

Prevention and Treatment of Injuries Following Hurricanes and Tornadoes

Clinician Outreach and Communication Activity (COCA) Conference Call July 11, 2013

Objectives

At the conclusion of this session, the participant will be able to accomplish the following:

- ❑ Describe the major challenges to provision of pre-hospital care**
- ❑ Discuss the patterns of injury seen after hurricanes and tornadoes, including appropriate initial management**
- ❑ Review appropriate emergency risk communication messages and the importance of data collection to improve messaging and response efforts**

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TODAY'S PRESENTER



John H. Armstrong, MD, FACS
State Surgeon General and Secretary of Health
Florida Department of Health

TODAY'S PRESENTER



David Sugerman, MD, MPH, FACEP

Health Systems Team Lead

Division of Unintentional Injury Prevention

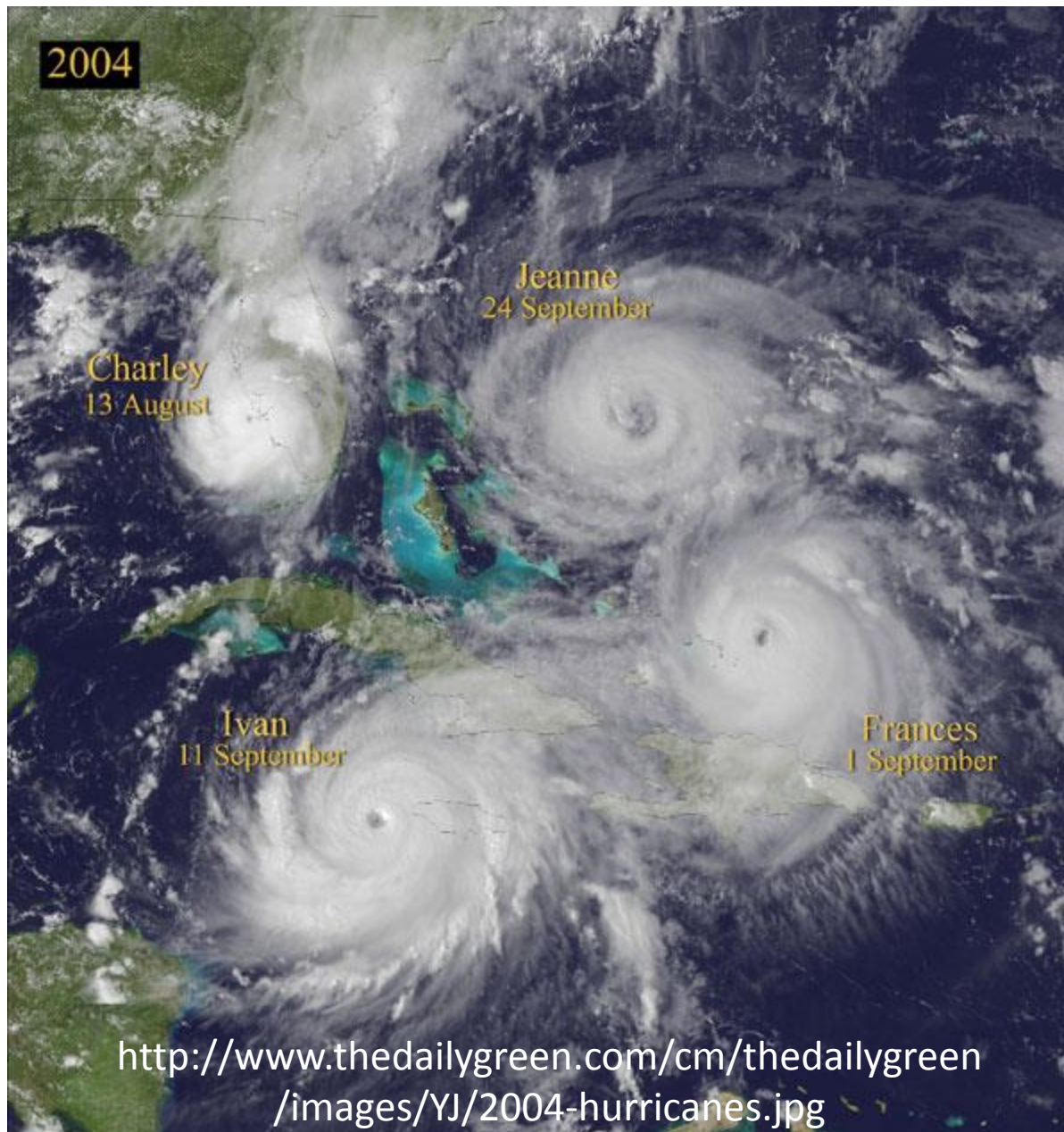
National Center for Injury Prevention and Control

Centers for Disease Control and Prevention



Nature's Wind & Rain: Injuries from Hurricanes

John H. Armstrong, MD, FACS
Surgeon General & Secretary
Florida Department of Health



<http://www.thedailygreen.com/cm/thedailygreen/images/YJ/2004-hurricanes.jpg>

FL hurricanes 2004-2005



Florida Department of Health
Hurricane Season 2004 & 2005

- County Health Department
- Tropical Storm Bonnie 50 Mile Swath
- Hurricane Dennis 50 Mile Swath
- Hurricane Katrina 50 Mile Swath
- Hurricane Rita 50 Mile Swath
- Hurricane Wilma 50 Mile Swath
- Hurricane Charlie 50 Mile Swath
- Hurricane Frances 50 Mile Swath
- Hurricane Ivan 50 Mile Swath
- Hurricane Jeanne 50 Mile Swath



0 25 50 100 Miles

Disclaimer:
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Map printed February 10, 2006.

