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Industrial Emergencies Case Studies from New Orleans

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Introductions:



Jeffrey E. Carter, MD, FACS
 Professor of Surgery, LSUHSC New Orleans
 Medical Director, UMC Burn Center
 Medical Director, LCMC Supply Chain



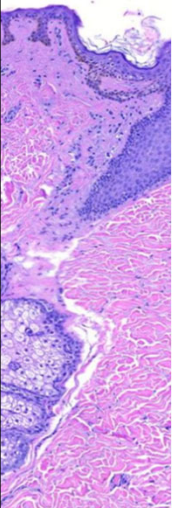


Carl A. Flores, NRP
 Burn Outreach Coordinator, UMC
 American Burn Association:

- Southern Regional Burn Disaster Coordinator
- Disaster Chair

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Disclosures

CARTER

Stockholder: Spectral MD Inc.

Consultant:

- **Avita Medical Ltd, PolyNovo Ltd., & Spectral MD Inc.**- *in lieu of compensation all proceeds are donated to a local burn charities to support burn education, survivor programs, outreach, & research*

Research Support:

1. BARDA	Lead Investigator	\$98.6 million	Burn Imaging & AI
2. DoD	Lead Investigator	\$9.4 million	Prehospital Education
3. DHA	Lead Investigator	\$1.3 million	Burn Imaging & AI
4. NIH R01	Co-Investigator	\$1.1 million	Lipids in Burn Injury

FLORES

Consultant:

- Stryker Medical
- Ring Rescue Inc.
- Compression Works

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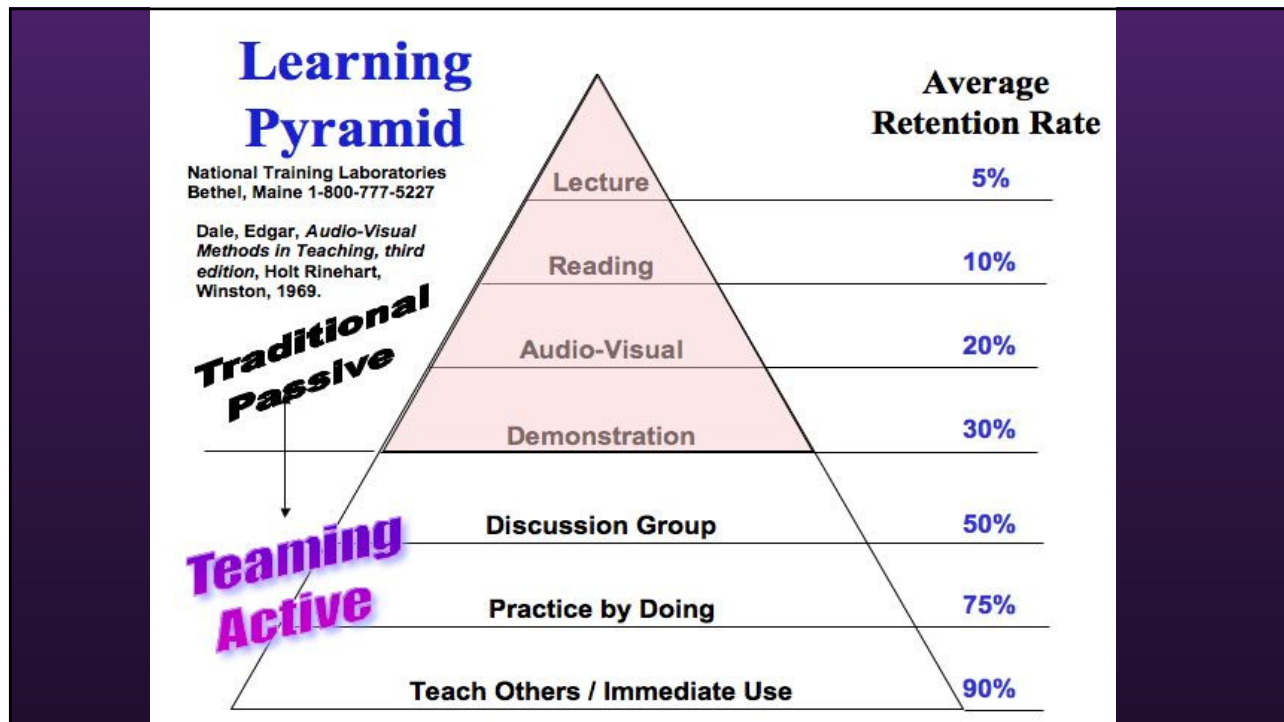




Objectives:

1. Identify at least one immediate clinical impact from industrial disasters.
2. Identify at least one delayed clinical impact from industrial disasters.
3. Identify at least three steps to improve disaster preparedness from industrial emergencies.

