Terrorist Incidents Involving Radioactive Material: Social, Psychological, Behavioral & Risk Communication Issues

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A Few Preliminaries

- Please: No Photos, No Audio/Video Recording
  - Handouts with Copies of Slides
  - List of Additional References
- Disclaimers
  - Research funders
  - U.S. NWTRB

Radiological Emergency Assistance Mission

- Advance Team: Dr. Rob Bristow, Ms. Katherine Bequary
- Mission Team:
  - Dr. P. Andrew Karam (Health Physics)
  - Dr. Katherine Uraneck (Emergency Medicine)
  - Dr. Steven M. Becker (Disaster Management, Risk Communication)

Radiological Emergency Assistance Mission

- Emergency Evacuation Preparation Zone (20-30 km zone)
- Hospitals
- Ops centers
- Evacuation centers
  - Courage of people in face of huge losses & tremendous uncertainties about future
- Receiving communities
- Radiological screening
- Community slated for evacuation
- Elected officials
- Disaster response teams and officials
# Radiological Emergency Planning: Terrorism, Security and Communication

## Radiological Emergency Assistance Mission

**Broad Aims**

1. To rapidly assess the situation on the ground
2. To exchange information, insights and experience with Japanese disaster response partners
3. Based on the rapid site assessment and information exchange, develop and provide training to Japanese hospital and healthcare professionals and first responders

## For Additional Information About the Assistance Mission and Lessons Learned


## Terrorist Incidents Involving Radioactive Material

- Number of casualties, extent of damage, size of affected area, nature and duration of threat will depend on various factors
  - Size and type of event
  - Radioactive materials involved
    - Short vs. long half-life
    - Internal vs. external hazard
  - Location
  - Time of day
  - Weather conditions

## Social, Psychological and Behavioral Impacts

- Research and experience over the past several decades has made it clear that social, psychological and behavioral effects constitute some of the most significant impacts of radiation emergencies.

## Social, Psychological and Behavioral Impacts

- Create major challenges for
  - Hospitals, healthcare, public health system
  - Emergency preparedness and response agencies
  - Communication
  - Critical infrastructure
  - Maintenance of public trust and confidence
  - Recovery efforts
Responses to Disaster

- Powerful, life-changing experience
- Resilience of individuals and communities
- Disaster myths: panic, looting, etc.
- Pro-social behavior
- Therapeutic community

Incidents Involving Radiation: Among the Most Challenging Situations

People find situations involving radiation and other toxic agents “a good deal more threatening than both natural hazards of even the most dangerous kind and mechanical mishaps of considerable power.” Toxic hazards “unnerve human beings in new and special ways.”

K. Erikson


Risk Perception

- Decades of research and experience have consistently shown that radiation associated with nuclear technology is perceived by the general public as one of the most feared of all hazards
- Radiation incidents: “have a remarkable capacity to produce widespread fear, a profound sense of vulnerability, and a continuing sense of alarm and dread.”

Perceived Characteristics

- **Invisibility**  
  - “...without substance and cannot be apprehended by the use of any of the unaided senses, and for that reason they seem especially terrifying.”
  - No sense of how to protect
- **Unbounded or open-ended threat**  
  - No sense of “safe” areas
  - No sense of low point, end of threat
- **Unfamiliar threat**

Perceived Characteristics

- Frightening popular images and historical associations

Perceived Characteristics

- Viewed as having the potential to cause hidden and irreversible damage
- Seen as representing special dangers to children and pregnant women

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Perceived Characteristics

- Long latency of potential health effects
- Seen as having the capacity to produce forms of illness and death that arouse particular dread (e.g., cancer)

Since 1990 there has been a dramatic increase in childhood thyroid cancer in Southern Belarus and Northern Ukraine

Viewed as Being Associated with Potential for Long-Term Contamination

- Large areas of Europe were affected to some degree by the Chernobyl releases.
- More than 200,000 km² in Europe were contaminated with radiocaesium. (CL, 2005)

Not An Accident or Mistake = Further Amplification

- Intentionality
  - Not an accident or mistake, but a calculated action

  “...people who are victimized by such events feel a special measure of distress when they come to think that their affliction was caused by other human beings.”