Objectives

- Describe injury epidemiology associated with hurricanes
- Discuss management of public health issues associated with hurricanes

Hurricane mechanics

- Wind speed
- Forward speed & direction
- Surge
- Rain
- Heat

Hurricane Charley deaths, 2004

TABLE. Number of deaths associated with Hurricane Charley, by date and cause — Florida, 2004

| Cause of death | August | | | | | | | | | | September | Total |
|-----------------------------------|--------|----|----|----|----|----|----|----|----|----|-----------|-------|
| | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 23 | 24 | 27 | 1 | |
| Trauma | 10 | 1 | 1 | | | 1 | | | 2 | 1 | 1 | 17 |
| Carbon monoxide poisoning | | 1 | 2 | | | | | | | | | 3 |
| Drowning | 1 | | | | | | | | | | | 1 |
| Electrocution | | 1 | | | | | | | | | | 1 |
| Suicide | | | | | | | 1 | | | | | 1 |
| Exacerbation of medical condition | 1 | 1 | 1 | 1 | 2 | | | | | | | 6 |
| Two or more causes | | | | | | | 1 | 1 | | | | 2 |
| Total | 12 | 4 | 4 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 31 |
| Percentage of total | 39 | 13 | 13 | 3 | 6 | 3 | 6 | 3 | 6 | 3 | 3 | 100 |

MMWR, September 17, 2004, 53(36), 835-837

Hurricane Katrina 2005

| Cause of death | Florida | | | |
|---------------------------|----------|----------|----------|-----------|
| | Direct | Indirect | Possible | Total (%) |
| Drowning | 3 | | | 3 (21) |
| Car collision | | 3† | | 3 (21) |
| Hit by falling tree limb | 2 | 2 | | 4 (29) |
| Carbon monoxide poisoning | | 2 | | 2 (14) |
| Fall from ladder | | 1 | | 1 (7) |
| Undetermined | | | 1 | 1 (7) |
| Total | 5 | 8 | 1 | 14 |

MMWR, March 10, 2006, 55(09), 239-242

Common Components of Fatal Occupational Injury Events Related to Hurricanes (Total 72)

| Component | Percentage |
|--------------------------|------------|
| Trees, logs | 24 |
| Highway vehicle | 14 |
| Excavation machinery | 10 |
| Fishing boats (drowning) | 7 |
| Roofs (eg, falls) | 7 |
| Generators | 6 |

Fayard, Disaster Med Public Health Preparedness, 2009;3:201-209

213 deaths, 2004-5

| Characteristic | 2004 | | 2005 | | Total | |
|-----------------------|-------------|----------------------|-------------|----------|--------------|----------|
| | No.* | %[†] | No. | % | No. | % |
| Phase of death | | | | | | |
| Preimpact | 15 | (10) | 5 | (7) | 20 | (9) |
| Impact | 44 | (31) | 22 | (32) | 66 | (31) |
| Postimpact | 85 | (59) | 42 | (61) | 127 | (60) |

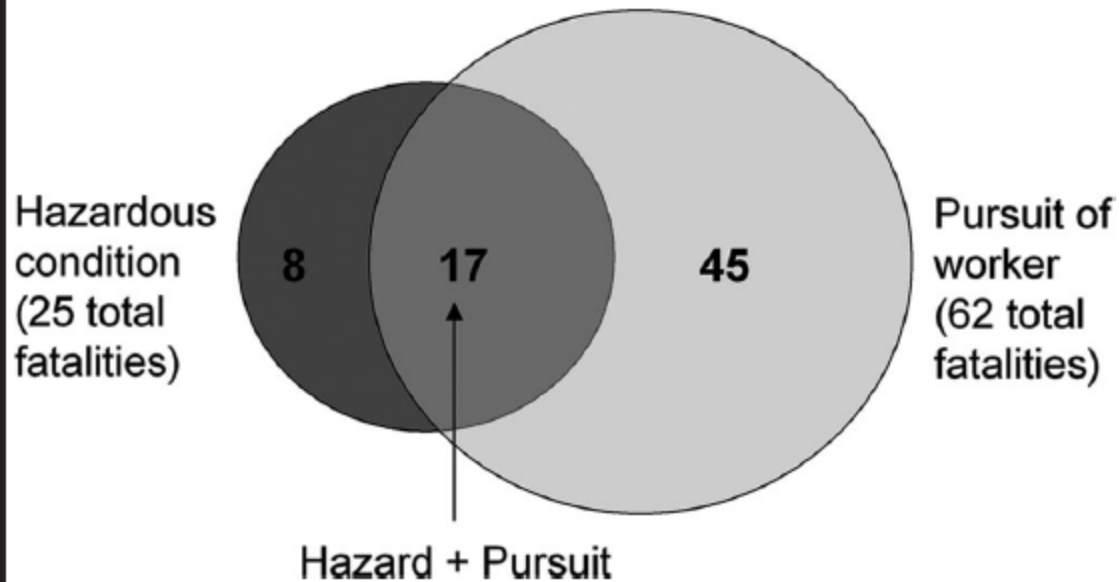
Ragan, Am J Forensic Med Path, 2008;29

FL hurricane deaths, 2004-5

- 76% male
- 79% > 40 years old
- 49% trauma, 21% non-accidental

Ragan, Am J Forensic Med Path, 2008;29

Fatal work injuries involving hurricanes (total 72). Two fatal injuries were related to hurricanes by means other than hazardous condition or pursuit.



Fayard, Disaster Med Public Health Preparedness, 2009;3:201-209

Consequences

| Storm | Deaths | Cost (\$B) |
|---------|--------|------------|
| Charley | 34 | 14.0 |
| Frances | 38 | 7.0 |
| Ivan | 52 | 12.0 |
| Jeanne | 28 | 6.5 |

Shultz, Epidemiol Rev, 2005;27:21-35

Hazards during the storm

- Structural collapse
- Wind-borne debris
- Falling trees
- Downed power lines

Shultz, Epidemiol Rev, 2005;27:21-35

Hazards after the storm

- Flooded roads
- Exposed utilities
- Insects & animals
- Potable water
- Carbon monoxide poisoning