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- Louisiana:
 - Over 4,000 oil & gas rigs
 - 2 of 4 Petro reserves
 - Top 10 natural disaster
- GNO:
 - 7k ships/year unchecked
 - 250k barges/year
 - 85% of hazardous

• Southeastern Louisiana University, Accessed June 2018 <https://www2.southeastern.edu/orgs/oilspill/environment.html>
 • Office of Fossil Energy, Accessed June 2018 <https://www.energy.gov/fe/services/petroleum-reserves/strategic-petroleum-reserve/spr-storage/sites>
 • FEMA Disaster Report, Accessed June 2018 <https://www.fema.gov/disasters/state-tribal-government>
 • New Orleans Preparedness for Terrorism 2010 https://assets.aspeninstitute.org/content/uploads/files/content/docs/pubs/NewOrleans_report

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WV NEWS

Accident at

Six injured in explosion at Westlake Chemical





ad

New Orleans Area: Northern Tool & Equipment, Visit The Product Experts

Northern Tool + Equipment

FOLLOW US



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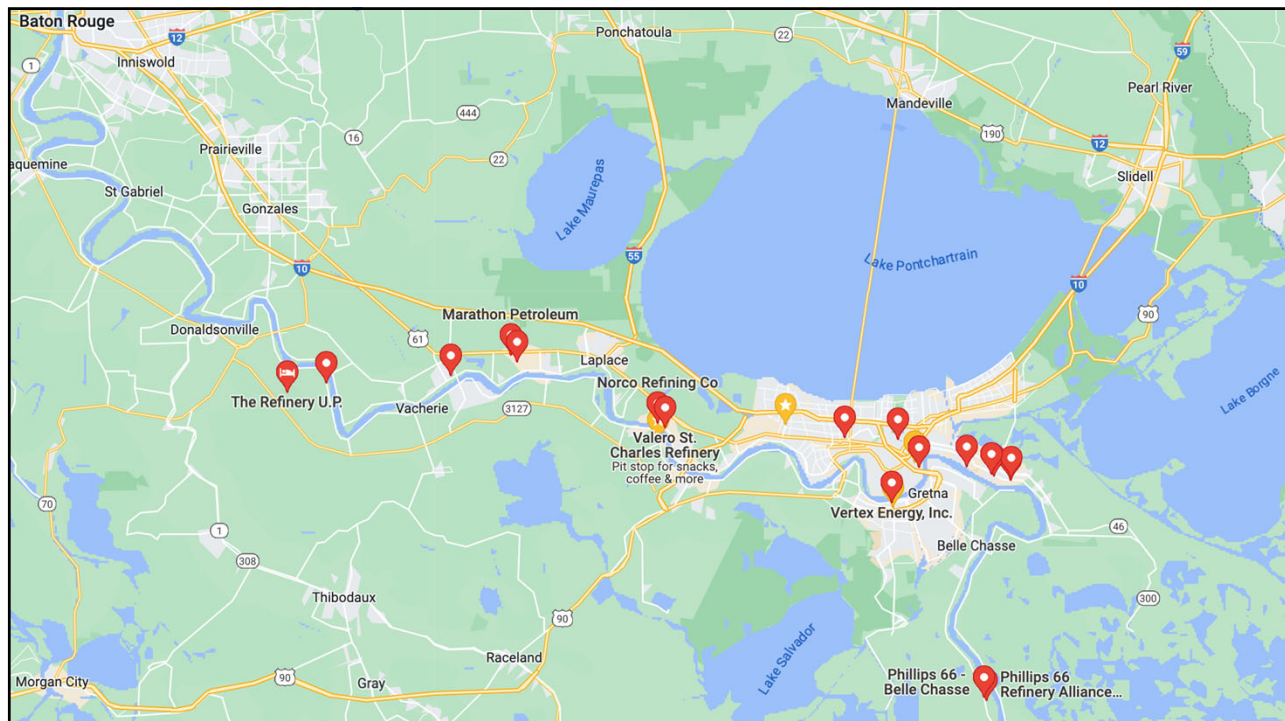
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Marathon Refinery



