



SOCIETY OF TRAUMA NURSES



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INTERPROFESSIONAL CONTINUING EDUCATION

# THE ELECTRONIC LIBRARY OF **TRAUMA LECTURES**

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# TRAUMA LECTURES

## Emergency Preparedness





# Objectives

**At the conclusion of this presentation  
the participant will be able to:**

- Gain an understanding of the epidemiology of disasters.
- Review the incidence of mass casualty events.
- Explore the hospital, regional and national Incident Command System and the planning cycle.
- Review the ethical and psychosocial implications associated with an emergency response.



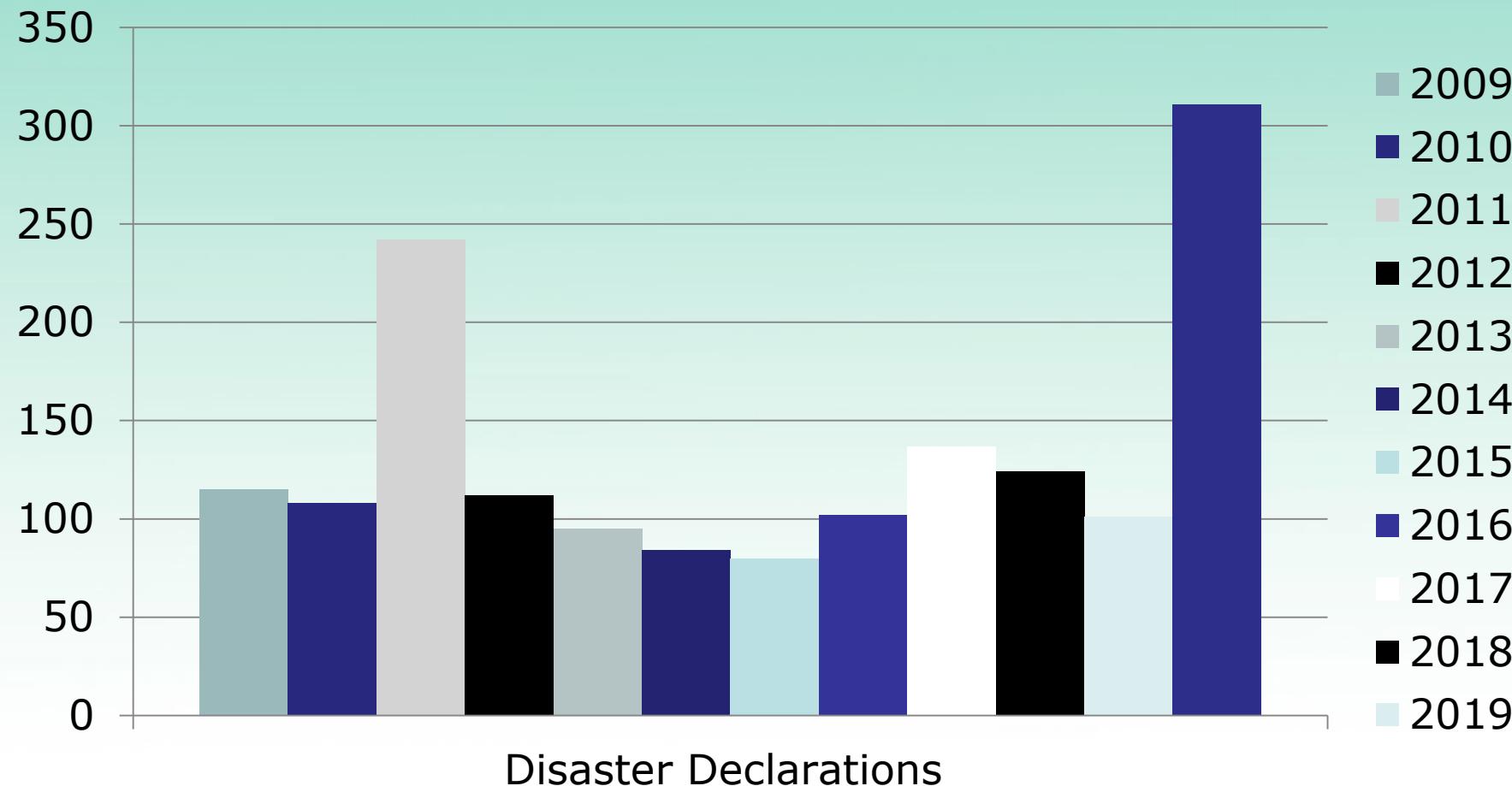
A close-up, low-angle shot of a train's wheel and suspension system. The wheel is large and dark, with a thick metal rim. Above the wheel, a complex assembly of metal brackets, springs, and a cylindrical shock absorber is visible. The background is blurred, showing more of the train's structure and some greenery.

# Disaster

- Crisis situation
- Disaster management
- Natural or man made
- Emergency response plan