Shultz, Epidemiol Rev, 2005;27:21-35

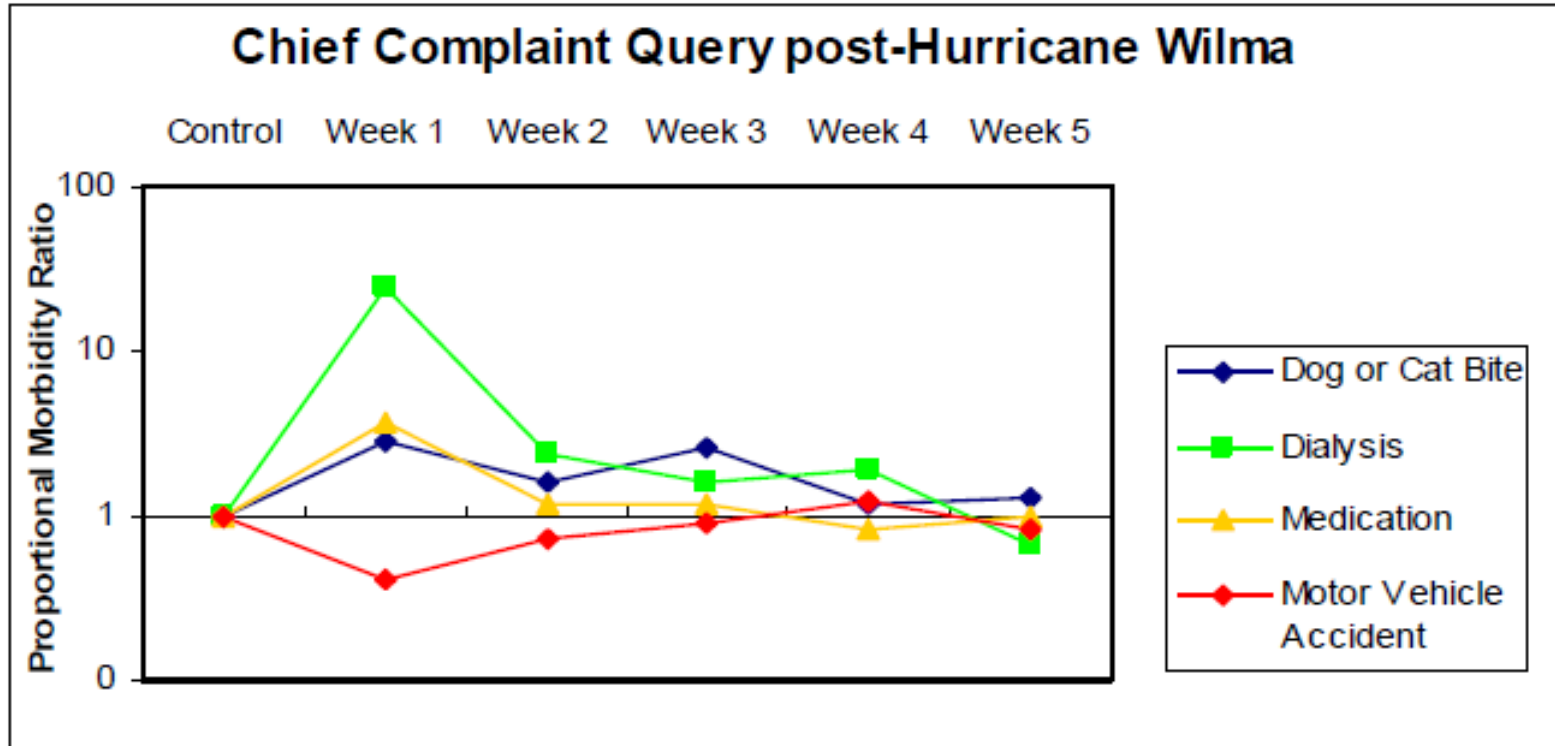
Public health consequences

- Mortality
- Water, food shortages
- Environmental hazards
- Loss of electrical power
- Damaged infrastructure
- Displaced population
 - Loss of homes
 - Loss of livelihoods
 - Loss of education infrastructure

Health challenges

- Traumatic injury
- Heat injury
- Mosquitoes
- Exacerbations of chronic disease
- Psychosocial effects

Hurricane Wilma 2004



Kite-Powell, Adv Dis Surv, 2007;2:157

Hurricane injuries

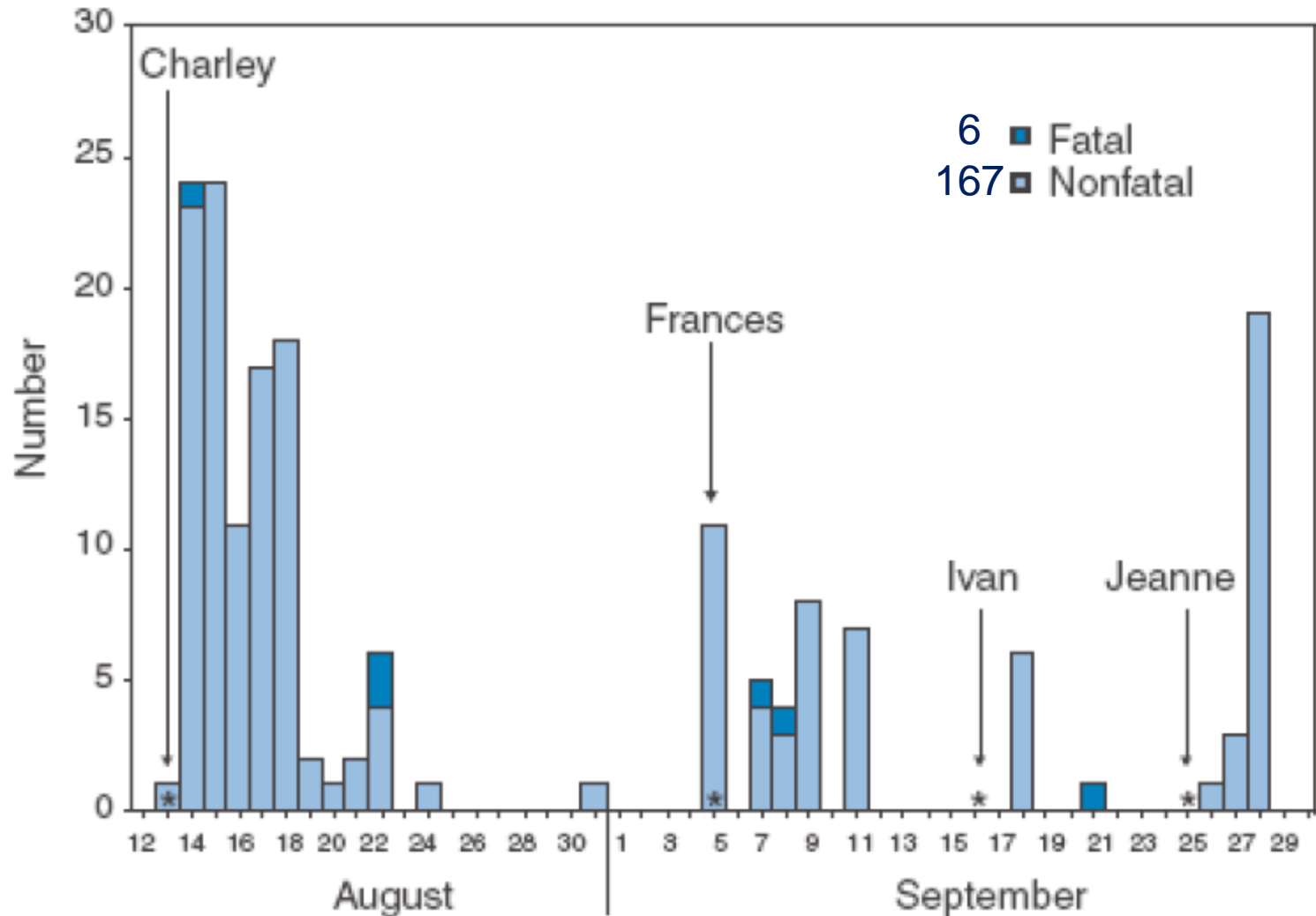
- Lacerations
- Puncture wounds
- Blunt trauma