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Potential Hazards



Burn & Trauma Center Outreach and Education

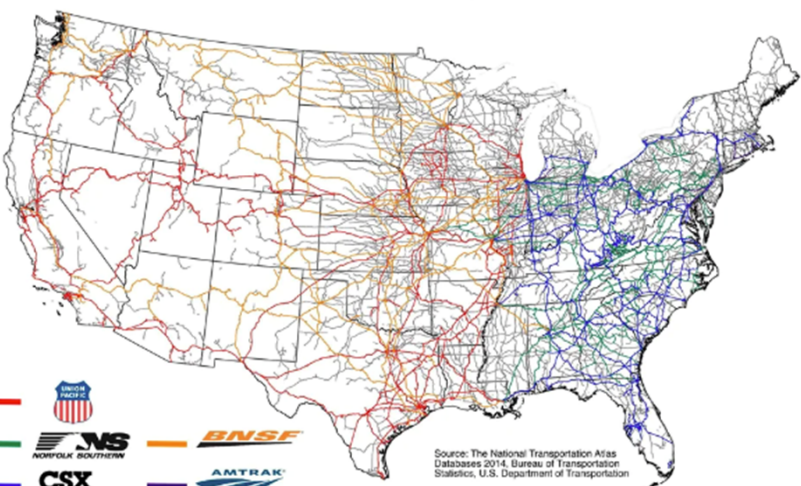
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Industry: RAILROAD

185 US Railroad Lines by Ownership

U.S. Railroad Lines by Ownership



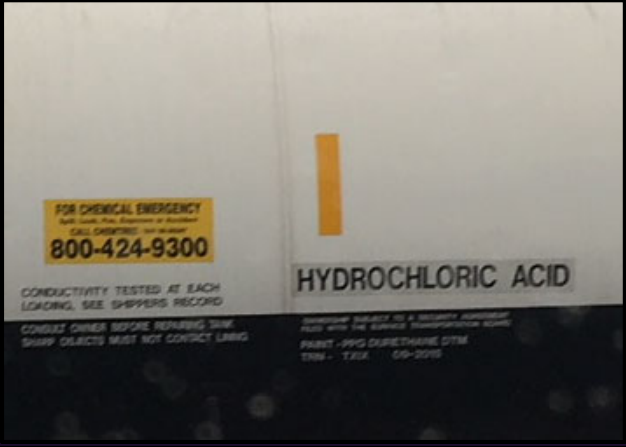
Source: The National Transportation Atlas Databases 2014, Bureau of Transportation Statistics, U.S. Department of Transportation
www.mapattacks.com

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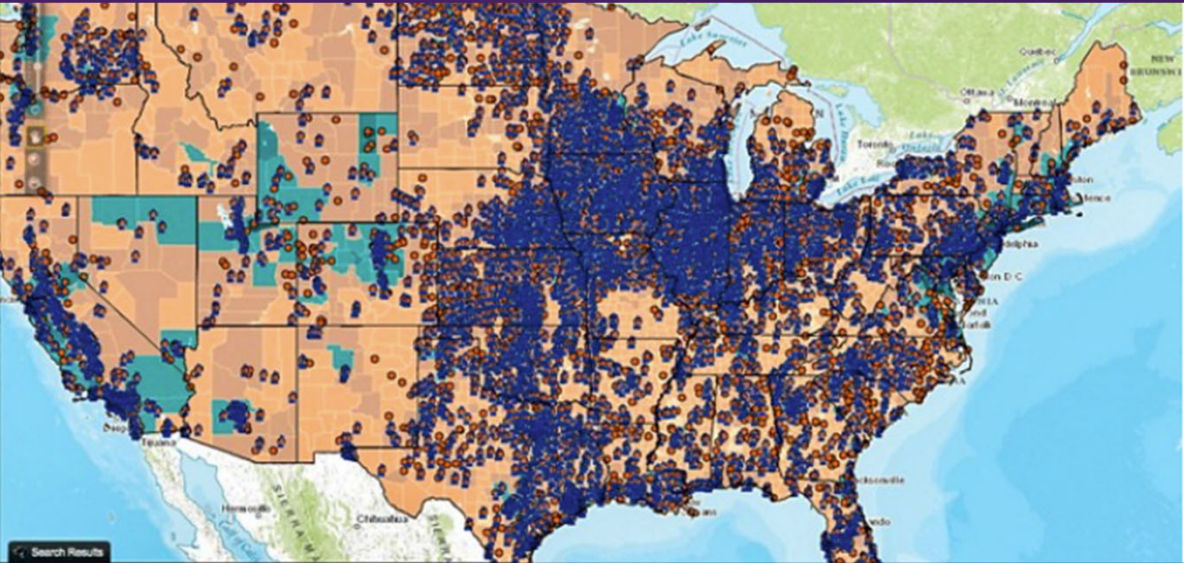


5 primary schools within 100 yards of railroad in 1 parish





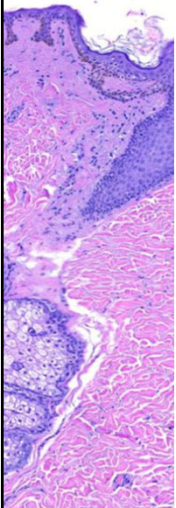
Burn & Trauma Center Outreach and Education