# Historical Review



United States Federal Emergency Management Agency, 2021

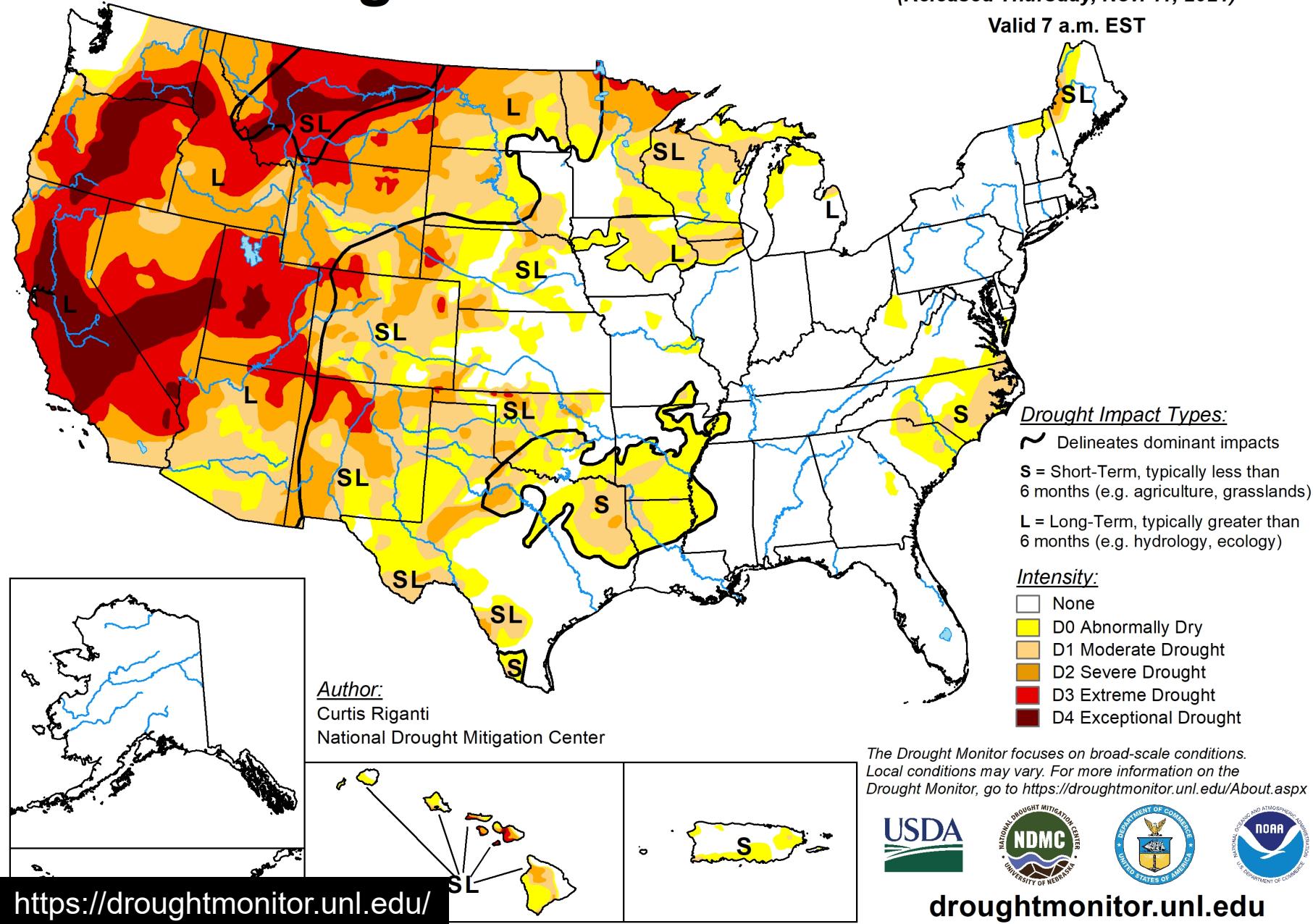


# 2020 Disaster Declarations

Biological	161
Fire	82
Hurricanes	30
Storms and Flooding	19
Tornados	3
Flood/Mudslides	6
Coastal Storms	6
Ice	1
Earthquakes	3
Dam/Levee	2



# U.S. Drought Monitor





# US Reported Earthquakes in 2015

State		State	
Alabama	6	Montana	19
Alaska	1575	Nebraska	3
Arizona	10	Nevada	172
California	130	New Mexico	12
Colorado	7	New York	2
Connecticut	1	Oklahoma	888
Hawaii	53	Oregon	3
Idaho	38	Tennessee	1
Kansas	60	Texas	21
Michigan	2	Utah	4
Mississippi	3	Washington	11
Missouri	5	Wyoming	198

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in the  
World's Largest  
Earthquake Drill.**

October 21, 2021

**Shake  
Out**

[www.ShakeOut.org](http://www.ShakeOut.org)

<https://www.shakeout.org/wyoming/dropcoverholdon/>

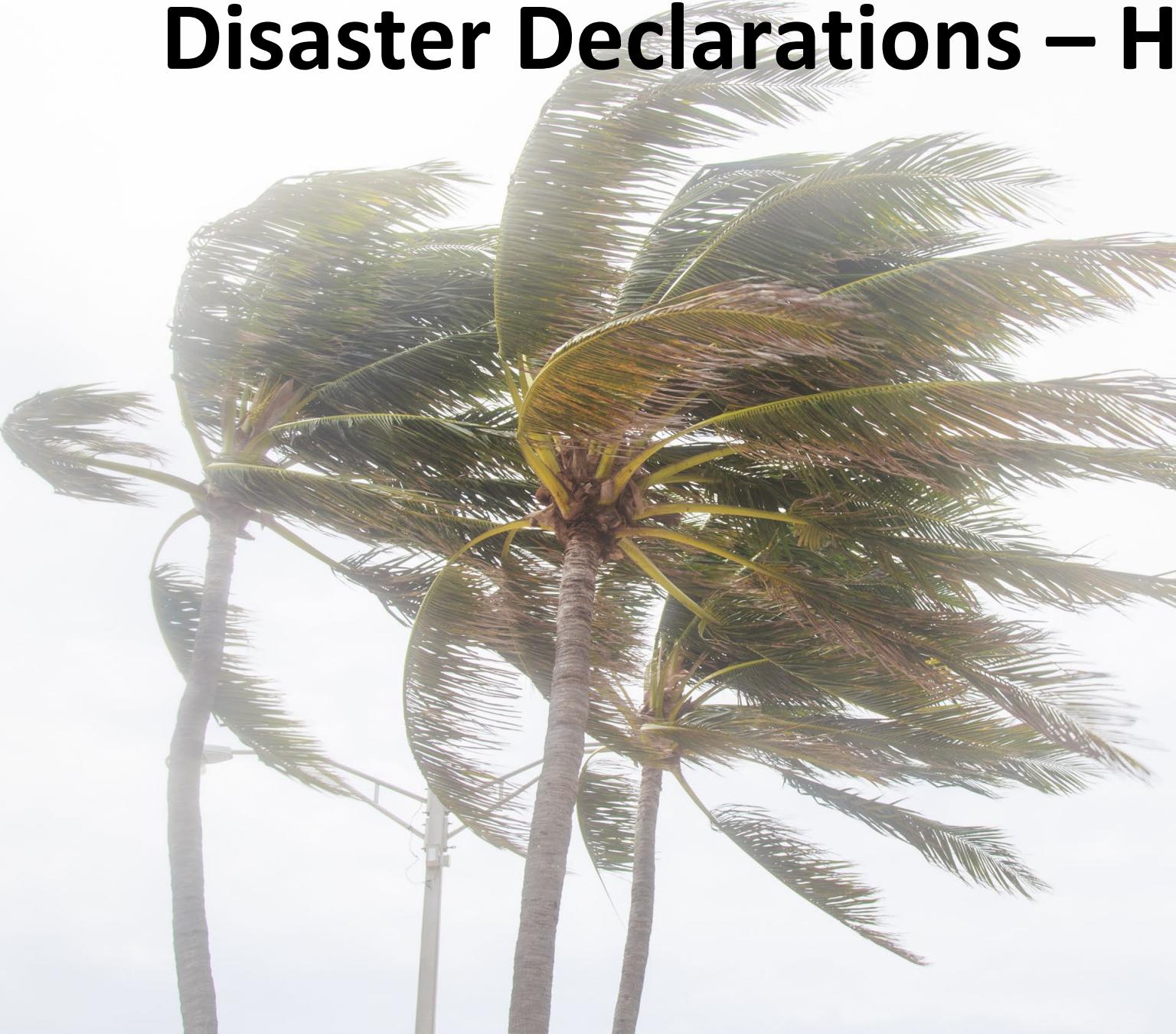
# Disaster Declarations – Flooding (2020)

- North Dakota flooding, April
- North Dakota flooding, October
- Oregon severe storms, flooding, landslides, and mudslides, February
- Washington severe storms, flooding, landslides, and mudslides, January
- Wisconsin severe winter storm and flooding, January





# Disaster Declarations – Hurricane (2020)



Douglas- Hawaii

Hanna- Texas

Isaias- New Jersey, North Carolina, Connecticut, Delaware, New York, Florida

Laura- Texas, Louisiana, Arkansas, Mississippi

Marco- Texas, Mississippi, Louisiana

Sally- Florida, Alabama, Louisiana, Mississippi

Eta- Florida

Zeta- Louisiana

Delta- Louisiana, Mississippi



# Disaster Declarations – Tornado (2020)

- Arkansas Severe Storms and Straight-line Winds, April
- Arkansas Severe Storms, Tornadoes, and Straight-line Winds, March
- Tennessee Severe Storms, Tornadoes, Straight-line Winds, and Flooding, March



