_____

*Address*_____

*City/State/Zip*_____

Day Number_____Night Number_____

Appendix C: Participant Information Form

U. S. Department of Health and Human Services: CDC Study

Information for Participants

Purpose of this survey

You are being asked to participate in a discussion being held by the Centers for Disease Control and Prevention (CDC), with the assistance of The Oak Ridge Institute for Science and Education. In the discussion, you will be asked your opinions and practices regarding some information that might be provided to you. Your answers can help efforts to provide accurate, helpful information to the public. The discussion will be recorded (audio only) to be sure we get all the information.

Please remember that:

You choose to participate.
You are not required to answer the questions.
This session should last about 90 minutes.
You will receive a cash incentive for participating in the discussion.
You are free to leave at any time without losing the cash incentive or other penalty.

Risks

The risks you take by taking part in the discussion are the same as you encounter in daily life.

Benefits

You may be better informed about a public health issue.
You may have a sense of satisfaction from contributing.
Your comments may help improve the information the public receives.

Confidentiality

We will keep the information you give us private and confidential to the extent allowed by law. Your name will not be used in the final report. No statement you make will be linked to you by name. Only members of the research staff will be allowed to look at the records. When we present this study or publish its results, your name or other facts that point to you will not show or be used.

Persons to Contact

If you have questions about this session, or taking part in it, you may call: Carol McCurley (770-488-3800) at the Centers for Disease Control and Prevention, Atlanta, GA.
If you need more information about your rights as a study participant, you may contact: Chair, Oak Ridge Site-Wide Institutional Review Board, Oak Ridge Institute for Science and Education, Oak Ridge, TN 37831-0117, 865- 576-1725.

Appendix D: Moderator's Guide

CDC/ IND Message Testing

Moderator's Guide

I. Introduction

a. Introduce self

b. CDC sponsorship

1. Opportunity
2. Importance

c. Recording and observers

1. No personal identifiers used in reporting

d. Respondent introductions

1. First Name
2. How long lived in area
3. A favorite hobby

II. Scenario

a. *Today we will be talking about information you might receive following the explosion of what's called an "Improvised Nuclear Device" or "IND". An IND would be an atomic bomb built and set off by terrorists. CDC and I know that this is not a pleasant thing to think about, but like many natural and man-made disasters, it's better to be prepared than to go "off the cuff" in an emergency.*

b. *Today we will be working with some draft messages that might be issued in the event of the explosion of an IND. I'll be asking you what about them you thought was well done, and what would benefit from change, and some related questions. There are three things I'd like you to keep in mind as we proceed:*

1. *Keep in mind the questions and answers you are seeing is a sample. There are many more questions and answers – too many for one group to review in a reasonable amount of time. Please feel free to tell us other questions that occur to you so CDC can check them, but remember you are not seeing them all.*

2. *Some things cannot be known now. For example, the exact size of the area affected. These details, along with others, would require more situation-specific information.*

3. *Remember that in the event of an IND detonation, there will be constant news coverage, many press conferences and interviews with public health*

officials, elected officials, and others. TV, radio, newspapers, the Internet and other sources will have lots and lots of coverage. You are likely to hear information repeated often.

c. *To try to give you a better feel for what we are talking about – and to help get you in the moment- I'm going to show you a short video.*

Show a short video describing what could be happening following detonation of an IND.

III. Message Testing -- 1

a. Listening to message

First I would like you to listen to our first question and answer – like you were hearing it on the radio or emergency responders were talking to you.

Play recording of message.

b. Response to hearing message

1. What is the main idea that this message is trying to get across, in your own words. (D.1.d)?
2. How would you sum up in just a few words your first impression of this message? Did you like it? Not like it? What makes you say that? (D.7.d)
3. Is this message believable or not? Why or why not? (D.15.d)
4. What action would this message prompt you to take? (D.3.d)
    a. What makes it hard to do this? (D.41.d)
    b. What would make this easier to do? (D.51.d)

c. Reading message

Next I would l like you to read along with me as I read the message.
As I read aloud and you read along with me, please:

1. *Underline phrases, sentences or images you think are important. (D.36.d)*
2. *Circle phrases, sentences or images you think are unclear or confusing. (D36.d)*

Hand out a printed version of the fact sheet to each respondent.

1. What did you indicate as important? (D.36.d)
2. What did you indicate as unclear or confusing? (D.36.d)
   a. Were there any words used that were unusual or unfamiliar? (D.4.d)
   b. What other words can be used in their place? (D.5.d)
3. How easy are these guidelines for you to follow and understand? (D.54.d)
4. What, if anything, makes it difficult to follow? How might this be presented in
   an easier way? (D.55.d)
5. How could this message be improved? (D.33.d)
6. Is there anything you want to know that this item does not tell you? (D.29.d)

IV. Message Testing – 2

Repeat process for listening to, and reading, another information sheet.