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Blue Dots represent schools within 1 mile of a high-risk chemical facility

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Background

The World Health Organization defines disaster as, “***a sudden phenomenon of sufficient magnitude to overwhelm the resources of a hospital, region, or location requiring external support.***”



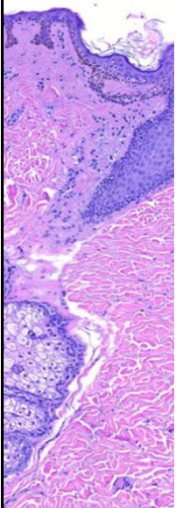
Source: Image by Jeffrey Carter, Lviv, Ukraine, 2023.

Source: Gebbie KM, Qureshi K. Emergency and disaster preparedness: core competencies for nurses. *Am J Nurs.* 2002 Jan;102(1):46-51.



2022 Trauma Center, Lviv, Ukraine

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Background

- **85%** of hospitals reported experiencing a disaster event **within 5 years** of survey
- **73%** of hospital could not **continue operations** beyond one week without help
- **18%** of hospitals believed their **disaster plans were sufficient**

Source: Image NPR News. [New wildfire warnings have Boulder, Colo., on edge](#) : NPR Accessed May 31, 2002

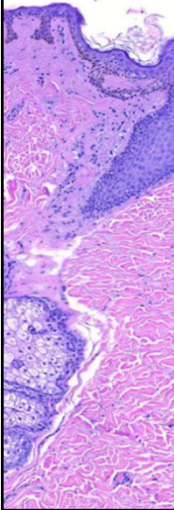
Source: Vick DJ, Wilson AB, Fisher M, Roseamelia C. Assessment of community hospital disaster preparedness in New York State. *Jour Emer Man* 2018;16(4):213-27.

Source: Kaji AH, Lewis RJ. Hospital disaster preparedness in Los Angeles County. *Acad Emerg Med* 2006;13(11):1198-203.



Wildfires, Boulder, Colorado, 2021

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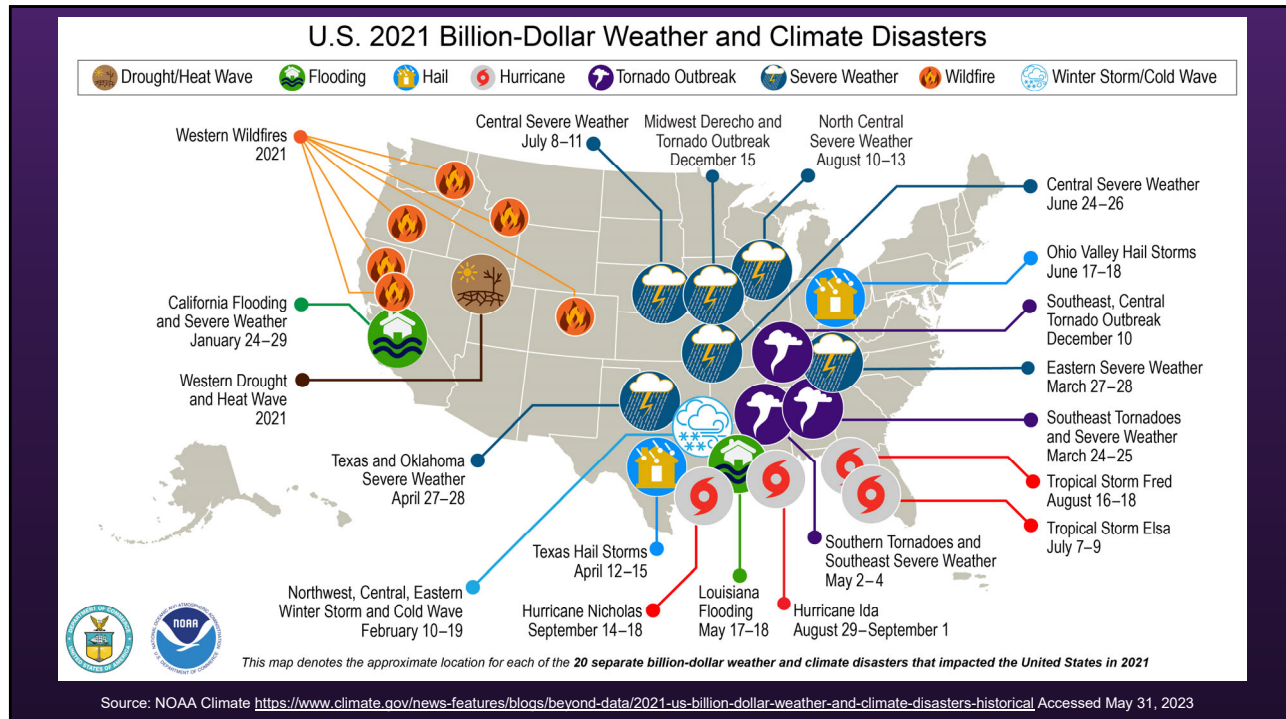


