

Evaluation of Potassium Iodide Prophylaxis Knowledge and Nuclear Emergency Preparedness: New Jersey 2005

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The Nuclear Regulatory Commission requires states to consider including potassium iodide as a protective measure in the unlikely event of a major release of radioactivity from a nuclear power plant. We evaluated emergency preparedness knowledge, including proper potassium iodide use, among the general public and emergency responders located around New Jersey's nuclear power plants. We found that knowledge about responder chain of command, evacuation routes, and some aspects of potassium iodide usage was incomplete among the general public and emergency responders. (*Am J Public Health*. 2007;97:S100-S102. doi:10.2105/AJPH.2006.094573)

The Nuclear Regulatory Commission required states to consider including potassium iodide (KI) as a protective measure in the unlikely event of a major release of radioactivity from a nuclear power plant.¹ Significant releases of radioactive iodine resulting from accidents at nuclear power plants have occurred throughout the years, with the most notable being Chernobyl.² Isotopes of iodine are of particular interest, because radioactive iodine has

the potential to be released in large quantities.³ The proper use of KI has been demonstrated to be an effective thyroid blocking agent for the prevention of radioactive iodine uptake by the thyroid, thereby reducing the risk of thyroid cancer among people exposed to radioactive iodine.^{4,5} As a result, the distribution and use of KI have become part of many state nuclear emergency response plans. Details regarding nuclear emergency response planning, communications, and KI have been discussed in several studies.⁶⁻⁹

The New Jersey Department of Health and Senior Services, in collaboration with other state and local partners, distributed KI tablets in clinics in July 2002. Intended recipients of KI pills lived or worked within emergency planning zones, which represent areas encompassing an approximate 10-mile radius around the state's 2 nuclear power generating stations. We summarize the results of a study that sought to determine the fate of the KI tablets that were distributed and to assess knowledge regarding KI prophylaxis and nuclear emergency preparedness among the general public, health professionals (i.e., physicians, nurses, and pharmacists), and emergency responders (i.e., firefighters, police, and hazardous material technicians). Details on separate but related analyses of this study are available elsewhere.¹⁰⁻¹²

METHODS

We developed 2 standardized questionnaires: one for use among the general public (general public survey) and the other for use among health professionals and emergency responders (emergency responder survey). Each questionnaire assessed basic knowledge about KI (e.g., its indications, contraindications, and appropriate dosing) using the same questions. Emergency responders and health professionals were further questioned about their level of emergency preparedness, whereas the general public was further questioned about their expected behaviors during an emergency at a nuclear power plant. Both questionnaires were assessed for validity and pilot tested before their initial use in February 2005. Incentives (US\$10 gift card), reminders, and repeat mailings were used to encourage the completion and return of surveys.

RESULTS

General Public Survey

Of the 1487 surveys that were successfully mailed to the general public residing in emergency planning zones, 729 (49%) were returned; of these, 421 (58%) respondents reported having obtained KI tablets. It is important to note that the demographics of the survey respondents closely matched the demographics of the background population living within the emergency planning zones, which implies that the survey sample was a representative sample and that nonresponse bias was minimized.

Of the 421 KI recipients, 401 (95%) reported knowing where they had stored their tablet (approximately 2.5 years after the KI distribution clinics were held), 16 (4%) indicated that they did not recall where they stored their tablet(s), and 2 (<1%) had already taken their tablets. Questions meant to assess expected behaviors among the general public revealed that 380 (52%) respondents did not know their emergency evacuation route, and 197 (27% of total; 52% of those who did not

know) survey respondents did not know where they could find information about emergency evacuation routes. Survey responses also revealed that 618 respondents (85%) would evacuate their home if they were told to so by a government agency or the police.

Figure 1 depicts behaviors that respondents were either likely or unlikely to adopt during a major accident at a nuclear power plant. More than 75% indicated that it was likely that they would listen to or watch mass media (e.g., public emergency announcement), 53% reported they were likely to drive as far away as possible, and 31% reported they were likely to drive to an emergency shelter.

Figure 2 demonstrates the behaviors that respondents would adopt if they thought they were exposed to radiation or radioactive materials from a nuclear power plant release; 63% reported that they were likely to go to their hospital emergency department, 59% reported that they were likely to call or visit their personal doctor, and 44% said that they were likely to go to an emergency reception center.