V. Message Testing – 3

Repeat process for listening to, and reading, another information sheet.

VI. Sources

Next I would l like to ask you some questions about information sources.

1. Where do you get information about emergency preparedness? (D.69.d)
2. Who do you think would be a good spokesperson to use to convince you and your friends to take protective measures during an IND incident? (D.91.d)

VI. Wrap-Up

1. Those are all of my questions for you.
2. Thank you.
3. I know thinking about this subject may have raised some questions. I'd like to introduce _____ from the Centers for Disease Control and Prevention, who will come in to the room and talk with you for a few minutes.

Appendix E: Messages

Original Messages

55. How much radiation is safe? How much radiation is considered low risk?

- Current radiation protection standards and practices are based on the premise that any radiation dose, no matter how small, may result in detrimental health effects, such as cancer and hereditary genetic damage.

- However, according to the Health Physics Society, a nonprofit scientific professional organization whose mission is excellence in the science and practice of radiation safety, doses below 0.05-0.1 Sieverts (5-10 rem) result in risks of health effects that are either too small to be observed or are nonexistent.

- There are steps you can take to limit exposure.
    - Similar to wearing a lead apron for a dental x-ray, getting inside a strong building or in a basement can provide shielding from radiation exposure.
    - During an emergency, listen to state and local officials and emergency responders for instructions.
    - Advice given during emergencies is meant to limit exposure.

68. What is radiation exposure and how does it occur?

- Exposure occurs when radiation interacts with the body.
    - Exposure can be long-term at low levels, such as that from background radiation (the radiation that is naturally in the environment).
    - Exposure can be short-term at a high dose, such as that from a major accident, diagnostic medical imaging or radiation therapy.
    - Health effects depend on the strength and length of the exposure.

- Exposure can be from radioactive material inside the body.
    - We receive exposure from radioactive material ingested during eating, inhalation, injection, or absorption.
    - Our organs and cells can be exposed to radiation from these materials.
    - Different kinds of radioactive materials may concentrate in and affect different organs.

- Exposure can be from radioactive materials outside the body.
    - Radiation from radioactive materials outside the body can interact with the body.
    - Sources include background radiation and procedures such as x-rays.
    - Sources can be from an accidental release of radiation or from intentional acts of aggression.

69. What is radioactive contamination?

- External contamination refers to particles of radioactive material settling on a surface - like the way dust settles on a surface.
    - Radiation exists naturally and can be found in cities and locations worldwide at varying levels.
    - Harmful radiation particles can be very small and have a consistency like sand.
    - Contamination could be on your body or clothing, including your shoes, on a structure, or on an object like a purse or a car.
    - During a radiological emergency, a person or thing can leave the area of a release of radioactive material and still be contaminated.

- Internal contamination occurs when radioactive material enters the body.
    - It can be swallowed, inhaled, injected, or absorbed.

- Radioactive contamination can be spread in the same way that dust or mud can be tracked into the home or spread to another person or object.
    - While radioactive contamination can spread through physical contact, radiation is not "infectious" or "contagious" like some diseases.
    - Radioactive contamination can often be easily removed.
    - If you are or were in a contaminated area, listen for public announcements on how to decontaminate (remove the contamination).

79. What are the health effects of radiation exposure?

- The health effects of radiation depend on the amount of radiation, type of radiation, the type of radioactive material and length of time a person is exposed to radiation.

- Seek medical attention immediately if you think you may have been exposed to radiation and develop these symptoms: skin burns, nausea, and vomiting. Note that skin burns can take time to present themselves and nausea from preexisting conditions should not be confused with radiation sickness.

- Unlike flu symptoms, these symptoms of radiation sickness can take time to develop after someone is exposed to radiation.

- There are some treatments available for people exposed to certain types of radioactive material.
    - Local emergency workers and medical professionals will determine if medical treatments are needed and what kind of medical treatment to provide.

80. Does radiation cause cancer?

- There is documented scientific evidence linking high levels of radiation exposure to an increased risk of cancer.
- However, the cancers may not appear for years, or even decades.
- Background radiation and low radiation doses from routine medical and environmental sources will not significantly increase your overall cancer risk.

83. How will people know if they have been exposed to radiation and what happens if they are exposed?

- If you are near an incident, you may have been exposed to radiation and you may also be contaminated by radioactive material.
    - You may not experience any immediate health effects.

- A large dose of radiation may cause skin burns, nausea, and vomiting.
    - If you have these symptoms, seek medical attention immediately.
    - If possible, stay inside until you are instructed to leave. This will protect you from dangerous radiation levels outside.