Background

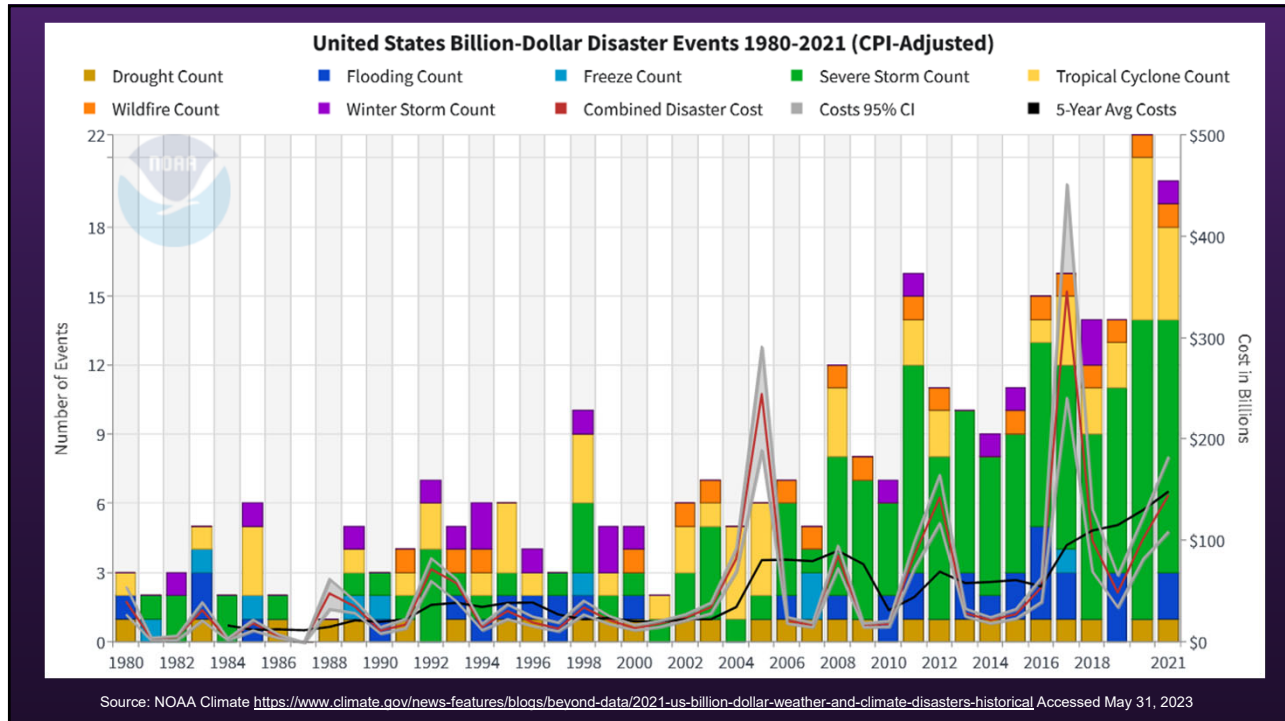
1. 15-39% of all burn injuries occur at work with larger injuries at industrial plants.
2. 10% of burn patients have concomitant trauma
 - Patients with combined burn and trauma injuries have a mortality **4-5x HIGHER** than either alone.
3. High incidence of contact as mechanism of burn injury
4. 25-30% of those injured in a mass disaster or terrorist attack will sustain moderate to severe burn injuries

- Mian MAH, Mullins RF, Alam B, Brandigi C, Friedman BC, Shaver JR, Hassan Z. Workplace-related burns. *Ann Burn Fire Disasters* 2011;30:89-93.
- Reichard AA, Srinivas K, Jackson LL. Occupational Burns Treated in Emergency Departments. *AM J Ind Med.* 2015;58:290-8.
- Varghese TK, Kim AW, Kowal-Vern A. Frequency of Burn-Trauma Patients in an Urban Setting. *JAMA Surg* 2003;138(12):1292-96.
- Disaster Management and the ABA Plan. ABA Board of Trustees, Committee on Organization and Deliver of Burn Care. *J Burn Care Rehab* 2005;26(2):102.
- ABA Organizational and Delivery Burn Care. Operation Gotham Shield, 2017.