  Erikson

A Third Factor That Adds Still Further

- Terrorism/ Mass Violence

  “The impact of terrorism, particularly, goes beyond the body count of any single act to a broader assault upon the safety and security of the community itself.”

  Zinner & Williams (1999)

Key Characteristics

- “Within the developed countries, technological disasters produced a significantly higher aggregate severity rating than did natural disasters.... Technological disasters, however, were less disturbing than disasters of mass violence....”

  Norris (10/01)
  National Center for PTSD

A Powerful Combination

- In a sense, large-scale radiological/nuclear terrorist incidents represent a combination of three broad characteristics, each of which is sufficient to produce serious social, psychological and behavioral consequences.
A Powerful Combination

- First these incidents involve invisible toxic hazards.
- Second, they are intentional acts by other human beings.
- Third, they involve terror/mass violence (with the possibility of multiple attacks).

“Public fear of a terrorist attack involving radioactive materials is likely to be high and could produce responses that endanger physical and mental health as well as the economic viability of affected communities.”

(August 2003)

I. Individual Mental Health Impacts

- Increased incidence of anxiety, depression, post-traumatic stress symptoms
- Medically unexplained physical symptoms
- Poor subjective health ratings

Learning from Research and Experience: Eight Broad Categories of Social, Psychological and Behavioral Impacts

Long-Lasting Impacts

- Chernobyl
  - 6 1/2 years after disaster, found significantly higher level of mental health problems among people in exposed region as compared to those in control area...
  - N=3044

Terrorist Incidents Involving Radioactive Material: Social, Psychological, Behavioral & Risk Communication Issues, S.M. Becker
Highest Risk Groups

- Mothers of young children
  - Women with children <18
- Cleanup workers

Terrorist Events and Children

- American Academy of Pediatrics, Committee on Environmental Health, March 2000:
  - “All children are at risk of psychological injury”

Terrorist Events and Children

- American Academy of Pediatrics, Committee on Environmental Health, March 2000:
  - “Terrorist acts may be directed specifically at children”
  - “Children witness injuries and deaths, possibly of their parents, which would produce both short- and long-term psychological trauma”

II. Spontaneous Evacuation

- Spontaneous evacuation, flight
  - Not inevitable, but definitely possible
  - Invisible, unfamiliar agents
  - Perceived lack of information
  - Lack of trust in officials/lack of credibility of authorities

Population Flight

- TMI
  - For every person advised to leave, about 45 actually did (Enkson, 1994)
  - Some 150,000 people took to the highways
Rad/Nuc Terrorism Situations

- In survey research, people have indicated a higher likelihood of leaving in a radiological or nuclear terrorism event than in a natural disaster, technological disasters, or chemical terrorism incident.

Dirty Bomb Scenario: Likelihood of Leaving

Higher than for natural disasters, technological disasters, chemical terrorism

Nuclear Detonation Scenario: Propensity to Evacuate

Households with Children

III. Disruption from Evacuation and Relocation

Chernobyl Evacuation/Resettlement

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Chernobyl

- Relocation proved a “deeply traumatic experience” for some 350,000 people moved out of the affected areas.

Chernobyl’s Legacy (2005)

Fukushima Dai-ichi Evacuation

Families that evacuated due to Fukushima Dai-ichi:

3 yrs. post-accident, half of the households that were intact before the accident are no longer under the same roof with family members separated due to housing problems, work requirements, children’s educational needs. (Kyodo, 5/4/14)

Japan: Physical security in radiation evacuation zone has been difficult to maintain

- Criminals have taken advantage of the evacuations to steal money and property
  - Home break-ins
  - ATMs
  - Convenience stores
  - Hundreds of reported crimes
  - Actual number likely much higher

IV. A Secondary Disaster: Social Stigma

- Fear of, and hostility toward, evacuees and people displaced by incident
- Avoidance of products from areas perceived to be associated in any way with the incident
- Potential for emergency workers, others involved in responding to incident, to be viewed negatively