Shultz, Epidemiol Rev, 2005;27:21-35

Wound care

- Irrigate & debride, wet-to-dry gauze dressing
- Avoid primary closure
- Check tetanus status
- No antibiotics

CO in Florida, 2004 hurricanes



MMWR, July 22, 2005, 54(28); 697-700

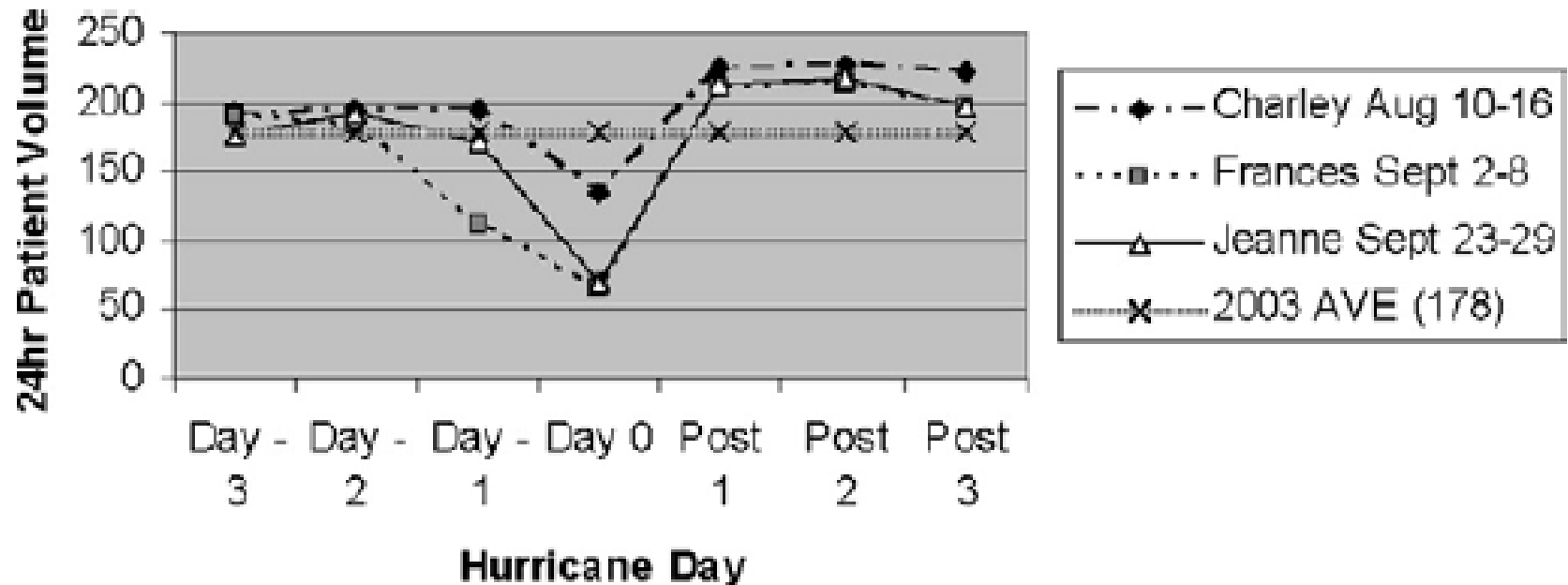
JHA, Hurricane injuries, COCA July 11 2013

TABLE. Number and percentage of patients with nonfatal carbon monoxide poisoning and COHb* level, by symptom and treatment — Florida, August–September 2004

| Symptom/Treatment | No. | (%) | Mean COHb level % |
|---|-----|--------|-------------------|
| Symptom† | | | |
| Headache | 132 | (80.0) | 19.9 |
| Nausea | 85 | (51.5) | 20.6 |
| Dizzy or lightheaded | 84 | (50.9) | 19.6 |
| Vomiting | 52 | (31.5) | 19.7 |
| Shortness of breath or dyspnea | 27 | (16.4) | 21.3 |
| Loss of consciousness | 24 | (14.5) | 25.0 |
| Lethargy or fatigue | 20 | (12.1) | 19.6 |
| Confusion or altered mental status | 19 | (11.5) | 24.9 |
| Difficulty walking or ataxia | 13 | (7.9) | 21.6 |
| Weakness | 13 | (7.9) | 19.1 |
| No symptoms | 8 | (4.8) | 14.8 |
| Treatment | | | |
| Emergency department only | 81 | (48.5) | 16.3 |
| Emergency department and HBO ₂ § | 73 | (43.7) | 22.9 |
| Hospitalization | 9 | (5.4) | 19.4 |
| Hospitalization and HBO ₂ | 4 | (2.4) | 33.5 |

MMWR, July 22, 2005, 54(28); 697-700

ED volume, 3 FL hurricanes 2004



Platz, J Emer Med, 2007; 33(1):39-46

Risk communication

- Carbon monoxide poisoning
- Heat exhaustion
- Prevent illness
- Hazards of flood waters
- Avoid personal injury
- Prevent mosquito-borne illnesses

<http://www.doh.state.fl.us/Hurricane/Hurricanefactsheet.html>

Post-hurricane monitoring

- Injuries
- Outbreaks
- Regular health maintenance

Summary

- Traumatic injuries are most relevant in storm recovery
- Risk communication is essential during all storm phases to mitigate injury

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Tornado Injuries — Prevention and Response

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Medical Officer

Health Systems Lead

Health and Trauma Systems Branch

National Center for Injury Prevention and Control

Division of Unintentional Injury Prevention



Enhanced Fujita Scale (EF Scale)