Emergency Responder Survey

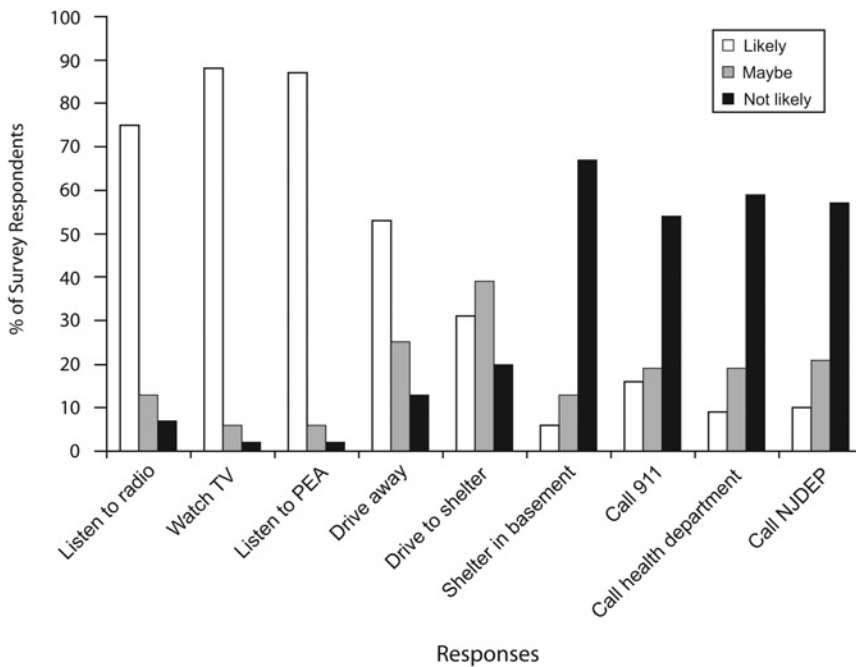
Sixty-eight percent of the emergency response units returned at least 1 survey. Of the 160 emergency responders completing the survey, 65 were police officers, 65 were firefighters, 12 were hazardous material technicians, and 4 were public health professionals; 14 respondents indicated that they have no response role. Forty four (38%) of the contacted health professionals completed and returned surveys; of these, 20 (45%) were school nurses.

When grouped together in the analysis, 61% of emergency responders and health professionals did not feel that they had enough safety equipment to protect themselves during a radiological emergency, and 40% are not familiar with emergency response plans for the nuclear power plants. Among fire, police, and hazardous material responders, 46% identified the State Office of Emergency Management as the lead agency during a major nuclear incident, whereas 54% identified another agency. Among the survey respondent groups, health professionals answered the highest percentage of knowledge-based questions about KI usage correctly. Questions about KI use during pregnancy and the proper KI dosage for children had the lowest number of correct responses among all of the groups. Sixty percent of the school nurses answered the question about dosage for children correctly.

DISCUSSION

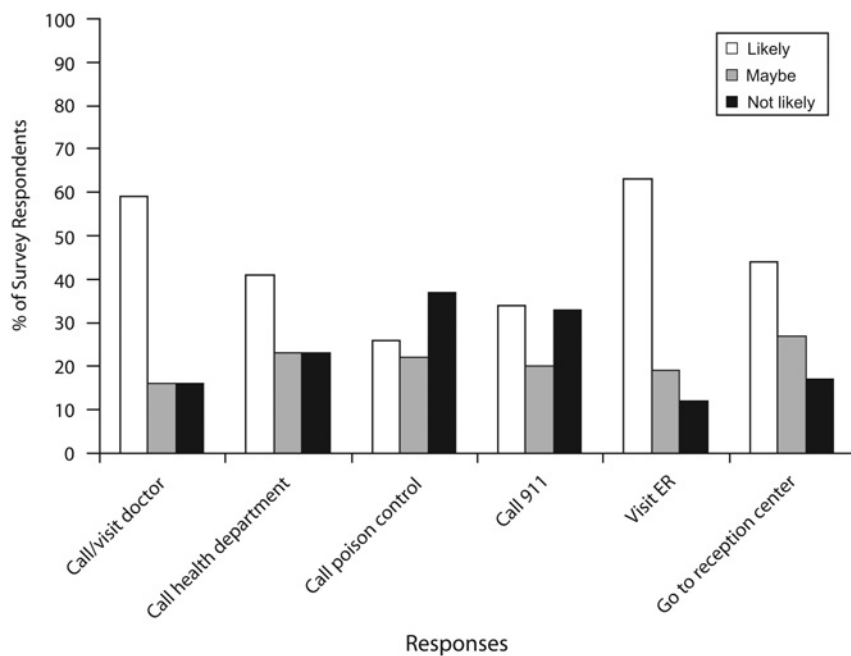
These data suggest that gaps exist in knowledge of emergency preparedness. Questions about KI use during pregnancy and the proper dosage for children were the questions most frequently answered incorrectly among all of the groups that we surveyed, which indicates the need to clarify those specific points. The question about dosage for children is particularly important for school nurses, because during an event they may be asked to administer KI to a large number of children in school.