85. Are there any treatments for radiation sickness and removal of radioactive contamination?

- Treatment for radiation sickness is mainly limited to preventing infections, maintaining hydration, and treating major injuries and burns.

- There are limited medical treatments available for internal (inside the body) radioactive contamination, but these only work for certain types of radioactive materials and need to be prescribed by a doctor. Internal contamination is typically a small part of total radiation exposure and not everyone will need this medicine. Potassium Iodide can help with internal contamination with radioactive iodine if taken quickly after an incident. It is available without a prescription but should only be taken on the recommendation of a doctor or public health official.

- Local emergency workers and medical professionals will monitor the situation to determine if medical treatments are needed and what kind of medical treatment to provide.

- You can reduce external radioactive contamination by washing with soap and warm water.

- You should seek medical attention immediately if you have skin burns, nausea, and/or vomiting.

Alternative Messages

Alternative 55. How much radiation is considered low risk?

- The less radiation you are exposed to, the lower your risk of developing health effects.
    - Infants, children, and pregnant women are more sensitive to radiation exposure.

- You can lower your risk of developing health effects by limiting your exposure.
    - Get inside a strong building away from windows or in a basement to protect yourself from radiation exposure.
    - Listen to state and local officials and emergency responders for further instructions.

Alternative 68. What is radiation exposure and how does it occur?

- Exposure occurs when radiation interacts with the body.
    - Exposure can be long-term at low levels, such as the radiation that is naturally in the environment.
    - Exposure can be short-term at a high dose, such as radiation from radiation therapy.

- Exposure can be from radioactive material inside the body.
    - You can receive exposure from radioactive material inside the body if radioactive materials are swallowed, inhaled, or absorbed through your skin.
    - Different kinds of radioactive materials affect different parts of the body.

- Exposure can be from radioactive materials outside the body.
    - You can receive exposure from radioactive material outside the body through many different sources in nature and medical treatments.

- During a radiation emergency, follow instructions from state and local officials to limit your radiation exposure.

Alternative 69. What is radioactive contamination?

- Radioactive contamination is when radioactive material is on or in an object or a person.
    - Contamination can be inside of your body if radioactive materials are swallowed, inhaled, or absorbed through your skin.
    - Contamination can be outside your body on your skin, hair, clothes, or shoes.
    - Contamination can be on objects like a purse or a car.

- During a radiation emergency, you can leave the affected area and still be contaminated.

- Radioactive contamination can spread in the same way that dust or mud can be tracked into the home or spread to another person or object.

- You can take the following steps to limit your contamination:
    - Go inside the nearest building or to an area to which you are directed by state and local officials.
    - Carefully remove the outer layer of your clothing. If radioactive material is on your clothes, getting it away from you will reduce the contamination on your body and decrease your risk of getting contamination inside your body.
    - Place the clothing in a plastic bag or leave it in an out-of-the-way area, such as the corner of a room. Keep people away from it to reduce their exposure to radiation. Keep cuts and abrasions covered when handling contaminated items to avoid getting radioactive material in them.
    - Wash all of the exposed parts of your body using lots of soap and lukewarm water to remove contamination.

Alternative 79. What are the health effects of radiation exposure?

- Radiation can affect the body in a number of ways, and the health effects of exposure may be unknown for many years.
    - These health effects can range from mild, such as skin reddening; to serious, such as cancer or death.
    - The health effects of radiation depend on the amount of radiation, type of radiation, type of radioactive material and length of time a person is exposed to radiation.

- There are some treatments available for people exposed to certain types of radioactive material.
    - Local emergency workers and medical professionals will determine if medical treatments are needed and what kind of medical treatment to provide.
    - Seek medical attention immediately if you develop these symptoms: skin burns, nausea, and vomiting.

Alternative 80. Does radiation cause cancer?

- People who were exposed to radiation could have a greater risk of developing cancer later in life, depending on the level of radiation exposure.

- Health officials will monitor people affected by radiation emergencies for long-term health effects, including cancer.

- During a radiation emergency, follow instructions from state and local officials to limit your radiation exposure.

Alternative 83. How will people know if they have been exposed to radiation and what happens if they are exposed?

- If you are near a radiation emergency, you may have been exposed to radiation.
    - You may not have any immediate health effects.
    - You can lower your risk of developing health effects by limiting your exposure.

- Get inside a strong building away from windows or in a basement to protect yourself from radiation exposure.

- Listen to state and local officials and emergency responders for further instructions.

- A large amount of radiation may cause skin burns, nausea, and vomiting.
    - If you have these symptoms, seek medical attention immediately.

Alternative 85. Are there any treatments for radiation sickness and removal of radioactive contamination?