# Tornado Hospital Impact





# Commercial Rail Events

	2015	2016	2017	2018	(R) 2019	2020
<b>Fatalities, total</b>	11	7	7	7	3	1
Derailments	8	0	3	0	0	0
Collisions	1	3	0	5	0	0
Other	2	4	4	2	3	1
<b>Injuries, total</b>	<b>564</b>	<b>433</b>	<b>(R) 319</b>	<b>204</b>	<b>57</b>	<b>67</b>
Derailments	471	113	159	24	21	26
Collisions	32	14	13	155	12	8
Other	32	14	13	155	12	8





# Commercial Aircraft Events

**2010-2020**

- 11 commercial crashes in the United States
- 30 fatalities
- 217 reported injuries



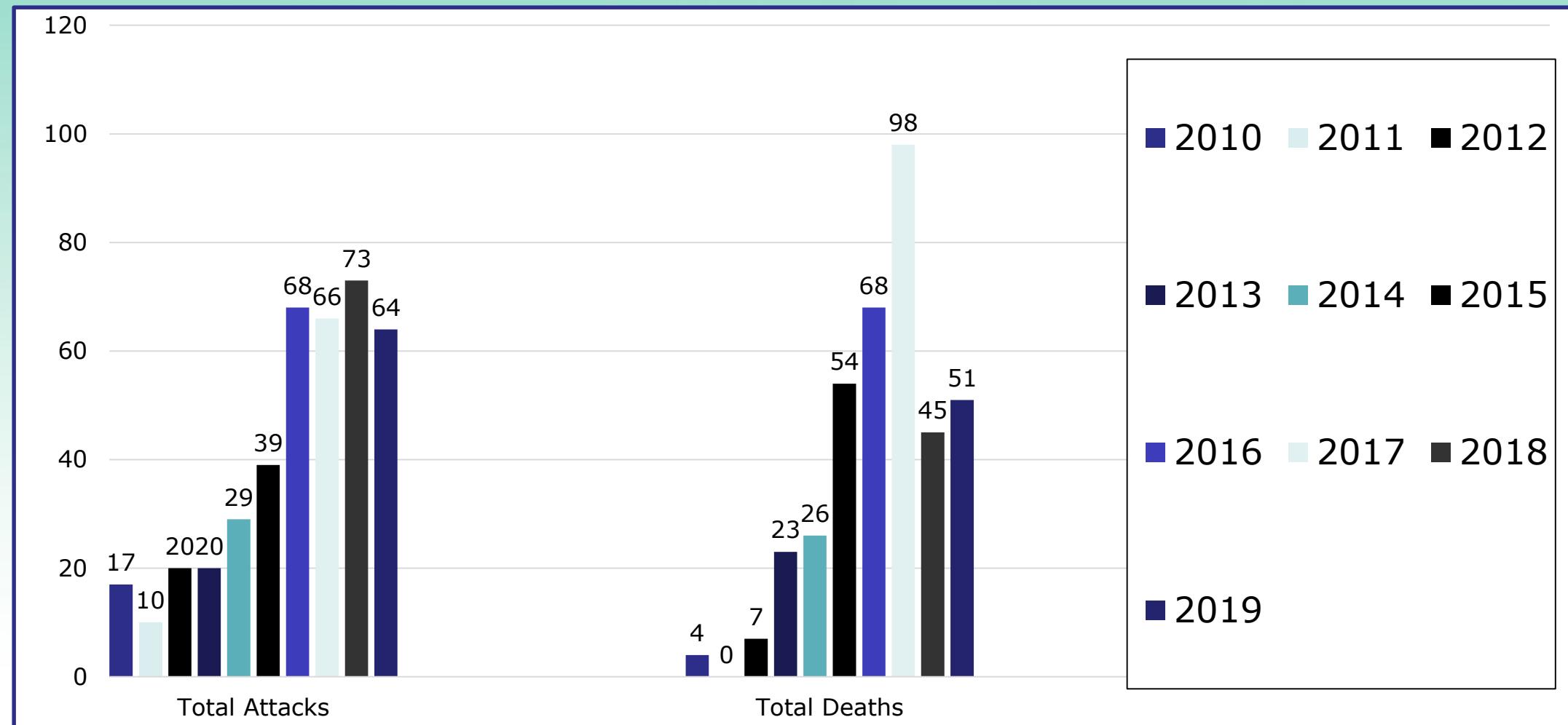


# Terrorist Events in the US

- Terrorist goal: instill fear and social disruption in society
- “No-Notice” events producing casualties in a short period of time with lethal injuries
- Require hospital planning and preparation to develop surge response capabilities and capacity
- Bombings and explosions
- Shootings
- Vehicle attacks
- Chemical agents



# American Deaths in Terrorist Attacks in US



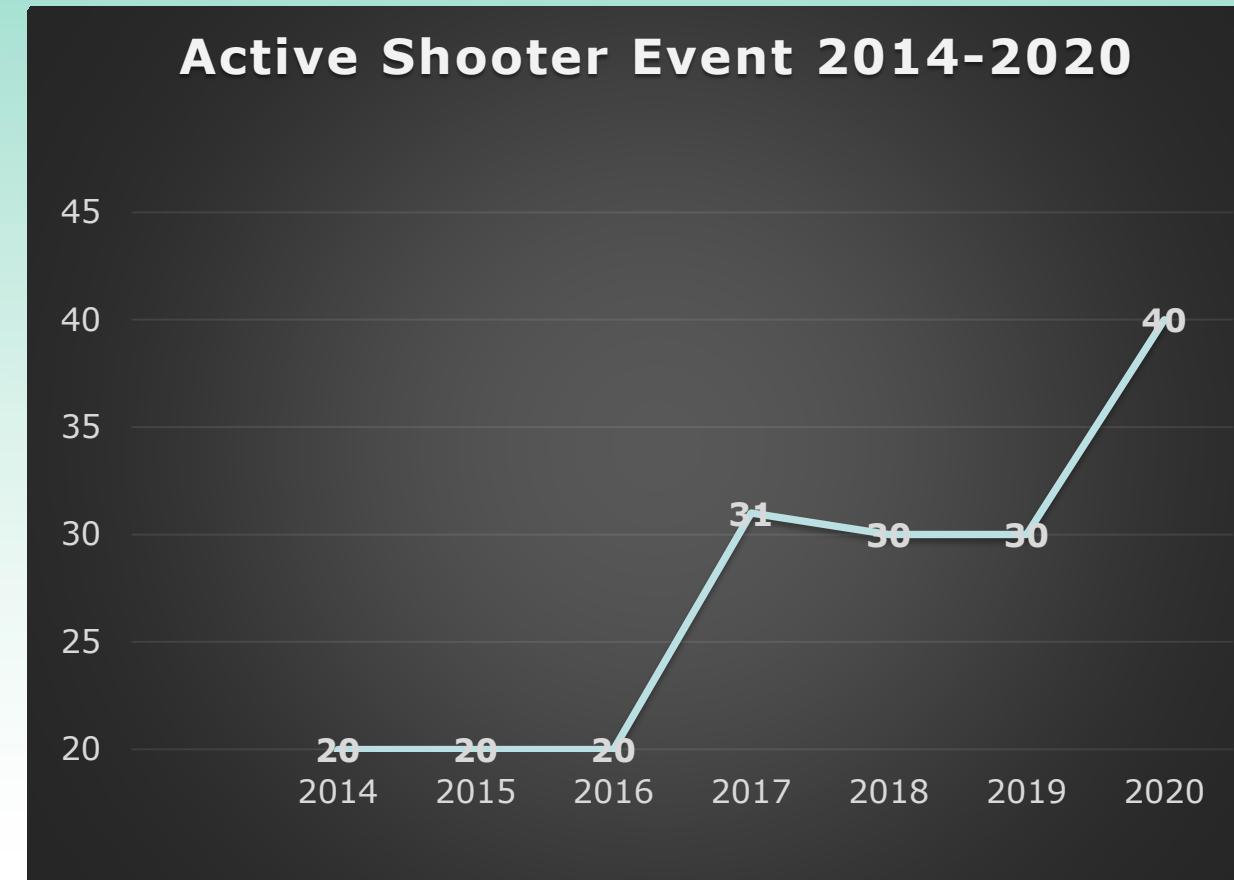
National Consortium for the Study of Terrorism and Responses to Terrorism (START)