III. Cs Goiania, Brazil Accident

- 244 contaminated
- 54 treated
- 4 deaths
- 800 acres contaminated

Source: IAEA

Goiania Accident

Cesium 137

Goiania

Source: Ricks, REACT/S

September 13, 1987

Goiania, Brazil Accident

Source: UNESCO
Social Stigma

- The Example of Goiania
  - “Hotels in other parts of Brazil refused to allow Goiania residents to register. Some airline pilots refused to fly airplanes that had Goiania residents aboard. Cars with Goiania license plates were stoned in other parts of Brazil” (Kasperson & Kasperson, 1996)

- The Example of Chernobyl
  - “It was very unpleasant…they shunned us”
  10th form pupil at the Karpovichi secondary school (TOTBW, 1996)

Tokaimura

- September 30, 1999
- Conversion building, nuclear fuel processing facility, JCO Company Ltd.
- Dissolve uranium oxide powder in nitric acid to produce uranyl nitrate solution
- Enriched uranium for JOYO research reactor
- Procedure – dissolution tank, buffer column for homogenization, precipitation tank
- Stainless steel buckets, mechanical stirring
- 40 L of solution into precipitation tank (~16 kg. U)
- Critical mass

Stigma and Fukushima Dai-ichi

- Avoidance of produce (peaches, tomatoes, cucumbers, apples, pears)
- Fishing boats avoided docking in area due to fear catches would be seen as tainted
- Drops in tourism, educational field trips

Stigma and Fukushima Dai-ichi

- Some hotels refused to accept people from Fukushima
- Some healthcare facilities refused to provide treatment to people unless they showed certificates saying they “had not been exposed to radiation”
- Suggestion that women from Fukushima are tainted, should not marry, have children
- “Children from Fukushima were bullied after evacuating to a city outside of Fukushima.” (Mainichi, 5/25)

Social stigma constitutes a secondary disaster that greatly complicates and slows recovery

Economic damage, Loss of social support

V. Chronic Stress in Unexposed Population

- Concerns over invisible agents can produce chronic stress symptoms in unexposed population

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Radiological Emergency Planning: Terrorism, Security and Communication

Selected Studies

- Goiania
  - Chronic stress in individuals who were exposed, as well as in individuals who were fearful of potential exposure, 3 1/2 years after the accident

Potential Consequences

- Saturation of 9-1-1 and healthcare facilities by people who are experiencing vague symptoms, believe they need to be examined, or want radioprotection medication

Fatalism

- Persistent myths and misperceptions about the threat of radiation have resulted in “paralyzing fatalism” among residents of affected areas.
- “A strong sense of lack of control over their own lives.”
- “Anxiety over the effects of radiation on health shows no sign of diminishing. Indeed, it may even be spreading beyond the affected areas into a wide section of the population.”

VI. A Culture of Fatalism

- Fatalistic attitudes towards radiation/radioactive contamination are not uncommon
  - “I don’t think we’d have a chance…”
  - “It’s radioactive material. Once it gets in you, [you’re] dead anyway.”
  - “There is nothing you can do.”

Chernobyl’s Legacy (2005)

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Chernobyl’s Legacy (2005)

VII. Concerns and Reactions of Emergency Responders

- Front line in any effort to manage a radiological/nuclear terrorism incident
- Public trusts responders, looks to them for information

Terrorist Incidents Involving Radioactive Material: Social, Psychological, Behavioral & Risk Communication Issues, S.M. Becker
Radiological Emergency Planning: Terrorism, Security and Communication

Research Findings

• High level of dedication to duty
  – “We are professionals” (clinician)
  – “If you are wearing a badge you know that you are fixing to go to work - regardless of what kind of badge it is” (first responder)
  – “We are duty bound” (hospital-based physician)
  – “I would be ready as a health professional to do what I could to help” (public health)

Research Findings

• A perception that the radiological/nuclear threat is new or somehow different
  – “This one is going to involve radiation or nuclear materials, this is a new one.” (first responder)
  – “This is a completely different situation than it would be if it was a weather situation” (hospital-based nurse)
  – “Radiation – I think radiation exposure is a particular kind of problem that is a little bit separate from the other ones” (emergency department physician)