- Medical professionals have limited medical treatments for radiation sickness and removing radioactive contamination inside the body.
    - There are limited medical treatments available for radiation sickness resulting from a high dose of radiation.
    - Treatment for radiation sickness also includes preventing infections, maintaining hydration, and treating major injuries and burns.
    - There are limited medical treatments available for radioactive contamination inside the body, but only for certain types of radioactive materials.
    - Local emergency workers and medical professionals will monitor the situation to determine if medical treatments are needed and what kind of medical treatment to provide.

- You can take the following steps to limit your contamination:
    - Go inside the nearest building or to an area to which you are directed by state and local officials.
    - Carefully remove the outer layer of your clothing. If radioactive material is on your clothes, getting it away from you will reduce the contamination on your body and decrease your risk of getting contamination inside your body.
    - Place the clothing in a plastic bag or leave it in an out-of-the-way area, such as the corner of a room. Keep people away from it to reduce their exposure to radiation. Keep cuts and abrasions covered when handling contaminated items to avoid getting radioactive material in them.
    - Wash all of the exposed parts of your body using lots of soap and lukewarm water to remove contamination.

- Seek medical attention immediately if you have skin burns, nausea, and/or vomiting.

Appendix F: Message Rotation Schedule

Message Rotation Schedule

	Boston	Atlanta	Denver	Seattle
Focus Group 1	*68		55	
	79	*69	*68	*80
	*83	*85	*83	*69
	80	*55	*79	85
Focus Group 2		80		*68
	*55	*68	*69	83
	*69	*79	*85	*79
	*85	83	*80	*55
Focus Group 3	*80		68	
	68	*55	*79	*69
	*83	*69	83	*85
	*79	*85	*55	*80

***Indicates an alternative version of this message was also tested.**

Appendix G: Participant Feedback Tables

Original Messages Participant Feedback Table

55. How much radiation is safe? How much radiation is considered low risk?	Participant Feedback
• Current radiation protection standards and practices are based on the premise that any radiation dose, no matter how small, may result in detrimental health effects, such as cancer and hereditary genetic damage. • However, according to the Health Physics Society, a nonprofit scientific professional organization whose mission is excellence in the science and practice of radiation safety, doses below 0.05-0.1 Sieverts (5-10 rem) result in risks of health effects that are either too small to be observed or are nonexistent. • There are steps you can take to limit exposure. o Similar to wearing a lead apron for a dental x-ray, getting inside a strong building or in a basement can provide shielding from radiation exposure. o During an emergency, listen to state and local officials and emergency responders for instructions. o Advice given during emergencies is meant to limit exposure.	Participants felt that this message was too wordy. Many of the terms were confusing, and raised anxiety because it did not provide clear instructions on how to reduce risk of exposure. The information about the Health Physics Society was considered irrelevant. The statements “any radiation dose could result in detrimental health effects” and “certain doses result in effects too small to be observed or nonexistent” seemed contradictory to the participants. Comparing shielding from a building to a lead apron did not seem to help participants determine appropriate protective actions. Participants wanted additional information on how to determine if the building was strong enough to provide adequate shielding. The following terminology was unfamiliar/confusing: • Radiation protection standards and practices • Premise • Dose • Detrimental health effects • Hereditary genetic damage • Health Physics Society • Sievert • Rem

68. What is radiation exposure and how does it occur?	Participant Feedback
• Exposure occurs when radiation interacts with the body. o Exposure can be long-term at low levels, such as that from background radiation (the radiation that is naturally in the environment). o Exposure can be short-term at a high dose, such as that from a major accident, diagnostic medical imaging or radiation therapy. o Health effects depend on the strength and length of the exposure. • Exposure can be from radioactive material inside the body. o We receive exposure from radioactive material ingested during eating, inhalation, injection, or absorption. o Our organs and cells can be exposed to radiation from these materials. o Different kinds of radioactive materials may concentrate in and affect different organs. • Exposure can be from radioactive materials outside the body. o Radiation from radioactive materials outside the body can interact with the body. o Sources include background radiation and procedures such as x-rays. o Sources can be from an accidental release of radiation or from intentional acts of aggression.	Most of the information provided in this message was irrelevant following an IND event. Participants wanted to know how to determine if they were exposed and protective measures to reduce exposure. While some participants were interested in internal contamination pathways, they wanted detailed examples, such as eating food, or drinking water, on how it might occur in this specific scenario. Participants felt providing examples of sources was unnecessary, considering that in this scenario, the source is an IND. The following terminology was unfamiliar/confusing: • Low/high levels • Background radiation • Dose • Radioactive material