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# Active Shooter Events 2000-2020

- Active shooter is an individual(s) engaged in killing or attempting to kill people in a confined and populated area.
- 373 Active shooter events
- 387 Number of shooters
- 3015 Casualties



United States Federal Bureau of Investigation, 2021



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# Casualties by Active Shooter (2000-2020)

## Fatalities

- Civilian 1061
- Law Enforcement 30
- Security Guard 10

## Wounded

- Civilian 1789
- Law Enforcement 91
- Security Guard 6

Mass Casualty is defined as three or more killings in a single incident.

**140 were mass casualty events in 2000-2019.**

# Shooter Outcomes

- Suicide 126
- Kill by police 71
- Kill by civilian 7
- Apprehended 174



# Shooting in Hospitals

- Jefferson University Hospital employee fatally shoots coworker (10/4/21)
- Suspect fatally shot in Ohio hospital emergency department (4/12/21)
- Man shoots wife, kills self inside Houston medical facility (3/3/21)
- One dead, four injured in Buffalo Allina Health Clinic shooting (2/10/21)
- Combative patient shot by deputy at Harbor-UCLA Medical Center (10/8/20)
- Security officer killed by friendly fire at Munster Community Hospital (6/17/20)
- Man kills estranged wife's boyfriend, self outside St. Clare Hospital (6/11/20)
- Man with gun outside Wisconsin ER fatally shot by police (4/15/20)
- Man fires flare gun, threatens to shoot up O.C. Medical Center (4/9/2020)
- Brigham and Women's Hospital valet shot, suspect killed in police pursuit (2/13/2020)
- Fayetteville, VA shooting suspect was there for mental health treatment (2/11/2020)



# Active Training





# Mass Casualty Incident

- An incident where emergency medical services respond to a single event with multiple casualties.
- An active shooter event with three casualties is an MCI, while a natural disaster with 50 or more casualties will also be considered an MCI, on a much higher level.
- In a large-scale MCI, the number of casualties has the potential to exceed the resources available to provide support, triggering Public Health Disaster Response.



# Public Health Disaster Response Phases



# Preparedness





# Hospital Preparedness

- Phase of Information Gathering
- Hospital Leaders Define Federal & Regulatory Requirements
- CMS Provisions of Participation Criteria
- Joint Commission Standards
- Review of Lessons Learned
- Organizational Structure

# Emergency Preparedness Committee

- Each hospital has one and has already developed the plan, chain of command, personnel, methods of communication and identification, mutual aid, resources
- Predetermined location of the Emergency Operations Center (EOC)
- Predetermined incident command leadership
- Each department and unit should already know what to do.



# Hospital Response

## The 7 Phases of Readiness:

- **Preparedness**
- Planning
- Regional integration
- Integration with pre-hospital
- Emergency Operations Response Plan
- After action review
- Plan revisions





# Hospital All Hazards Self-Assessment

Planning Framework	Sheltering-in-Place
Command and Control	Isolated or Out of Communication
Authorized Personnel	Visitors
Notification Systems	Communication and Media
Plan Activation	Resources
Response Protocols	Allocating Pharmaceuticals
Communication Systems	Surveillance
Staffing Considerations	Infection Control
Security and Access	Staff Education & Training
Internal Traffic	Post-Mortem Care
External Traffic	Recovery Protocols
Patient Reception	Exercising the Plan
Evacuation (Horizontal & Vertical)	Infrastructure





# Hospital Response

## The 7 Phases of Readiness:

- Preparedness
- **Planning**
- **Regional Integration**
- **Integration with Pre-Hospital**
- Emergency Operations Response Plan
- After Action Review
- Plan Revisions





# Planning

- Planning phase is a critical element
- Hazard vulnerability assessment
- Review response plans
- Define resources needed
- Community integration
- Prioritize exercise events
- Special populations
- Specific risks: chemical, biological, blast
- Planning for staff needs