EF-0



EF-3



EF-1



EF-4



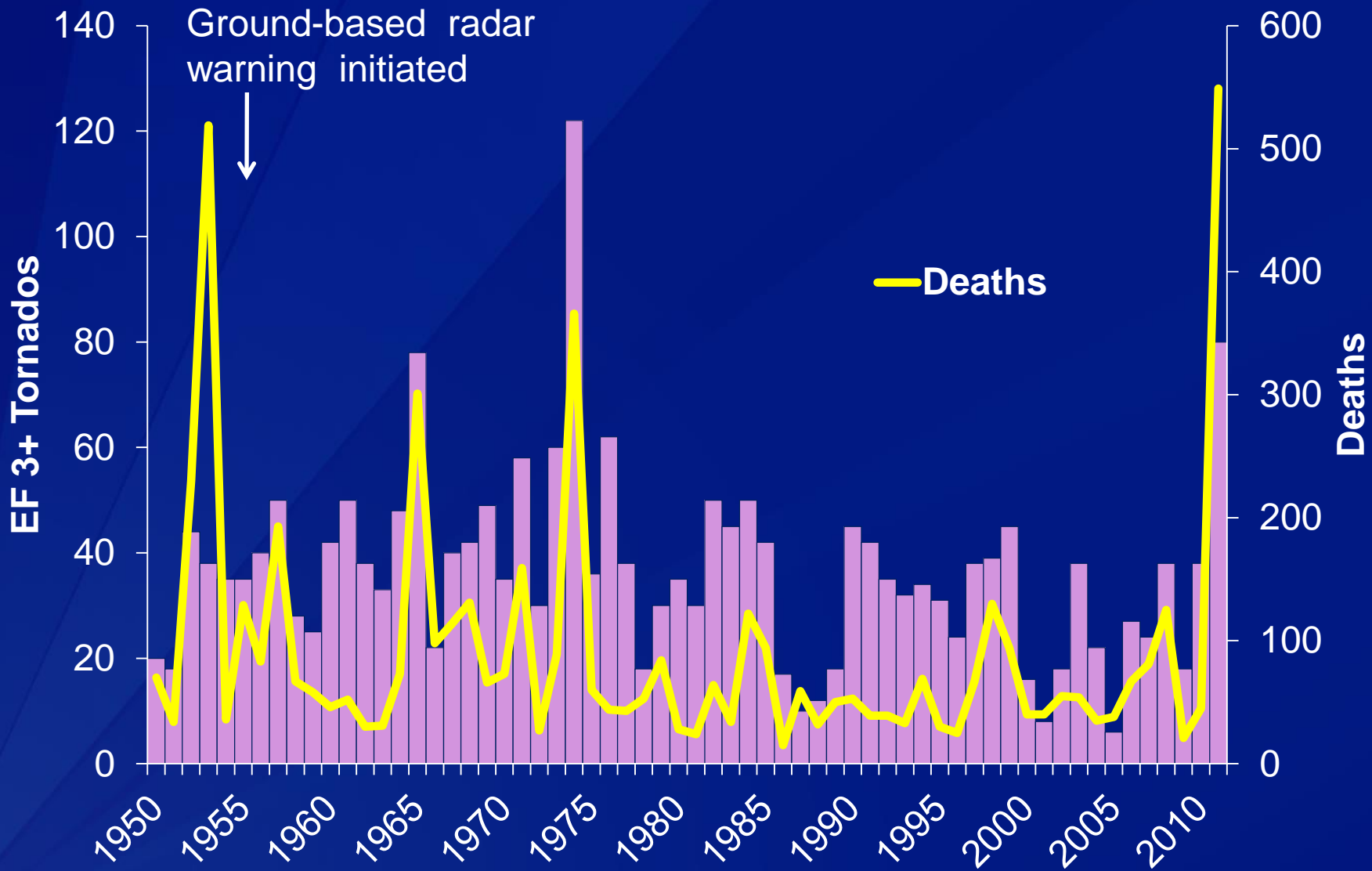
EF-2



EF-5



Intense U.S. Tornadoes and Deaths



Primary Prevention

- ❑ **Avoid exposure**
- ❑ **Get underground**
 - Storm Shelter
 - Basement
- ❑ **Last resort**
 - Lowest, windowless interior room in sturdy building
 - Remain belted in vehicle



Emergency Preparedness Guidance

CDC Home
Centers for Disease Control and Prevention
CDC 24/7: Saving lives, protecting people, reducing health costs

A-Z Index: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z #

Emergency Preparedness and Response

Emergency Preparedness & Response

Specific Hazards

Natural Disasters & Severe Weather

Tornadoes

Preparedness for All Hazards

What CDC Is Doing

What You Can Do

Blog: Public Health Matters

What's New

[Emergency Preparedness & Response](#) > [Specific Hazards](#) > [Natural Disasters & Severe Weather](#) > [Tornadoes](#)

During a Tornado

Signs of an Approaching Storm

Some tornadoes strike rapidly, without time for a tornado warning, and sometimes without a thunderstorm in the vicinity. When you are watching for rapidly emerging tornadoes, it is important to know that you cannot depend on seeing a funnel: clouds or rain may block your view. The following weather signs may mean that a tornado is approaching:

- A dark or green-colored sky.
- A large, dark, low-lying cloud.
- Large hail.



<http://www.bt.cdc.gov/disasters/>

<http://www.redcross.org/>

Be Red Cross Ready

Tornado Safety Checklist

A tornado is a violently rotating column of air extending from the base of a thunderstorm down to the ground. Tornado intensities are classified on the Fujita Scale with ratings between F0 (weakest) to F5 (strongest). They are capable of completely destroying well-made structures, uprooting trees and hurling objects through the air like deadly missiles. Although severe tornadoes are more common in the Plains States, tornadoes have been reported in every state.

Know the Difference

Tornado Watch

Tornadoes are possible in and near the watch area. Review and discuss your emergency plans, and check supplies and your safe room. Be ready to act quickly if a warning is issued or you suspect a tornado is approaching. Acting early helps to save lives!