69. What is radioactive contamination?	Participant Feedback
• External contamination refers to particles of radioactive material settling on a surface - like the way dust settles on a surface. o Radiation exists naturally and can be found in cities and locations worldwide at varying levels. o Harmful radiation particles can be very small and have a consistency like sand. o Contamination could be on your body or clothing, including your shoes, on a structure, or on an object like a purse or a car. o During a radiological emergency, a person or thing can leave the area of a release of radioactive material and still be contaminated. • Internal contamination occurs when radioactive material enters the body. o It can be swallowed, inhaled, injected, or absorbed. • Radioactive contamination can be spread in the same way that dust or mud can be tracked into the home or spread to another person or object. o While radioactive contamination can spread through physical contact, radiation is not "infectious" or "contagious" like some diseases. o Radioactive contamination can often be easily removed. o If you are or were in a contaminated area, listen for public announcements on how to decontaminate (remove the contamination).	Participants felt this message was incomplete. While some of the information on contamination was helpful, instructions on how to remove it and/or limit its spread were missing. The difference between exposure and contamination was unclear to participants. Many believed radiation to be invisible and did not understand how radioactive material could be seen. The statement “While radioactive contamination can spread through physical contact, but is not ‘infectious’ or ‘contagious’” seemed contradictory to participants. Without more specific information on how to remove contamination, many participants were skeptical that it could be “easily” removed. The following terminology was unfamiliar/confusing: • External contamination • Radioactive material • Radiation exists naturally • Radiation particles • Internal contamination

79. What are the health effects of radiation exposure?	Participant Feedback
• The health effects of radiation depend on the amount of radiation, type of radiation, the type of radioactive material and length of time a person is exposed to radiation. • Seek medical attention immediately if you think you may have been exposed to radiation and develop these symptoms: skin burns, nausea, and vomiting. Note that skin burns can take time to present themselves and nausea from preexisting conditions should not be confused with radiation sickness. • Unlike flu symptoms, these symptoms of radiation sickness can take time to develop after someone is exposed to radiation. • There are some treatments available for people exposed to certain types of radioactive material. o Local emergency workers and medical professionals will determine if medical treatments are needed and what kind of medical treatment to provide.	While participants found information on symptoms of large doses of radiation exposure (skin burns, nausea, vomiting) valuable, they wanted more information on how skin burns caused by radiation might present, and a more definitive timeline of how symptoms could develop. Many declared that regardless of preexisting conditions, they would seek medical attention immediately. Participants expressed their concern that the health system could quickly become overwhelmed in this scenario, and that these instructions could lead to chaos at the hospitals. Participants were confused by the mention of flu-like symptoms in a message concerning radiation exposure. Some participants concluded that radiation exposure could cause influenza. The following terminology was unfamiliar/confusing: • Radioactive material • Flu symptoms

80. Does radiation cause cancer?	Participant Feedback
• There is documented scientific evidence linking high levels of radiation exposure to an increased risk of cancer. • However, the cancers may not appear for years, or even decades. • Background radiation and low radiation doses from routine medical and environmental sources will not significantly increase your overall cancer risk.	Overall, participants did not think this would be a question they would ask in the first 72 hours. The language was considered to be too much legalese, without information on how to limit or reduce radiation exposure to lower cancer risk. This led to an overall impression of mistrust among participants. Participants wanted more information on what was considered a "high level" of radiation exposure based on an IND scenario. Information on background radiation and medical exposure was unnecessary information and deemed irrelevant based on the given scenario. The following terminology was unfamiliar/confusing: • High levels of radiation exposure • Background radiation

83. How will people know if they have been exposed to radiation and what happens if they are exposed?	**Participant Feedback**
• If you are near an incident, you may have been exposed to radiation and you may also be contaminated by radioactive material. o You may not experience any immediate health effects. • A large dose of radiation may cause skin burns, nausea, and vomiting. o If you have these symptoms, seek medical attention immediately. o If possible, stay inside until you are instructed to leave. This will protect you from dangerous radiation levels outside.	Participants found this message to be contradictory, in that it gave instructions to seek medical advice if certain symptoms were present, but also directed everyone to stay inside. Many had questions on how they could assess their potential level of exposure, besides proximity to the incident. Participants wanted more information on when health effects may appear, if not immediate, and what those might be and when they would most likely present. The following terminology was unfamiliar/confusing: • Contaminated • Radioactive material • Dose