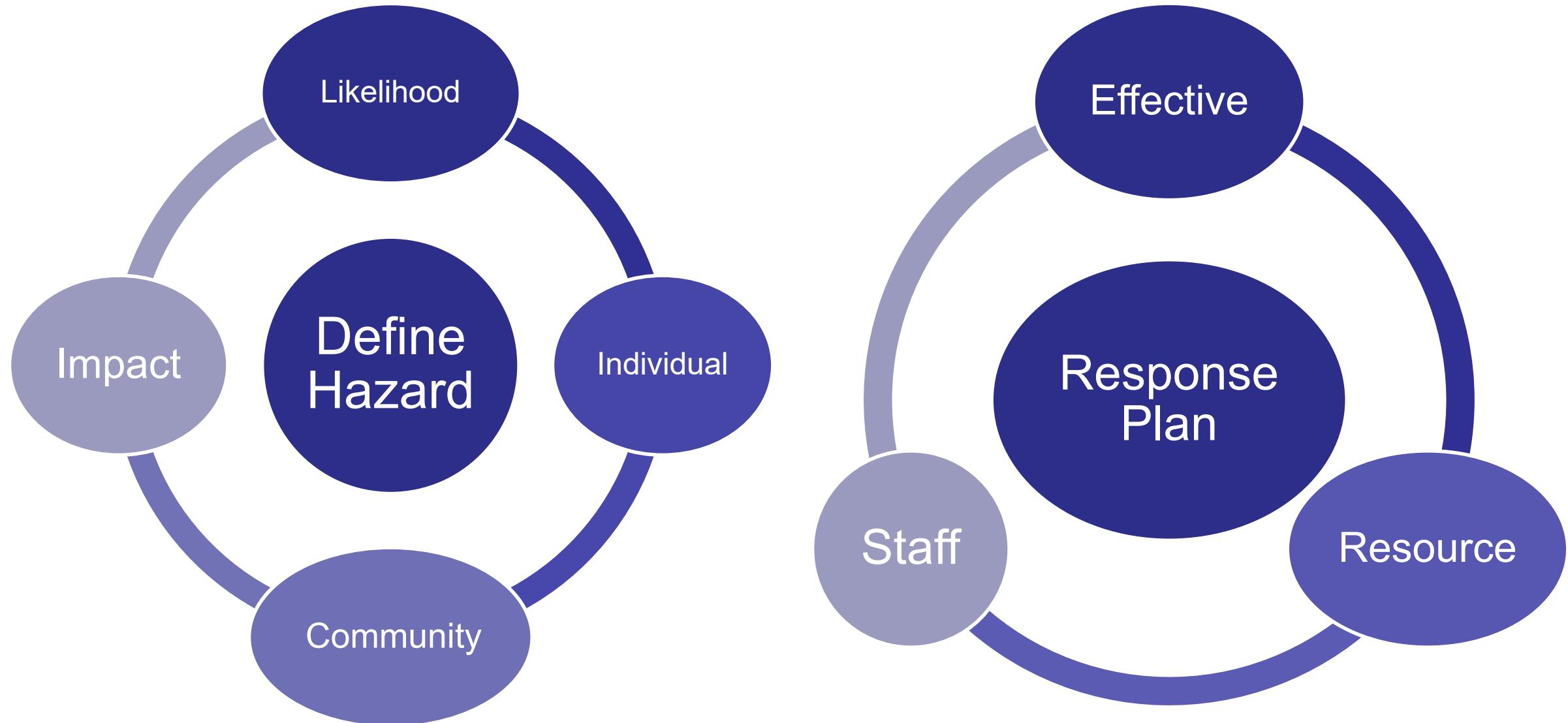
# HVA

<b>Natural</b>	<b>Manmade</b>
Tornado	Transportation
Flooding	Industrial Hazmat
Hurricane	Structure Collapse
Earthquake	Weapon Violence
Landslide	Fire
Mudslide	Explosion
Wildfire	Terrorist Chemical
Extreme Temp	Terrorist Biological
Volcano	Terrorist Radiation





# Hazard Vulnerability Assessment (HVA)



# Planning

- Incident Command Center
- Medical decontamination training
- EMS traffic routes/triage
- Medical care
- Staff notification/staff traffic routes
- Communication – redundancy
- Security





# Incident Command Center



[usfa.fema.gov](http://usfa.fema.gov)



[osceolaregional.com](http://osceolaregional.com)



[prd.blogs.nh.gov/](http://prd.blogs.nh.gov/)



# Planning

- Just-In-Time inventory
- Medication distribution

Deploying people and material effectively were the critical pieces of the stockpile's response after 9/11. “We were in NYC within hours. The National Pharmaceutical Stockpile (NPS) functioned well because of the investments made in **preparation, planning, and exercising.**” The NPS became the Strategic National Stockpile in 2003.



# Planning

- Infrastructure contingency
- Business continuity
- Casualty tracking



# Hospital Response

## The 7 Phases of Readiness:

- Preparedness
- Planning
- Regional integration
- Integration with pre-hospital
- **Emergency Operations Response Plan**
- **After action review**
- **Plan revisions**



# Planning

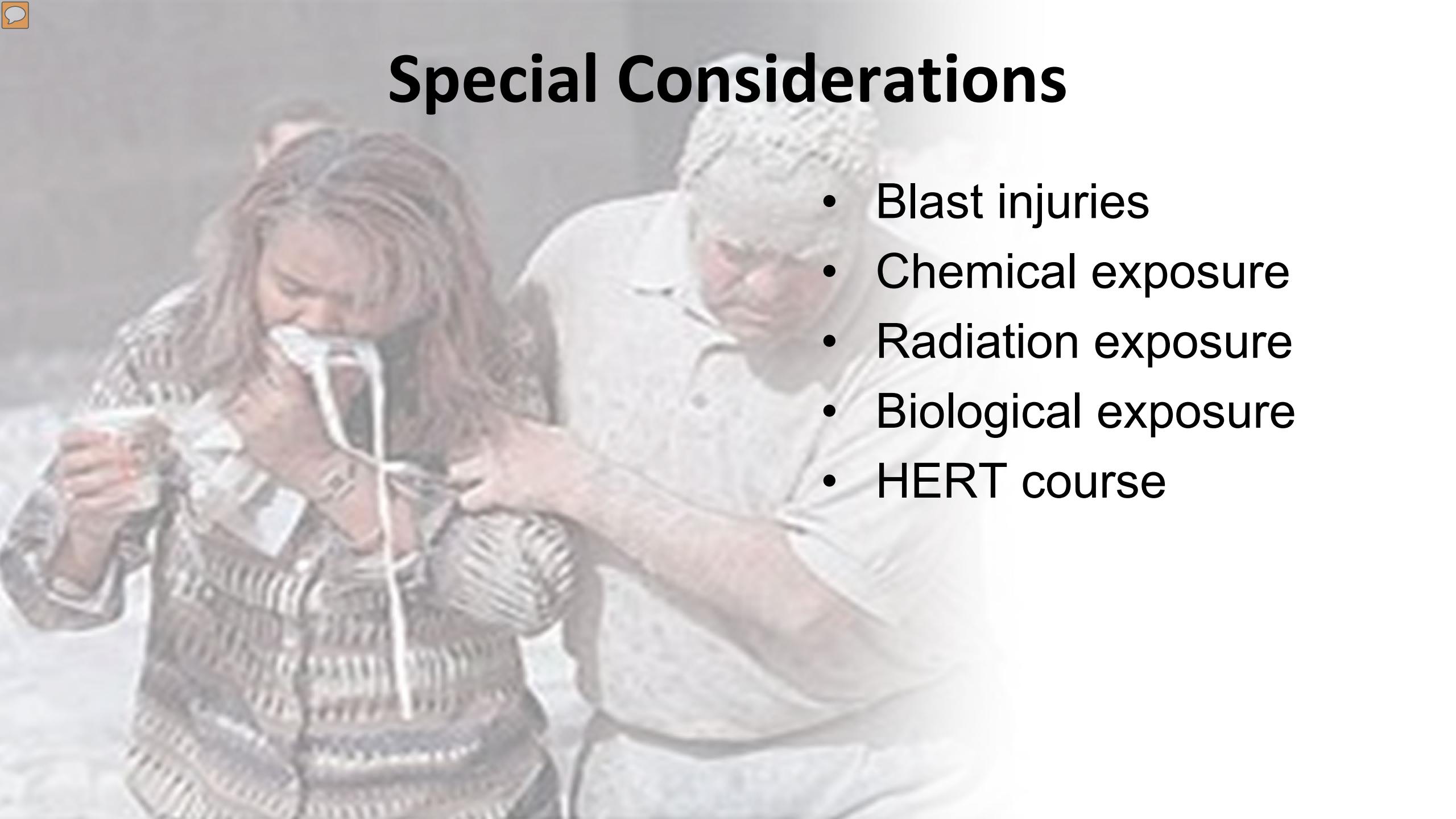
- Written Emergency Response Plan
- Input from medical, nursing and all other departments
- All hazard response plan
- Job action sheets
- Leadership training
- Departmental training



# Exercise & Training

- HVA used to define exercises
- Tabletop communication, medical decontamination
- Full function exercises
- Exercise controllers
- Regional exercises
- After action reviews
- Emergency operations response plan revisions





# Special Considerations

- Blast injuries
- Chemical exposure
- Radiation exposure
- Biological exposure
- HERT course



# Preparedness





# Hospital Response

- Event recognition
- Situational awareness
- Activation/level of response
- Notification
- Establish the command center
- Incident command system
- Communication
- Incident action plan



# Standard Disaster Alerts

Red	Fire
Blue	Adult Medical Emergency
White	Pediatric Medical Emergency
Pink	Infant Abduction
Purple	Child abduction
Orange	Hazmat Bioterrorism