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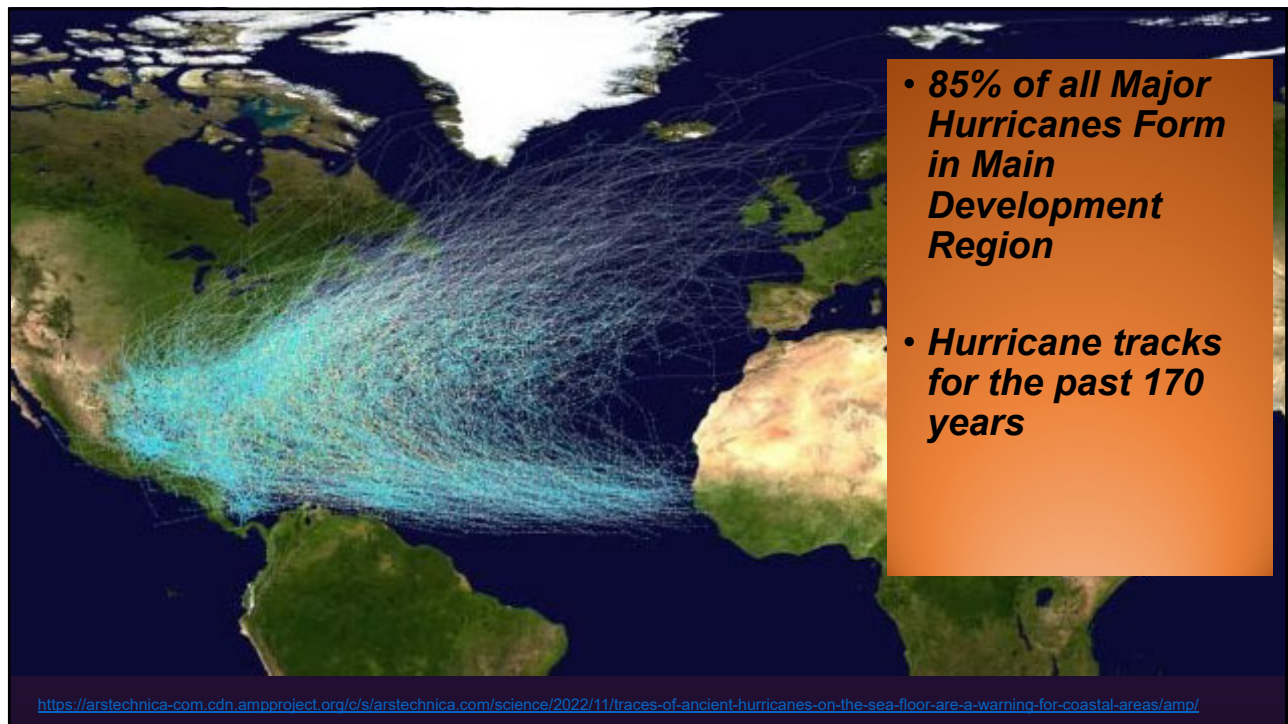
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Flood Risk to Hospitals From Hurricanes Atlantic & Gulf Coasts

Rank	Metropolitan Statistical Area	Hospitals at Risk (%)	Beds at Risk (%)	RR Hurricane Strike (Cat 2)
1	Miami, Ft Lauderdale, Palm Beach	38 (78%)	12,904 (71%)	183.6
2	New York, Newark, Jersey City	25 (20%)	9,271 (19%)	15.4
3	Boston, Cambridge, Newton	6 (15%)	2,240 (24%)	9.6
4	Orlando, Kissimmee, Sanford	1 (33.3%)	221 (45%)	136.5
5	New Orleans, Metairie	15 (79%)	3,471 (82%)	137.7
6	Tampa, St. Petersburg, Clearwater	8 (29%)	2,507 (30%)	89.3
7	North Port, Sarasota, Bradenton	6 (86%)	2,056 (95%)	69.4
8	Jacksonville	6 (43%)	2,004 (48%)	75.0
9	Cape Coral, Fort Myers	4 (80%)	1,542 (95%)	44.3
10	Philadelphia, Camden, Wilmington	5 (10%)	1,639 (11%)	3.2

Source: Tarabochia-Gast AT, Michanowicz DR, Bernstein AS. Flood Risk to Hospitals on the US Atlantic & Gulf Coasts From Hurricanes & Seal Level Rise. *GeoHealth*, 6, e2022GH000651.

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• **“This map covers 13 states in the Southeast United States. It illustrates the convergence of social vulnerability factors (such as economic standing and age, among others) and four environmental hazards: flooding, hurricane force winds, sea-level rise, and drought.”**

Mapping social vulnerability in southeastern states and the Gulf Coast

• <https://www.oxfamamerica.org/explore/countries/united-states/poverty-in-the-us/mapping-social-vulnerability-in-southeastern-states-and-the-gulf-coast/>

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Be Prepared

Perform a regional risk assessment

Sentinel Species are organisms, commonly animals, **used to provide advance warning of dangers** such as toxic exposures due to increased susceptibility relative to humans.