Tornado Warning

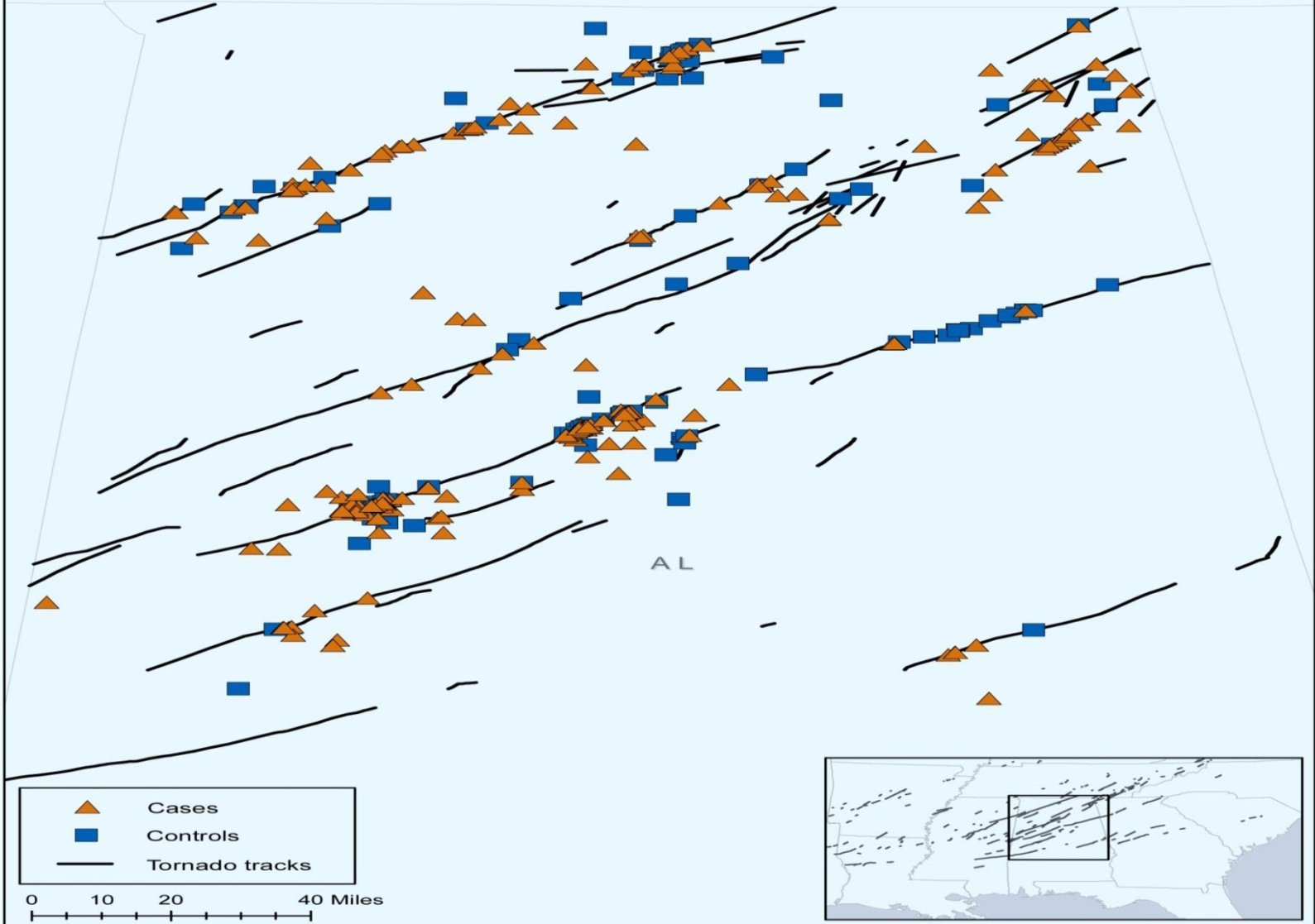
A tornado has been sighted or indicated by weather radar. Tornado warnings indicate imminent danger to life and property. Go immediately underground to a basement, storm cellar or an interior room (closet, hallway or bathroom).

What should I do to prepare for a tornado?

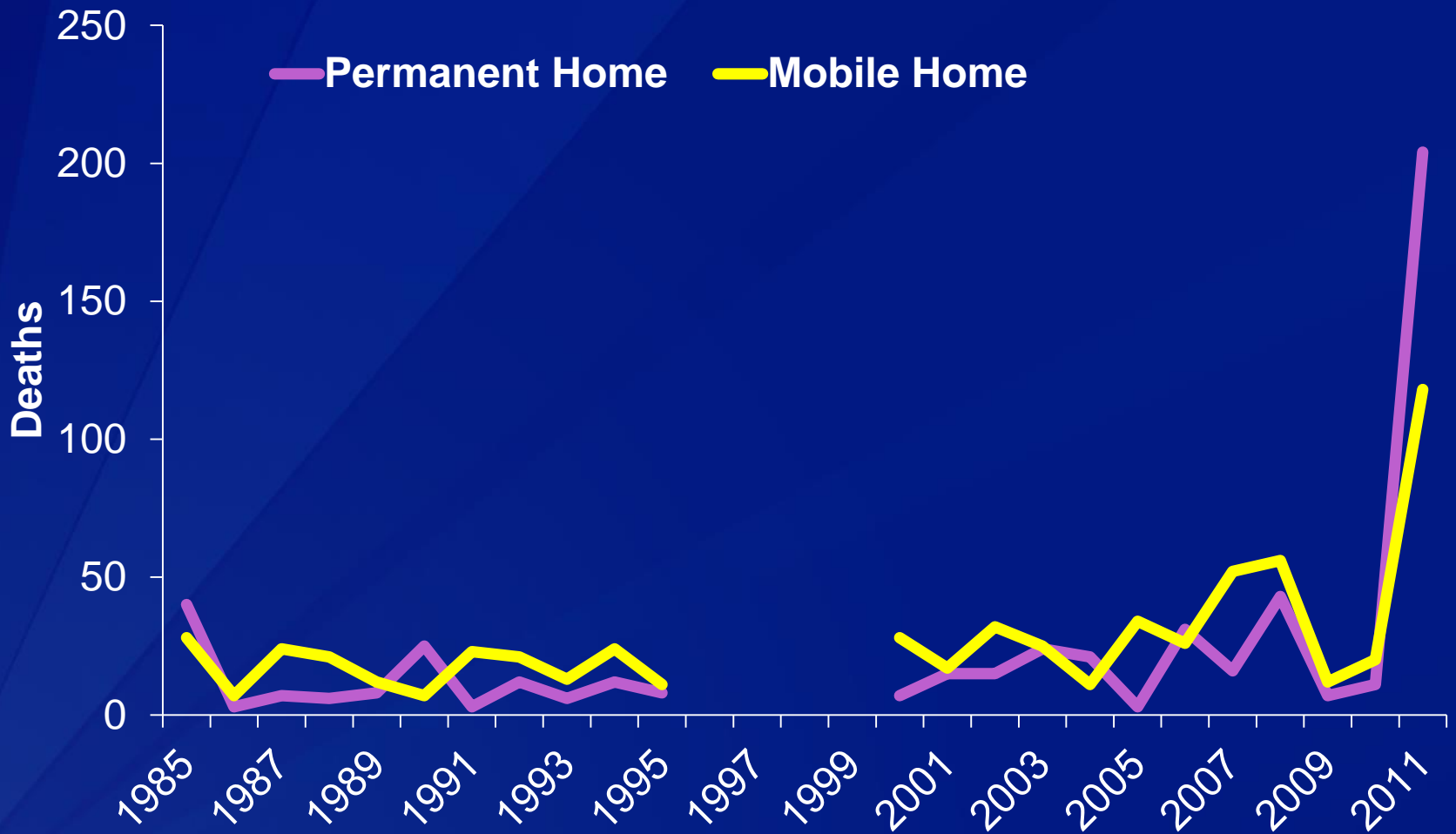
What should I do if a tornado is threatening?