Gray	Combative person
Yellow	Bomb Threat
Green	Patient Elopement
Silver	Person with weapon/active shooter/hostage
Triage Internal Alert	Internal Disaster
Triage External Alert	External Disaster



# Standard Disaster Alerts

<b>Event</b>	<b>Old Code</b>	<b>Plain Language</b>
Emergency Operations Response Plan Activation	Code Yellow	Disaster alert-Descriptor-Command Center Activated/Not Activated (Location)
Active Shooter	Code Silver	Security Alert-Active Shooter (Location)-Protective Actions
Missing Infant	Code Pink	Missing Infant/Child- (Location)-(Description)
Tornado	Code Black	Tornado Warning-(Description)-Location) (protective measures)





# Hospital Response

- Initial response procedures
- Security/Lockdown
- Reorganization to ICS
- Job action sheets
- Unit priorities
- Alternate care sites
- Elective procedures





# Hospital Response

- Medical decontamination
- Security/access
- Triage
- Echelon of triage
- Disaster standards of care
- Patient tracking
  - Special populations
  - Unresponsive casualties
  - Morgue
- Casualties' families
- Media



# Chemical Exposure

Agent	Side Effects	Onset	Specific Treatment
Nerve Agents: Vapor Liquid Both	Miosis (pinpoint pupils) Rhinorrhea SOB, LOC, Seizures Excessive Sweating GI Distress	Vapor – seconds to minutes Liquid- minutes to hours	Atropine Pralidoxime (2-PAMCI) Benzodiazepines ABC Support
Cyanide (Smells like bitter almonds)	Cherry Red Skin Nausea, LOC Dizziness Metabolic Acidosis Transient Rapid Breathing, LOC, Apnea, Cardiac Arrest	Seconds to minutes	Cyanide Kit Amyl Nitrate Sodium Nitrate Sodium Thiosulfate ABC Support
Blister Agents: Mustard Lewisite (Smell of mustard, onion or garlic) Nitrogen Mustard; Phosgene Oxime (CX)	Redness of skin. Blisters, Irritation of Eyes, Cough, SOB, Airway Injury Pulmonary Edema Mustard: Bone Marrow Suppression	Mustard: Hours Lewisite: Minutes	Lewisite: British Anti-Lewisite antidote Immediate decontamination, ocular irrigation, bronchodilators, airway assistance, fluid balance



Agent	Main Uses	Side Effects	Specific Treatment
Phosgene Chlorine (Gas) Smells like fresh cut grass or hay.	Manufacture of other chemicals, bleaching agent, water purification	Severe lung injury/death Corrosive to skin and eyes Delayed Pulmonary Edema	No Antidote ABC Support
Hydrochloric Acid (Liquid)	Production of chlorides, fertilizers, and dyes, in electroplating, and in the photographic, textile, and rubber industries	Severe skin and eye burns Toxic if inhaled	Remove to fresh air. If ingested drink water or milk; do NOT induce vomiting. Flush eyes with plenty of water for at least 15 min. Soap and wash area for at least 15 min



Agent	Main Uses	Side Effects	Specific Treatment
Sulfuric Acid Battery Acid Sulphuric Acid	Manufacture of fertilizers and other chemicals; petroleum refining; battery component.	Fatal if inhaled Severe burns	Respiratory support as needed. Wash skin or eyes liberally with water If swallowed drink large amounts of water/no vomiting
Ammonia, Anhydrous or Liquid	About 80% of the ammonia produced by industry is used in agriculture as fertilizer. Ammonia is also used as a refrigerant gas, for purification of water supplies, and in the manufacture of plastics, explosives, textiles, pesticides, dyes and other chemicals.	Irritation to death if inhaled Corrosive to skin Burns eyes	Respiratory support as needed. Copious irrigation of skin and eyes with water. Dilution of ingested ammonia with milk or water.





<b>Agent</b>	<b>Side Effects</b>	<b>Onset</b>	<b>Specific Treatment</b>
Riot Control Agents - Pepper Spray Tear Gas	Pain, Tearing, Redness of Eyes, Burning of Nose / Throat, Sneezing, Rhinorrhea SOB, Bronchospasm, Respiratory Distress Skin Erythema, Possible Conjunctivitis	Seconds	Irrigate Eyes Copiously With Water / NS  Wash Skin With Sodium Bicarbonate, Alkaline Soap, or Large Amounts of Cool Water Bronchodilators