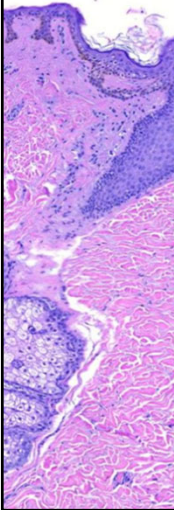
Source: Image Gorge McCaa, U.S. Bureau of Mines [The Story of the Real Canary in the Coal Mine | Smart News | Smithsonian Magazine](#) Accessed May 31, 2023.
Source: National Research Council 1991. *Animals as Sentinels of Environmental Health Hazards*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/1351>.
Source: Burnett, E., Gawaziuk, J. P., Shek, K. & Logsetty, S. Healthcare resource utilization associated with burns and necrotizing fasciitis. *J. Burn Care Res.* 38, e886–e891 (2017).
Image: Mining Foreman R. Thornburg with a canary assessing carbon monoxide gas in 1928.

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Improving Industrial Disaster Preparedness

Know Your Resources

Lady of the Sea Hospital, Galliano, Louisiana Hurricane Ida, 2021

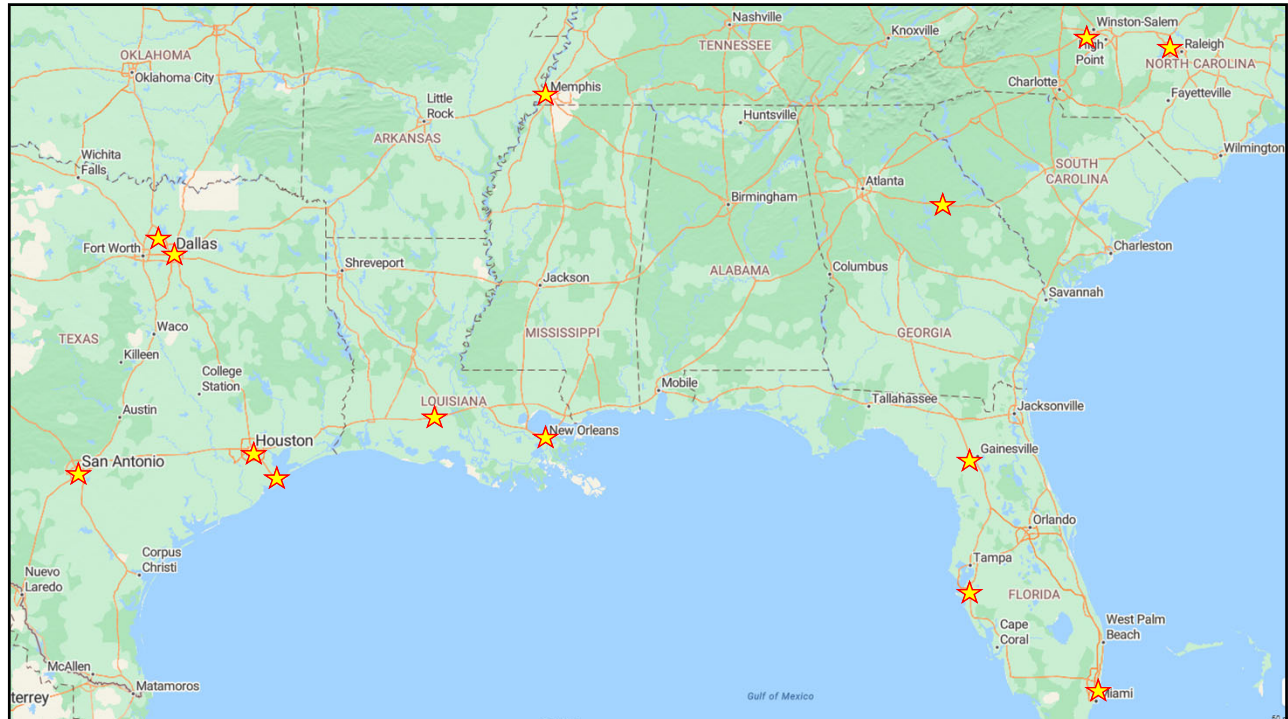


- **Burn Care**
 - ~250 practicing burn surgeons
 - <135 burn centers (~2%) & 56% verified