What do I do after a tornado?

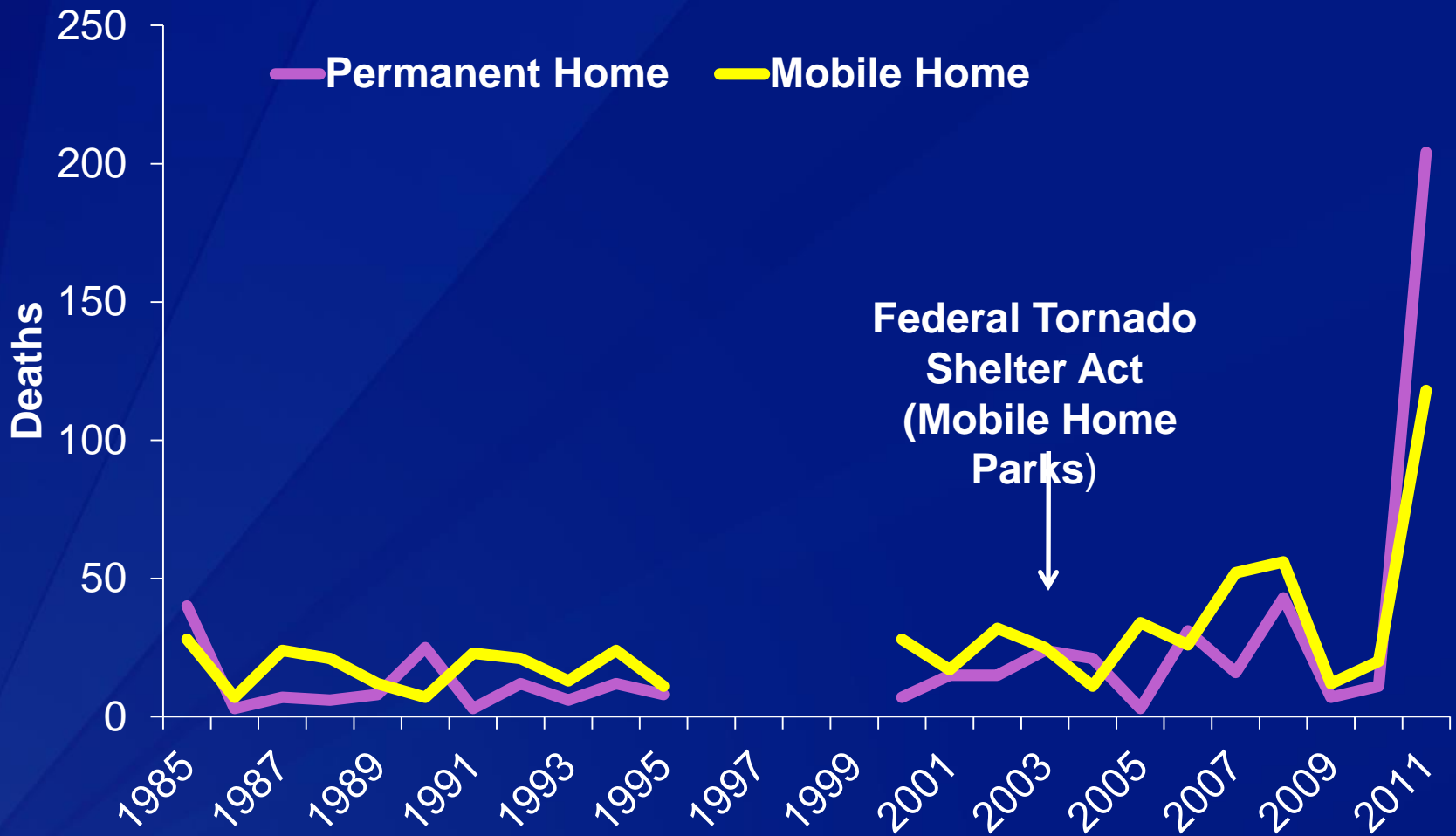
April 27, 2011 Alabama Tornadoes Injuries and Uninjured Controls



Death by Home Type (United States)



Death by Home Type (United States)



Clinical Care

❑ Bystander assistance

- Extrication
- Basic first aid

❑ EMS stabilization and triage

- Severe injuries to a trauma center
- Minor injuries to a non-trauma center

❑ Rapid treatment

Tornado Injuries



Common Injuries Presenting to ED (St. Michael Hospital, Oklahoma City)

- ❑ **Wounds (48%)**
 - Abrasions
- ❑ **Head injury (18%)**
 - Closed
- ❑ **Strains / sprains (12%)**
- ❑ **Fractures/ dislocation (12%)**
- ❑ **Abdominal trauma (6%)**
- ❑ **Chest trauma (3%)**
- ❑ **Spinal cord injury (<1%)**

Emergency Department Clinical Care (St. Michael Hospital, Oklahoma City)

- ❑ **Radiologic (47%)**
 - X-ray (40%)
 - CT (7%)
- ❑ **Wound Care (27%)**
 - General (20%)
 - Sutures (6%)
 - Cultures <1%
- ❑ **Resuscitative efforts (20%)**
 - IV access (12%)
 - Intubation (3%)
- ❑ **Fracture care (5%)**

Tornado Wound Infections

❑ Environmental source (soil)

- Aerobic gram negative bacilli (multiple species)
- *Clostridium perfringens*
- Fungal (cutaneous mucormycosis in Joplin, MO)