# Chemical Exposure / Mass Decontamination



# Chemical Exposure / Mass Decontamination





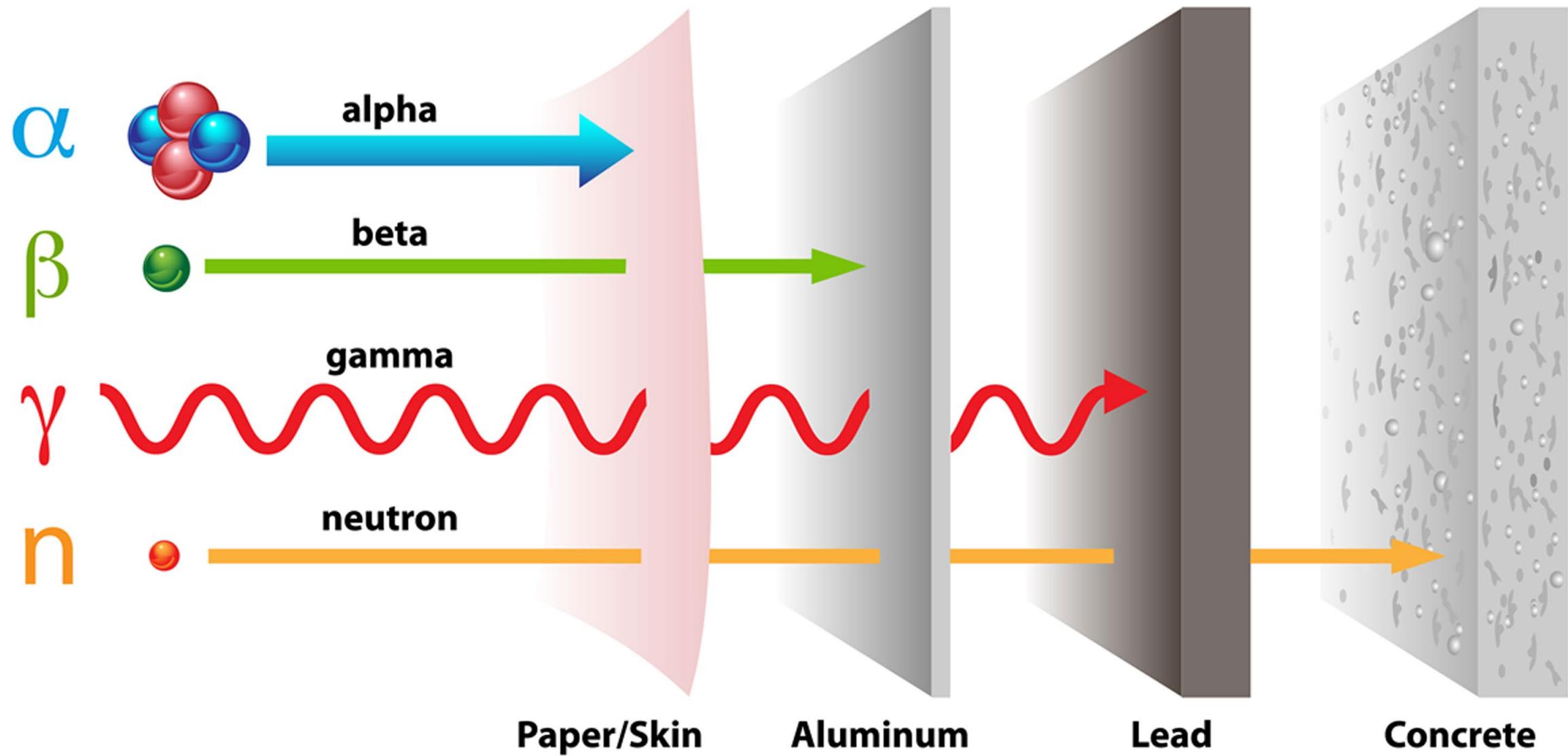
# Radiation Exposure

## Potential terrorist events

- Nuclear explosion
- Meltdown of nuclear reactor
- Dispersal of material through conventional explosives: radiation dispersal device (RDD or Dirty Bomb)
- Placing radioactive material in public areas



# Radiation Exposure





# Radiation Exposure

- External contamination
  - Radiation debris is on the body and clothing
  - Contamination is removed by medical decontamination
  - Prevent internal contamination by Inhaling, swallowing or through open wounds
- Internal contamination caused by inhalation, ingestion or absorbed by open wounds
  - Potential thyroid gland injury
  - Persistent levels of contamination after decontamination





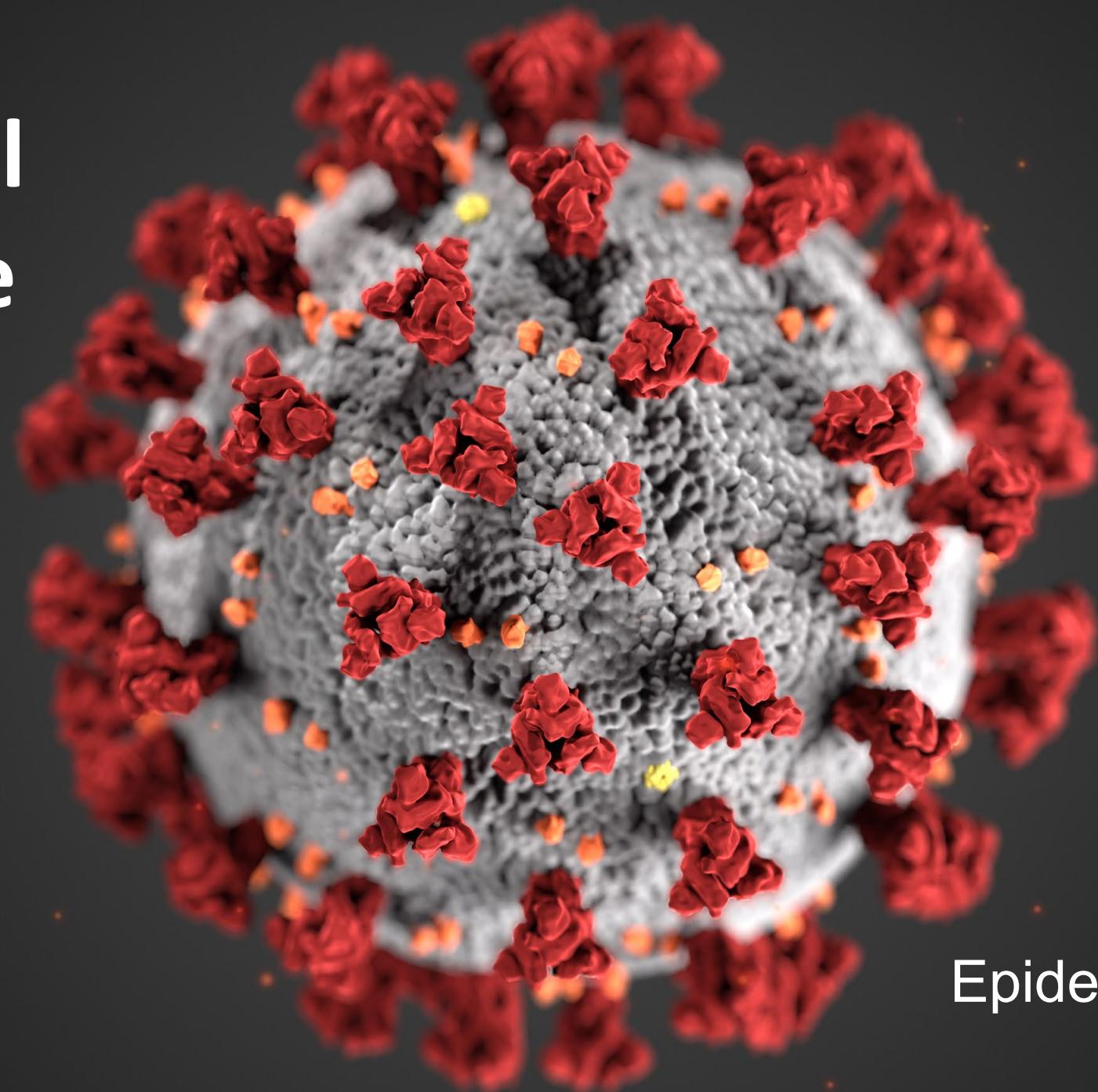
# Radiation Exposure: Prodromal Symptoms

Symptoms	Time of Onset	Approximate Whole-Body Radiation Dose	Physiological Illness
Nausea, Vomiting	First 48 Hours	1 Gray (100 Rad)	Decrease In White Blood Cells and Platelets
Nausea, Vomiting	First 24 Hours	2 Gray (200 Rad)	Hematopoietic Syndrome Marked Decrease in White Blood Cells and Platelets
Nausea, Vomiting, Diarrhea	First 12 Hours, 8 Hours for Diarrhea	4 Gray 400 Rad	Gastrointestinal Damage 50% Mortality in Absence of Treatment
Nausea, Vomiting, Diarrhea	Within 5 Minutes	10-30 Gray 1,000 – 3,000 Rad	Severe Gastrointestinal Damage Very Poor Prognosis
CNS Impact, Mental Status Changes	Within Minutes	<ul style="list-style-type: none"><li>• 30 Gray</li><li>• 3,000 Rad</li></ul>	Neurovascular Syndrome Severe CNS Damage, Cardiovascular Collapse Lethal





# Biological Exposure



Epidemic, Pandemic



# Biological Agents

Agent	Impact
Anthrax	Bacterial Agent: Skin, Gastrointestinal, Respiratory- Produce septicemia and death if untreated; treatment early with Penicillin
Plague	Bacterial Agent: Inhaled as aerosol – Pneumonic Plague; Highly contagious; Untreated – Mortality up to 50%
Brucellosis	Bacterial Agent: Systemic infection impacting any organ system; Symptoms 2-3 weeks after exposure with acute febrile illness; Common lab exposure
Botulism	Bacterial Agent: Food Botulism, Wound Botulism; Spread through blood stream; Most potent toxin; Most likely exposure is food and water contamination
Variola Virus	Viral Agent: Smallpox virus; Highly contagious and very virulent; Incubation period is 12 days; Clinical presentation is fever and headache; Pus filled vesicles over the body; Mortality is 30% in nonimmunized and 3% in the immunized population; Can be used as an aerosol weapon



# Blast Injuries

The images are of an explosion of an ammonium nitrate warehouse in Beirut August 2020, and a result of the blast.