Research Findings

• For all professional groups, there is a lower level of familiarity, less training, and a lower “comfort level” with radiation as compared to many other threats
  – “We know so little about radiation” (nurse)
  – “Radiation is one of my weakest points… I’ve had minimal training in radiation” (public health professional)
  – “They focus more on biological aspects than they do for radiological” (emergency department nurse)
  – “I’ve never been… I don’t know much about radiation” (physician)

Research Findings

• For some responders, the perceived newness and the lack of familiarity translate into greater apprehension than for other threats:
  – “A little anthrax, ok we can wear this. A little TB, we can wear this… If it was a dirty bomb… how could you actually prepare for something like that?” (emergency department clinician)
  – “This is something that is kind of unforeseen… It’s more scary” (nurse)

Concerns and Reactions of Emergency Responders

Survey of 175 Australian Paramedics

“Nuclear events that were the result of war, terrorism, or accidental release were ranked the highest for fear and unfamiliarity of all the disaster scenarios.”

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Commitment to Help in Non-Hospital Field Medical Facilities (Hawaii)

<table>
<thead>
<tr>
<th>Incident</th>
<th>Physician</th>
<th>Nurse</th>
</tr>
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<tbody>
<tr>
<td>Natural Disaster</td>
<td>83 %</td>
<td>90 %</td>
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<tr>
<td>Explosion Incident</td>
<td>67 %</td>
<td>70 %</td>
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<tr>
<td>Chemical Incident</td>
<td>59 %</td>
<td>59 %</td>
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<tr>
<td>Biological Incident</td>
<td>56 %</td>
<td>53 %</td>
</tr>
<tr>
<td>Contagious Epidemic</td>
<td>56 %</td>
<td>49 %</td>
</tr>
<tr>
<td>Radiological Incident</td>
<td>52 %</td>
<td>45 %</td>
</tr>
</tbody>
</table>


NYS Hospital-based Nurses’ Knowledge, Attitudes, Behavior & Willingness to Respond to a Radiation Emergency

(Veneema et al., 2008, SAQ, n=668)

• A majority of the nurses indicated they were willing to respond at least some of the time, but over 15% said they were unwilling to work in any of the more serious radiation event scenarios.


Japan: Reactions of Emergency Responders

• Japan Hospital Association survey of facilities in Fukushima
  – 54 out of the 127 hospitals responded; those that responded reported that over 530 physicians/nurses had left by July 2011; actual number probably significantly higher

• Japan Nursing Association
  – Approx. 40 percent drop in number of hospital nurses in area between 1 March 2011 and 1 September 2012.

• Many unfilled healthcare positions
  – Great difficulty attracting trainee doctors for residencies
  – Nursing Assoc: August 2012, 768 open positions, only 174 applicants


Fukushima Nurse Study

• Survey of nurses who were working at the Fukushima Medical University Hospital at time of Fukushima Daiichi accident

• 345 nurses, 17 male, 328 female


Intention to leave their jobs after the accident

• Younger, less experienced
• Living with preschoolers
• Consideration of the possible radiation health effects in children
• Anxiety about relationships with colleagues in the hospital after the accident
• Anxiety about life in Fukushima City after the accident

Hospital Update: 2015

“The outflow of medical staff has been considerable; therefore, many hospitals, including designated emergency hospitals, have been forced to close. There were originally six designated emergency hospitals in the Soma area, but at present, three in the south of the region cannot receive emergency patients. The number of fulltime doctors has decreased by 30% and the number of nurses by 20%. In the Futaba area, there were four designated emergency hospitals, but all of them closed after the disaster. The decrease in medical staffing has been severe: 80% of full-time doctors and 30% of nurses have left this area. Although 4 years have passed since the disaster, many of these doctors and nurses have not returned, and the hospitals are still suffering from a serious medical staff shortage….

Because the collapse of the patient assignment systems in the Soma and Futaba areas is continuing even now, ambulance crews must often contact several hospitals simultaneously for admission requests until one hospital accepts.”