❑ Possible nosocomial source

Wound Treatment

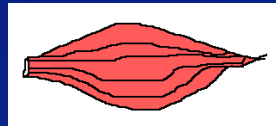


Emergency Department

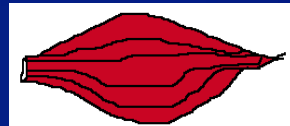


Operating Room

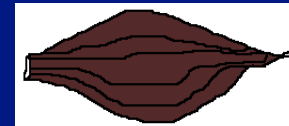
Crush Syndrome / Rhabdomyolysis



2



4



6

Hours of
ischemia



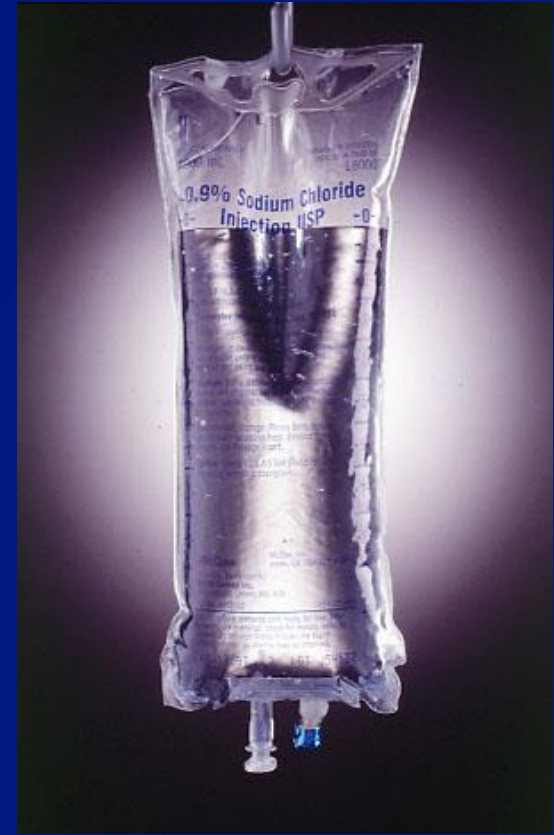
Crush Injury Treatment

❑ Prehospital (>4 hours)

- IV fluids
- Remove crush object

❑ Hospital

- Continue IV fluids
- Diuretics (i.e. mannitol)
- Assess for compartment syndrome



Surveillance



FEMA Disaster Recovery Assistance Files



25282

Federal Register / Vol. 78, No. 83 / Tuesday, April 30, 2013 / Notices

7. To federal, state, tribal, and local government agencies for the purpose of contacting FEMA IHP applicants to seek their voluntary participation in surveys or studies concerning effects of disasters, program effectiveness, and to identify possible ways to improve community preparedness and resiliency for future disasters.

Thank you

David Sugerman
ggi4@cdc.gov

For more information please contact Centers for Disease Control and Prevention

1600 Clifton Road NE, Atlanta, GA 30333

Telephone, 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348

E-mail: cdcinfo@cdc.gov Web: www.cdc.gov

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National Center for Injury Prevention and Control

Division of Unintentional Injury Prevention





Centers for Disease Control and Prevention Atlanta, Georgia

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<http://www.cdc.gov/TCEOnline/>

Those who participate in the COCA Conference Calls and who wish to receive CE credit/contact hours and will complete the online evaluation by **August 12, 2013** will use the course code **EC1648**. Those who wish to receive CE credits/contact hours and will complete the online evaluation between **August 13, 2013** and **July 10, 2014** will use course code **WD1648**. CE certificates can be printed immediately upon completion of your online evaluation. A cumulative transcript of all CDC/ATSDR CE's obtained through the CDC Training & Continuing Education Online System will be maintained for each user.

Thank you for joining!
Please email us questions at
coca@cdc.gov


Emergency Preparedness and Response

[Emergency Preparedness & Response](#) > [Preparedness for All Hazards](#) > [Clinician Resources](#) > [COCA Conference Call](#)

Emergency Preparedness & Response

- Specific Hazards
- Preparedness for All Hazards
- Clinician Resources
- COCA Conference Calls
 - Conference Calls - 2013
 - ▶ **July 11, 2013**
- What CDC Is Doing
- What You Can Do
- Blog: Public Health Matters
- What's New
- A - Z Index**


Prevention and Treatment of Injuries Following Hurricanes and Tornadoes

 = Continuing Education

Date: Thursday, July 11, 2013

Time: 2:00 - 3:00 pm (Eastern Time)


Location: Participate by Phone:


Dial: 888-324-7179 

Passcode: 2434519

Participate by Webinar: <https://www.mymeetings.com/nc/join.php?i=PW2616952&p=2434519&t=c>

Presenter(s):

 **David Sugerman, MD, MPH, FACEP**
Health Systems Team Lead
Division of Unintentional Injury Prevention
National Center for Injury Prevention and Control
Centers for Disease Control and Prevention

 **John H. Armstrong, MD, FACS**
State Surgeon General and Secretary of Health
Florida Department of Health


Overview:
Injuries following tornadoes and hurricanes result in significant morbidity and mortality. Both CDC and State Health Departments play important roles in providing assistance in disaster preparedness and response, including pre-hospital transport decision making, injury surveillance, and emergency risk communication. Following hurricanes and tornadoes, it is critical to have alternative treatment sites, appropriate wound management, injury data collection, and health messaging to reduce injuries. During this COCA call, subject matter experts will discuss the current state of science and epidemiology and state level response, with specific examples from Florida.

<http://emergency.cdc.gov/coca>

Upcoming COCA Call

July 23, 2013


Understanding the Public's Response to a Possible Scenario Involving Inhalation Anthrax

 = Continuing Education

Date: Tuesday, July 23, 2013

Time: 2:00 - 3:00 pm (Eastern Time)

Location: Participate by Phone:

Dial: 888-233-9077 

Passcode: 8674163

Participate by Webinar: <https://www.mymeetings.com/nc/join.php?i=PW1019513&p=8674163&t=c>

Presenter(s):



Gillian SteelFisher, PhD, MSc
Harvard Opinion Research Program
Harvard School of Public Health



Laura J. Ross, PhD
Division of State and Local Readiness
Office of Public Health Preparedness and Response
Centers for Disease Control and Prevention

<http://emergency.cdc.gov/coca>

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Government Organization
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About

 3,758
Photos Likes Map

Highlights

Status Photo / Video Offer, Event +

What's going on CDC Health Partners Outreach?

 CDC Health Partners Outreach shared a link via CDC.
April 24 · v8

 CDC Works For You 24/7 Blog - H7N9 Influenza: 6 Things You Should Know Now
go.usa.gov
CDC - Blogs - CDC Works For You 24/7 Blog - H7N9 Influenza: 6 Things You Should Know Now
Like Comment Share 2
304 people saw this post Boost Post

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April 23 at 10:30pm

 Art Leather
Cape Cod Artist Paints Chronic Pain <http://paintingpan.c...>
April 23 at 10:27pm

 Art Leather
Cape Cod Artist Paints Chronic Pain <http://paintingpan.c...>
April 23 at 10:24pm

 Art Leather
Cape Cod Artist Paints Chronic Pain <http://paintingpan.c...>
April 23 at 10:15pm

 Art Leather
Cape Cod Artist Paints Chronic Pain <http://paintingpan.c...>
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