85. Are there any treatments for radiation sickness and removal of radioactive contamination?	Participant Feedback
• Treatment for radiation sickness is mainly limited to preventing infections, maintaining hydration, and treating major injuries and burns. • There are limited medical treatments available for internal (inside the body) radioactive contamination, but these only work for certain types of radioactive materials and need to be prescribed by a doctor. Internal contamination is typically a small part of total radiation exposure and not everyone will need this medicine. Potassium Iodide can help with internal contamination with radioactive iodine if taken quickly after an incident. It is available without a prescription but should only be taken on the recommendation of a doctor or public health official. • Local emergency workers and medical professionals will monitor the situation to determine if medical treatments are needed and what kind of medical treatment to provide. • You can reduce external radioactive contamination by washing with soap and warm water. • You should seek medical attention immediately if you have skin burns, nausea, and/or vomiting.	Participants felt this message was too long, and they had trouble remembering the main points of the message. This message raised anxiety. Many wanted to know things they could do themselves to prevent infections, maintain hydration (particularly if they were concerned about a clean water supply) and treating injuries and burns. Participants did not like the use of the word “limited”. Information about Potassium Iodide, its effectiveness and availability, did not test well. Many doubted that it would be available. Some confused Potassium Iodide with radioactive Iodine. Participants did not believe they would be able to contact their doctor to obtain treatment, and were concerned that hospitals could be overwhelmed. Participants wanted more information about things they could do themselves with materials at hand to treat radiation sickness and remove contamination. They also wanted more information on how to determine if they were internally contaminated. Skin burns, nausea, and vomiting were often seen as unrelated symptoms and not recognized as symptoms of Acute Radiation Syndrome. Some participants said they would not seek medical treatment, as these symptoms seemed to be mild and treatable at home. The following terminology was unfamiliar/confusing: • Internal radioactive contamination • Potassium Iodide

Alternative Messages Participant Feedback Table

55. How much radiation is safe? How much radiation is considered low risk?	Participant Feedback
• The less radiation you are exposed to, the lower your risk of developing health effects. o Infants, children, and pregnant women are more sensitive to radiation exposure. • You can lower your risk of developing health effects by limiting your exposure. o Get inside a strong building away from windows or in a basement to protect yourself from radiation exposure. o Listen to state and local officials and emergency responders for further instructions.	Some participants felt that the statement "the less radiation you are exposed to, the lower your risk of developing health effects" was obvious, and seemed condescending. Participants wanted additional information on how to determine if the building was strong enough to provide adequate shielding. Participants did not think the message addressed the question.

68. What is radiation exposure and how does it occur?	Participant Feedback
• Exposure occurs when radiation interacts with the body. o Exposure can be long-term at low levels, such as the radiation that is naturally in the environment. o Exposure can be short-term at a high dose, such as radiation from radiation therapy. • Exposure can be from radioactive material inside the body. o You can receive exposure from radioactive material inside the body if radioactive materials are swallowed, inhaled, or absorbed through your skin. o Different kinds of radioactive materials affect different parts of the body. • Exposure can be from radioactive materials outside the body. o You can receive exposure from radioactive material outside the body through many different sources in nature and medical treatments. • During a radiation emergency, follow instructions from state and local officials to limit your radiation exposure.	Participants wanted to know how to determine if they were exposed, and protective measures to reduce exposure. While some participants were interested in internal contamination pathways, they wanted detailed examples, such as eating food, or drinking water, on how it might occur in this specific scenario. Participants thought that bringing up additional sources of exposure (nature, medical treatments) was irrelevant if this message was distributed in an IND scenario.

69. What is radioactive contamination?	Participant Feedback
• Radioactive contamination is when radioactive material is on or in an object or a person. o Contamination can be inside of your body if radioactive materials are swallowed, inhaled, or absorbed through your skin. o Contamination can be outside your body on your skin, hair, clothes, or shoes. o Contamination can be on objects like a purse or a car. • During a radiation emergency, you can leave the affected area and still be contaminated. • Radioactive contamination can spread in the same way that dust or mud can be tracked into the home or spread to another person or object. • You can take the following steps to limit your contamination: o Go inside the nearest building or to an area to which you are directed by state and local officials. o Carefully remove the outer layer of your clothing. If radioactive material is on your clothes, getting it away from you will reduce the contamination on your body and decrease your risk of getting contamination inside your body. o Place the clothing in a plastic bag or leave it in an out-of-the-way area, such as the corner of a room. Keep people away from it to reduce their exposure to radiation. Keep cuts and abrasions covered when handling contaminated items to avoid getting radioactive material in them. o Wash all of the exposed parts of your body using lots of soap and lukewarm water to remove contamination.	Though participants liked hearing instructions for decontaminating themselves, they wanted more information on the decontamination process. For example, some participants wanted to know what they should do if lukewarm water, and/or plastics bags were unavailable. Participants wanted to know more about how to keep from getting contaminated again, and how to ensure that clothes they put on post-decontamination would remain clean. Radioactive material was an unfamiliar term to participants.