Staffing Shortages in Nursing Homes

“The outflow of young people in the aftermath of the nuclear debacle has only added to the difficulty. In the Fukushima city of Minamisoma, 10 facilities reopened but three of them cut the numbers of tenants due to personnel shortages. The nursing home Kawauchi in the Fukushima village of Kawauchi, which newly opened in November 2015, is struggling to find workers, while the needs are high for nursing care are high as many residents returning to the village are elderly. Some people living outside the prefecture have declined to work here due to concern about radiation, said Mitsuhiro Hayashi, head of the facility.”

Japan Times, March 28, 2016

Minamisoma Update: 2015

• “The emigration of residents following the Fukushima nuclear accident has resulted in aging and depopulation problems in radiation-contaminated areas.”
• Serious implications for
  – Character of community life
  – Economic vitality
  – Level of medical need
  – Recovery prospects


Potential Social, Psychological and Behavioral Impacts of a Rad/Nuc Terrorism Event

• Widespread individual mental health impacts
• Spontaneous evacuation
• Disruption from evacuation and relocation
• Social Stigma
• Chronic stress in unexposed population
• A culture of fatalism
• Concerns and reactions of emergency responders/receivers
• Broader demographic shifts with implications for recovery and community viability

VIII. Broader Demographic Shifts with Implications for Recovery and Community Viability

• “Among the younger generation, the greatest worry is about raising their children.” Mayor Katsunobu Sakurai, April 11, 2014
• “Most of the returning residents are elderly.” Situation in community of Tamura, Fukushima Prefecture, N. Takahashi, April 9, 2014
• “While some residents have returned, there have been few young people among them… People aged 65 or older now account for 65 percent of the villagers, a jump from 35 percent prior to the disaster.” Situation in community of Kawauchi, Kyodo, February 4, 2014

Conclusions

Potential Social, Psychological and Behavioral Impacts of a Rad/Nuc Terrorism Event

• Widespread individual mental health impacts
• Spontaneous evacuation
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• Broader demographic shifts with implications for recovery and community viability

The Bottom Line

• Social, psychological and behavioral effects constitute some of the most significant impacts of radiological/nuclear incidents
  – The mental health impact of Chernobyl was “the largest public health problem created by the accident”

Chernobyl’s Legacy (2006)
Social, Psychological and Behavioral Impacts

- Likely to affect many people
- In some scenarios, social, psychological and behavioral effects may be the primary impact
- Potential for overwhelming emergency response capabilities
- Potential to complicate recovery efforts

A Strategic Issue

- How social, psychological and behavioral impacts are addressed will play a huge part in determining whether efforts to manage and recover from an incident are a success or a failure

Meeting the Challenge

- Work to integrate social, psychological and behavioral factors into response plans
- More emphasis on prevention
- Do more to identify and assist high-risk groups early

Meeting the Challenge

- Ensuring that people are kept well informed, and that their information needs and concerns are adequately addressed, is vital.
- It constitutes one of the most crucial components of a strategy of prevention

Meeting the Challenge

- They will all be looking to you as a trusted source of information
- Need to be ready
  - Prepare in advance
  - Follow general principles
  - Inform with rad-specific insights from research and field experience
- Make use of tools and resources

Risk Communication for Emerging Health Threats

- Cooperative Agreement: Centers for Disease Control and Prevention (CDC) and the Association of Schools of Public Health (ASPH)
- Four nationally-known schools of public health
  - Coordinated approach
- Multi-year effort
  - PEMDP: 2002-2006
  - PEMDP Follow-on studies: 2006-2008
  - Additional studies: 2009-2011
  - CDC, FEMA, DHS, NYCDOWMH, others
Demographic Characteristics of Study Participants, Pre-Event Message Development Project, n=1013

Key Message Content:
What Does the Public Want to Know?
People’s primary information needs center on health issues
- “How do I protect my family?”
- “What are the symptoms that I need to look for?”
- “When do [we] need to get medical help?”
- Should we take special medications?
- Is it okay to drink the water and eat the food?
- Should I go to the hospital?
- What will the situation mean for our health?