The results of the general public survey indicated that a significant number of residents would likely attempt to leave the area during an event, which could be problematic because many do not know the proper evacuation route or where to find this information.



Note. PEA = Public Emergency Announcement; NJDEP = New Jersey Department of Environmental Protection.

FIGURE 1—Responses to question 4 of the General Public Survey: “If you heard there was a major accident at a nuclear power plant, please rate the likelihood that you would. . . .”



Note. ER = emergency room.

FIGURE 2—Responses to question 5 of the General Public Survey: “If you felt you were exposed to radiation or radioactive materials, please rate the likelihood that you would. . . .”

Emergency response plans call for individuals to be directed to emergency reception centers, but this survey data suggest that the general public may be more likely to go to emergency departments or private physicians if they thought that they had been exposed to radioactive materials. Emergency departments and personal care physicians must be prepared to handle or direct contaminated persons to proper management facilities.

The results of the emergency responder survey indicated that there may be some confusion among emergency responders about the proper chain of command when responding to nuclear power plant emergencies. This should be more fully addressed in future training sessions. ■

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At the time of the study, James Blando and Martin Valcin were with the Occupational Health Surveillance Program, Public Health Services Branch, New Jersey Department of Health and Senior Services, Trenton, NJ. Corwin Robertson, Katina Pearl, and Carline Dixon were with the Communicable Disease Service, New Jersey Department of Health and Senior Services, Trenton. Eddy Bresnitz was with the New Jersey Department of Health and Senior Services, Trenton.

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Contributors

J. Blando originated the study and was the principal writer. C. Robertson helped develop the study and wrote and edited portions of the article. M. Valcin, C. Dixon, and K. Pearl helped develop the study and collected the data. E. Bresnitz provided guidance and comments on the study and helped edit the article.

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Human Participant Protection

This study was approved by the University of Medicine and Dentistry of New Jersey institutional review board.

References

1. Nuclear Regulatory Commission Consideration of potassium iodide in emergency plans final rule, 10 CFR 50. *Fed Regist.* 2001;66:5427-5440.
2. National Research Council. *Distribution and Administration Potassium Iodide in the Event of a Nuclear Incident.* Washington, DC: National Academies Press; 2004.
3. Crocker DG. Nuclear reactor accidents—the use of KI as a blocking agent against radioiodine uptake in the thyroid—a review. *Health Phys.* 1984;46:1265-1279.
4. Nauman J, Wolff J. Iodide prophylaxis in Poland after the Chernobyl reactor accident: benefits and risks. *Am J Med.* 1993;94:524-532.
5. Verger P, Aurengo A, Geoffroy B, Le Guen B. Iodine kinetics and effectiveness of stable iodine prophylaxis after intake of radioactive iodine: a review. *Thyroid.* 2001;11:353-360.
6. Winder AE, Hossain Z, Reddy S. The health effects of ionizing radiation: a survey of local health officials in New England and New York. *Public Health Rep.* 1994;109:219-225.
7. Becker SM. Addressing the psychosocial and communication challenges posed by radiological/nuclear terrorism: key developments since NCRP Report No. 138. *Health Phys.* 2005;89:521-530.
8. Becker SM. Emergency communication and information issues in terrorist events involving radioactive materials. *Biosecur Bioterror.* 2004;2:195-207.
9. Locke P, Stanley J, Bialek R. *Assessing and Meeting the Radiation Information Needs of the Public: Developing an Initial Framework to Meet the Needs of State, Local and Tribal Health Agencies.* Washington, DC: Public Health Foundation; 2004.
10. Blando J, Robertson C, Bresnitz E. Assessment of potassium iodide prophylaxis understanding for radiological emergency response among the general public and emergency responders. *Public Health Rep.* In press.
11. Blando J, Robertson C, Bresnitz E. *Final Report: Assessment of Potassium Iodide (KI) Distribution Campaign and Emergency Response Around New Jersey’s Nuclear Power Facilities.* Trenton, NJ: New Jersey Department of Health and Senior Services; 2007.
12. Blando J, Robertson C, Pearl K, Dixon C, Valcin M, Bresnitz E. Assessment of potassium iodide (KI) distribution among communities within the emergency planning zones (EPZ) of two nuclear power plants. *Health Phys.* 2007;92(Suppl 1).