79. What are the health effects of radiation exposure?	Participant Feedback
• Radiation can affect the body in a number of ways, and the health effects of exposure may be unknown for many years. o These health effects can range from mild, such as skin reddening; to serious, such as cancer or death. o The health effects of radiation depend on the amount of radiation, type of radiation, type of radioactive material and length of time a person is exposed to radiation. • There are some treatments available for people exposed to certain types of radioactive material. o Local emergency workers and medical professionals will determine if medical treatments are needed and what kind of medical treatment to provide. o Seek medical attention immediately if you develop these symptoms: skin burns, nausea, and vomiting.	While participants found information on symptoms of large doses of radiation exposure (skin burns, nausea, vomiting) helpful, they wanted more information on how skin burns caused by radiation might present, and a more definitive timeline of how symptoms could develop. Participants were doubtful that the medical system would be operational in this scenario.

80. Does radiation cause cancer?	Participant Feedback
• People who were exposed to radiation could have a greater risk of developing cancer later in life, depending on the level of radiation exposure. • Health officials will monitor people affected by radiation emergencies for long-term health effects, including cancer. • During a radiation emergency, follow instructions from state and local officials to limit your radiation exposure.	Participants did not think this would be a question they would ask in the first 72 hours. "During a radiation emergency" was considered unnecessary language given the scenario. Participants wanted more information on how they could limit their radiation exposure.

83. How will people know if they have been exposed to radiation and what happens if they are exposed?	**Participant Feedback**
• If you are near a radiation emergency, you may have been exposed to radiation. o You may not have any immediate health effects. o You can lower your risk of developing health effects by limiting your exposure. ▪ Get inside a strong building away from windows or in a basement to protect yourself from radiation exposure. ▪ Listen to state and local officials and emergency responders for further instructions. • A large amount of radiation may cause skin burns, nausea, and vomiting. o If you have these symptoms, seek medical attention immediately.	Many had questions on how they could assess their potential level of exposure, besides proximity to the incident. Participants wanted more information on when health effects may appear, if not immediate, and what those might be and when they would most likely present. Participants found this message to be contradictory, in that it directed everyone to stay inside but also gave instructions to seek medical advice if certain symptoms were present.

85. Are there any treatments for radiation sickness and removal of radioactive contamination?	Participant Feedback
• Medical professionals have limited medical treatments for radiation sickness and removing radioactive contamination inside the body. o There are limited medical treatments available for radiation sickness resulting from a high dose of radiation. o Treatment for radiation sickness also includes preventing infections, maintaining hydration, and treating major injuries and burns. o There are limited medical treatments available for radioactive contamination inside the body, but only for certain types of radioactive materials. o Local emergency workers and medical professionals will monitor the situation to determine if medical treatments are needed and what kind of medical treatment to provide. • You can take the following steps to limit your contamination: o Go inside the nearest building or to an area to which you are directed by state and local officials. o Carefully remove the outer layer of your clothing. If radioactive material is on your clothes, getting it away from you will reduce the contamination on your body and decrease your risk of getting contamination inside your body. o Place the clothing in a plastic bag or leave it in an out-of-the-way area, such as the corner of a room. Keep people away from it to reduce their exposure to radiation. Keep cuts and abrasions covered when handling contaminated items to avoid getting radioactive material in them. o Wash all of the exposed parts of your body using lots of soap and lukewarm water to remove contamination. • Seek medical attention immediately if you have skin burns, nausea, and/or vomiting.	Participants did not like the use of the word “limited.” Many wanted to know things they could do themselves to prevent infections, maintain hydration (particularly if they were concerned about a clean water supply) and treating injuries and burns. Participants wanted more information about things they could do themselves with materials at hand to treat radiation sickness and remove contamination. They also wanted more information on how to determine if they were internally contaminated. Though participants liked hearing instructions for decontaminating themselves, they wanted more information on the decontamination process. For example, some participants wanted to know what they should do if lukewarm water, and/or plastics bags were unavailable. Participants wanted to know more about how to keep from getting contaminated again, and how to ensure that clothes they put on post-decontamination would remain clean. Skin burns, nausea, and vomiting were often seen as unrelated symptoms and not recognized as symptoms of Acute Radiation Syndrome. Some participants said they would not seek medical treatment, as these symptoms seemed to be mild and treatable at home.

Appendix H: Sample Revised Messages

Sample Revision 55. How much radiation is considered low risk?

- The less radiation you are exposed to, the lower your risk of developing health effects.
    - Infants, children, and pregnant women are more sensitive to radiation exposure.

- You can lower your risk of developing health effects by limiting your exposure.
    - Get inside a strong building away from windows or in a basement to protect yourself from radiation exposure.
    - Listen to state and local officials and emergency responders for further instructions.

Sample Revision 68. What is radiation exposure and how does it occur?

- Exposure occurs when radiation interacts with the body.