Trusted Sources: National

<table>
<thead>
<tr>
<th>Source</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>CDC</td>
<td>84%</td>
</tr>
<tr>
<td>Doctor who is expert</td>
<td>83%</td>
</tr>
<tr>
<td>U.S. Surgeon General</td>
<td>76%</td>
</tr>
<tr>
<td>NIH</td>
<td>75%</td>
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<tr>
<td>DHHS Secretary</td>
<td>69%</td>
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<tr>
<td>DHS Secretary</td>
<td>68%</td>
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</tbody>
</table>

Source: Marist College and NCDP, Columbia University surveys

Trusted Agencies: Local and State

- At the state government level, the “health department was rated the highest for being honest with the public about terrorism.”
- At the local government level, “the fire department was rated the highest for being honest with the public about terrorism.”

Need for spokesperson(s) with high credibility on health issues

Sheltering

- Consistent with other research, many participants suggested they would not comply with recommendations to shelter
  - “If you have kids, the first thing you do is to get to your kids.”
  - “You’re not thinking of covering up, you’re trying to get to that child at that time.”
  - “I’m not gonna stay in the house. I’m gonna try and find my kids.”
  - “My first response would be to go find my children.”
  - “I would still go get my children no matter what. Because to me that is everything.”

Make schools a central part of preparedness and response planning

Fatalism in Minority Populations

- Some fatalistic attitudes toward terrorism in general and radiological/nuclear terrorism in particular were evident, particularly among minority populations
  - “I don’t think we’d have a chance when the terrorist[s] attack.”
  - “It’s radioactive material. Once it gets in you, [you’re] dead anyway.”
  - “If [you’re] exposed to radiation, there is nothing you can do.”

Trusted sources, “tried and true” measures
Practical Actions

• Providing information about risks or possible impacts without providing information about self-protection or risk reduction can produce anxiety, fear, despair, passivity, resignation and fatalism.
• When discussing problems, threats, hazards, health effects, etc., it is vital to provide information about what people can do and what actions they can take in the face of a threat.
• Effective risk communication should aim to empower people.

General Finding

• In areas used to dealing with natural disasters, television meteorologists were seen as a good source of information
  – Seen to be apolitical and without an axe to grind
    • “Why would he tell us something he didn’t believe in? It’s not like he will be voted out of office.”
  – Considered well known, familiar figures that people regularly watched for daily weather information or, more importantly, for updates on weather emergencies
    • “Usually, if something bad happens, it is weather. So when you go to the TV, there he is giving us the information.”

Ensure that Key Terms are Understood: “Shelter in Place”

• “Who provides shelter, the Red Cross?”
• “Shelter in place. What does it mean? Does it mean stay where you are?”
• “I assume shelter in place means to go to the place that affords you the greatest protection.”
• “The word shelter sounds a little confusing…."

Tools and Resources

Tools and Resources

Additional CDC fact sheets may be found at http://emergency.cdc.gov/radiation/emergencyinstructions.asp

Tools and Resources

Emergency Services Clinician Toolkit and Public Health Officials Toolkit

Radiation Studies Branch, Centers for Disease Control and Prevention (CDC)
Along with a pocket guide, a poster and recorded webcasts, kits include a variety of fact sheets. Information on toolkits may be found at http://emergency.cdc.gov/radiation/toolkit.asp
Tools and Resources

- Communicating Radiation Risks: Crisis Communications for Emergency Responders
- Published in July 2007 by the Office of Radiation and Indoor Air, U.S. Environmental Protection Agency (EPA-402-F-07-008), this pocket guide includes a discussion of crisis communications, pointers on communicating effectively, advice on message development, sample messages, and other information.

Broadening Communication Efforts

<table>
<thead>
<tr>
<th>Present</th>
<th>Future</th>
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<tbody>
<tr>
<td>Public in affected areas</td>
<td>Receiving communities</td>
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<tr>
<td>Broader public</td>
<td>Special populations</td>
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<tr>
<td></td>
<td>Hospital and healthcare personnel and families</td>
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<td>First responders</td>
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<td>Other key workforce/critical infrastructure components</td>
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Meeting the Challenge

- Work to integrate social, psychological and behavioral factors into response plans
  - More realistic
- More emphasis on prevention
  - Do more to identify and assist high-risk groups early
  - Systematic plans for addressing stigma
- Expand messaging to additional audiences, recovery process
- Practice, practice, practice

Questions?