# Blast Effect on Human Body

- Primary blast effect
- Reverberations of blast and negative waves
- Followed by shrapnel, fragments, heat, smoke and fire
- Concern for toxic fumes/dust
- Potential structural collapse





# Blast Injuries

- Primary: hollow viscus or gas-filled organs
- Secondary: penetrating from shrapnel
- Tertiary: deceleration or struck by injuries
- Quaternary

# County





# Emergency Preparedness Regions

- Emergency Management District Coordinators
- Regional Epidemiologists
- Regional Bioterrorism Coordinators
- Regional Medical Directors





# State Emergency Operations Center





# National Response Framework 2019

- Blueprint for the nation's response to all types of disasters
- Designed to be scalable, flexible, and adaptable
- Defines the National Incident Management System and key roles across the nation
- Describes the principles, roles, responsibilities, and coordinating structure for response
- Mission: Ensuring effective national response

Federal Emergency Management Agency, 2019



# National Response Framework

## Objectives

- Define capabilities necessary to save lives
- Protect property
- Protect the environment
- Meet basic human needs
- Stabilize the incident
- Restore basic services and community functionality
- Establish environment that facilitates recovery

FEMA, 2019



# National Incident Management System 2017

- Comprehensive national approach to incident management
- Concepts and principles of response for all threats, hazards and events
- Scalable, flexible, and adaptable
- Standard resource management procedures that facilitate coordination
- Essential principles for communication

FEMA, 2017



# Electrical Power Company Preparedness

- Year round preparation
- Logistical expertise
- Skilled workers
- Specialized equipment
- Mutual aid
- Regional mutual assistance groups (RMAG)





# Psychological First Aid

2018

- Limit shifts – no more than 12 hours
- Rotation of staff
- Mandate time off
- Staff at all levels
- Encourage peer partners
- Monitor high risk providers

2022



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# Ethical Principles

- Autonomy
- Nonmaleficence
- Beneficence
- Justice



# Ethical Considerations in Disaster Management

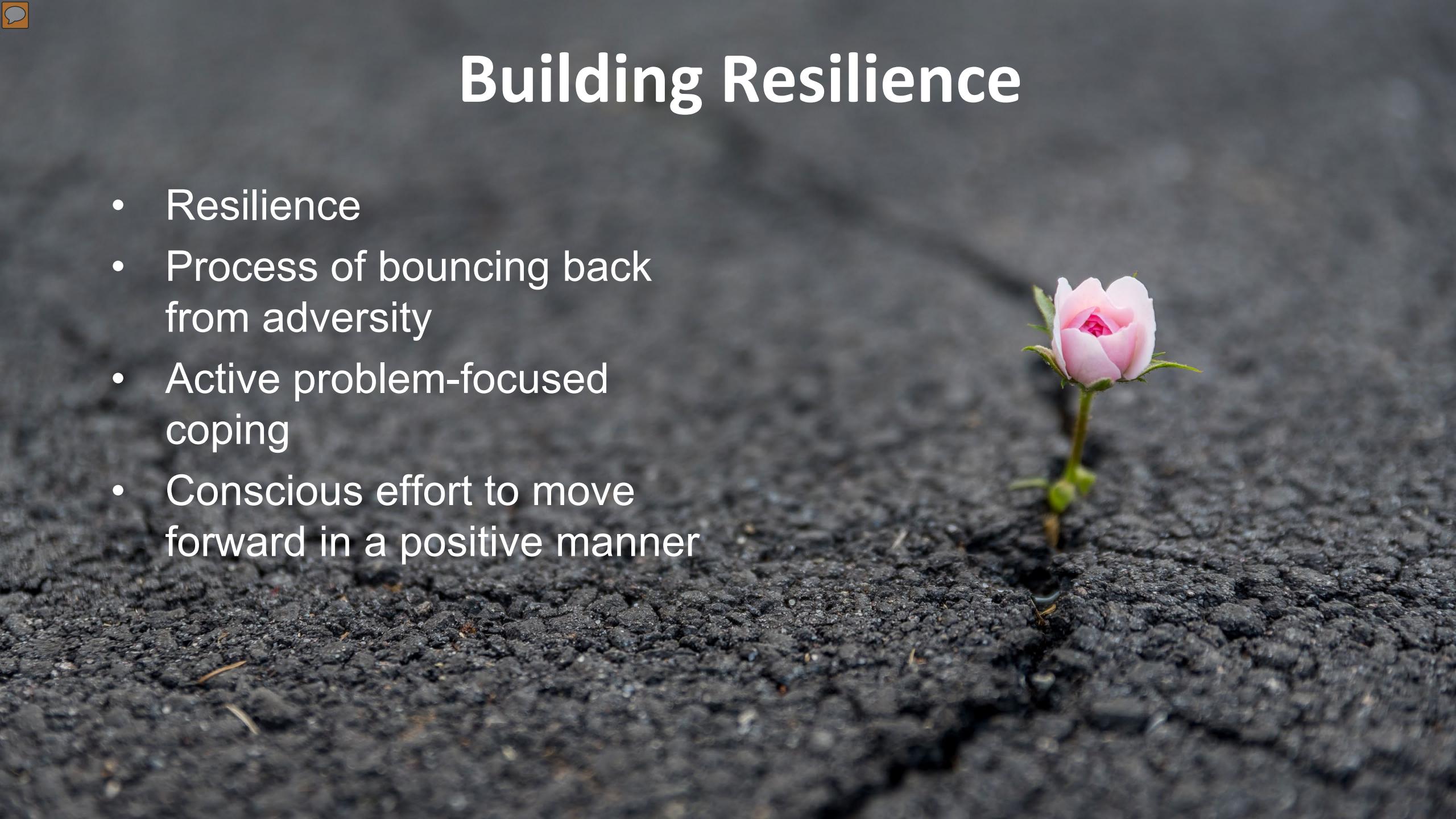
## Disaster Events

- Training & Readiness
- Need-based Resource Management
- Willingness of Workers
- Media

## COVID 19

- Nurses' safety, role and moral distress
- Resource allocation
- Nurse-client relationship



A close-up photograph of a single, small pink rosebud growing through a dark, textured surface, likely asphalt or concrete. The rosebud is in sharp focus in the center-right of the frame, while the background is blurred.

# Building Resilience

- Resilience
- Process of bouncing back from adversity
- Active problem-focused coping
- Conscious effort to move forward in a positive manner



# Post Traumatic Stress Disorder (PTSD)

- Occurs months or years after exposure
- Diagnosis requires a persistence of reactions for months
- May include:
  - Intrusive thoughts
  - Flashbacks
  - Avoidance of reminders
  - Negative thoughts and feelings
  - Reactive symptoms
- Psycho-education
- Mental Health Consultants



# Summary

- Understanding the incidence of disaster declaration in the US and the epidemiology of disasters facilitates planning and response.
- All entities use the Incident Command System and its planning cycle to manage an incident, to foster unified command and integration.
- Hospitals complete an HVA that defines their priorities for mitigation, preparedness, planning, education and response training annually.
- Disaster ethical and psychosocial implications will pose additional challenges.