- Exposure can be from radioactive material inside the body.
    - You can receive exposure inside the body if you eat or drink something that is contaminated with radioactive material, breathe in radioactive material, or get radioactive material inside of an open wound.

- Exposure can be from radioactive materials outside the body.
    - You can receive exposure outside the body if you are near objects that have been contaminated with radioactive material.

- Follow instructions from state and local officials to limit your radiation exposure.

Sample Revision 69. What is radioactive contamination?

- Radioactive contamination is when radioactive material is on or in an object or a person.
    - Contamination can be inside of your body if radioactive materials are swallowed, inhaled, or absorbed through your skin.
    - Contamination can be outside your body on your skin, hair, clothes, or shoes.
    - Contamination can be on objects like a purse or a car.

- During a radiation emergency, you can leave the affected area and still be contaminated.

- Radioactive contamination can spread in the same way that dust or mud can be tracked into the home or spread to another person or object.

- You can take the following steps to limit your contamination:
    - Go inside the nearest building or to an area to which you are directed by state and local officials.
    - Carefully remove the outer layer of your clothing. If radioactive material is on your clothes, getting it away from you will reduce the contamination on your body and decrease your risk of getting contamination inside your body.
    - Place the clothing in a plastic bag or other container or leave it in an out-of-the-way area, such as the corner of a room. Keep people away from it to reduce their exposure to radiation. Keep cuts and abrasions covered when handling contaminated items to avoid getting radioactive material in them.
    - Gently wash all of the exposed parts of your body using lots of soap and water to remove contamination.

Sample Revision 79. What are the health effects of radiation exposure?

- Radiation can affect the body in a number of ways, and the health effects of exposure may be unknown for many years.
    - These health effects can range from skin reddening, skin burns, vomiting, diarrhea, to cancer or death.
    - The health effects of radiation depend on the amount of radiation, type of radiation, type of radioactive material and length of time a person is exposed to radiation.

- There are some treatments available for people exposed to certain types of radioactive material.
    - Local emergency workers and medical professionals will determine if medical treatments are needed and what kind of medical treatment to provide.
    - Seek medical attention as soon as officials say it is safe to leave your shelter if you develop these symptoms: skin burns, nausea, and vomiting.

Sample Revision 80. Does radiation cause cancer?

- People who were exposed to radiation could have a greater risk of developing cancer later in life, depending on the level of radiation exposure.

- Health officials will monitor people affected by radiation emergencies for long-term health effects, including cancer.

- Follow instructions from state and local officials to limit your radiation exposure.

Sample Revision 83. How will people know if they have been exposed to radiation and what happens if they are exposed?

- If you are near a radiation emergency, you may have been exposed to radiation.
    - You may not have any immediate health effects.
    - You can lower your risk of developing health effects by limiting your exposure.
        - Get inside a strong building away from windows or in a basement to protect yourself from radiation exposure.
        - Listen to state and local officials and emergency responders for further instructions.

- A large amount of radiation may cause skin burns, nausea, and vomiting.
    - If you have these symptoms, seek medical attention as soon as officials say it is safe to leave your shelter.

Sample Revision 85. Are there any treatments for radiation sickness and removal of radioactive contamination?

- There are some medical treatments for radiation sickness and removing radioactive contamination inside the body.
    - Treatment for radiation sickness also includes preventing infections, maintaining hydration, and treating major injuries and burns.
    - Local emergency workers and medical professionals will monitor the situation to determine if medical treatments are needed and what kind of medical treatment to provide.

- You can take the following steps to limit your contamination:
    - Go inside the nearest building or to an area to which you are directed by state and local officials.
    - Carefully remove the outer layer of your clothing. If radioactive material is on your clothes, getting it away from you will reduce the contamination on your body and decrease your risk of getting contamination inside your body.
    - Place the clothing in a plastic bag or other container or leave it in an out-of-the-way area, such as the corner of a room. Keep people away from it to reduce their exposure to radiation. Keep cuts and abrasions covered when handling contaminated items to avoid getting radioactive material in them.
    - Gently wash all of the exposed parts of your body using lots of soap and water to remove contamination.

- Seek medical attention as soon as officials say it is safe to leave your shelter if you develop these symptoms: skin burns, nausea, and vomiting.

Appendix I: Contacts for More Information

Contacts for More Information

CDC Technical Contact:
Carol McCurley
Radiation Studies Branch
National Center for Environmental Health
U.S. Centers for Disease Control and Prevention
Atlanta, GA
Telephone: 770-488-3800
E-mail: cMcCurley@cdc.gov

ORISE Technical Contact:
Leeanna Allen, MPH, MCHES
Oak Ridge Institute for Science and Education
Oak Ridge, TN
Telephone: 706-270-3345
E-mail: Leeanna.Allen@orise.orau.gov