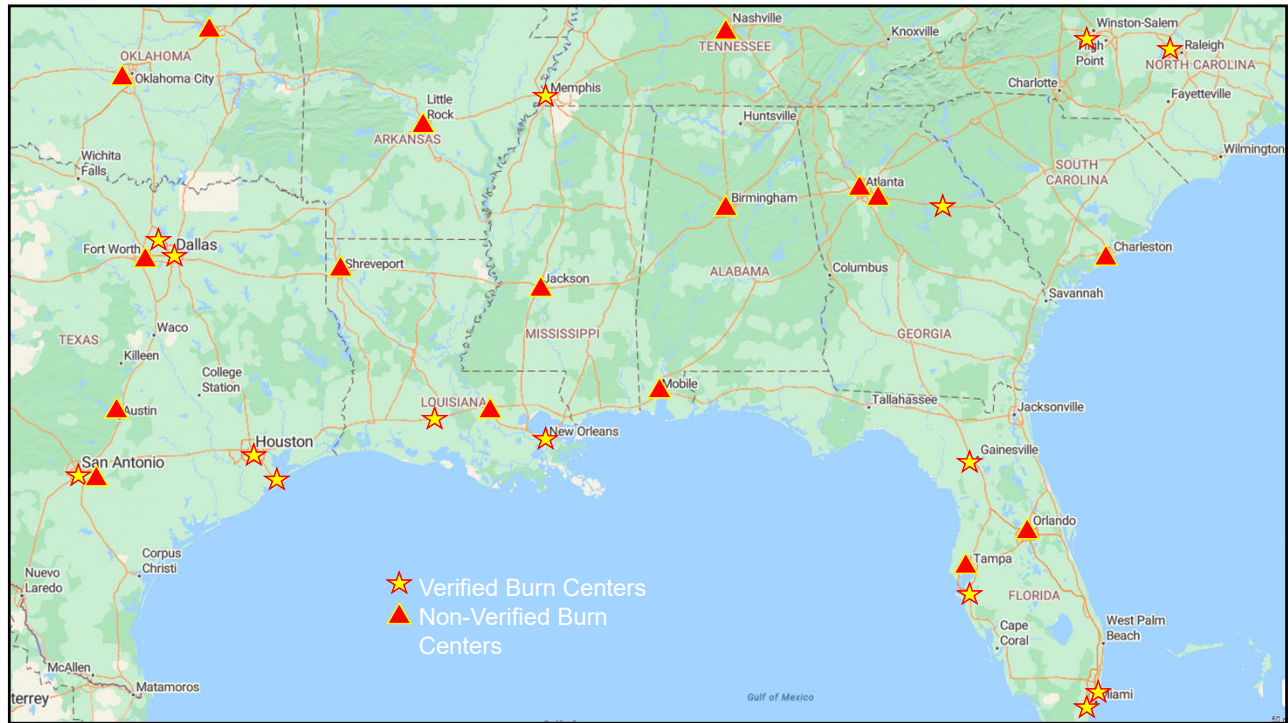
- **Trauma Care**
 - ~313 trauma surgeons **trained per year**
 - >600 Lvl 1 or 2 trauma centers & >90% ACS verified

Source: NBC News. [WATCH: Hurricane Ida Rips Roof Off Hospital – NBC 6 South Florida \(nbc6miami.com\)](#) Accessed August 29th, 2021
 Source: Image Gorge McCaa. U.S. Bureau of Mines [The Story of the Real Canary in the Coal Mine | Smart News | Smithsonian Magazine](#) Accessed May 31, 2023.
 Source: Ortiz-Pujols M, Thompson K, Sheldon GF, et al. "Burn care: Are there sufficient providers and facilities?" ACS Health Policy Research Institute, November 2011.
 Source: ACS Trauma Centers <https://www.facs.org/search/trauma-centers?country=United%20States> Accessed March 22, 2018.
 Source: Bazzoli GJ, MacKenzie EJ. Trauma Centers in the United States: identification and examination of key characteristics. *J Trauma* 1995;38:103-10.
 Source: EAST Trauma Fellowships <https://www.east.org/professional-development/fellowships> Accessed March 22, 2018.
 Source: American Board of Surgery SCC Exam <http://www.absurgery.org/default.jsp?statcrit> Accessed March 22, 2018.
 Source: Cohn SM, Price MA, Villarreal CL. Trauma and surgical critical care workforce in the United States: a severe surgeon shortage appears imminent. *J Am Coll Surg* 2009;4:446-52.
 Source: JAMA Appendix Graduate Medical Education 2021-2022. 2022;11:9951112-46.
 Source: National Research Council 1991. *Animals as Sentinels of Environmental Health Hazards*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/1351>.
 Source: Jeschke, M.G., van Baar, M.E., Choudhry, M.A. et al. Burn injury. *Nat Rev Dis Primers* 6, 11 (2020).

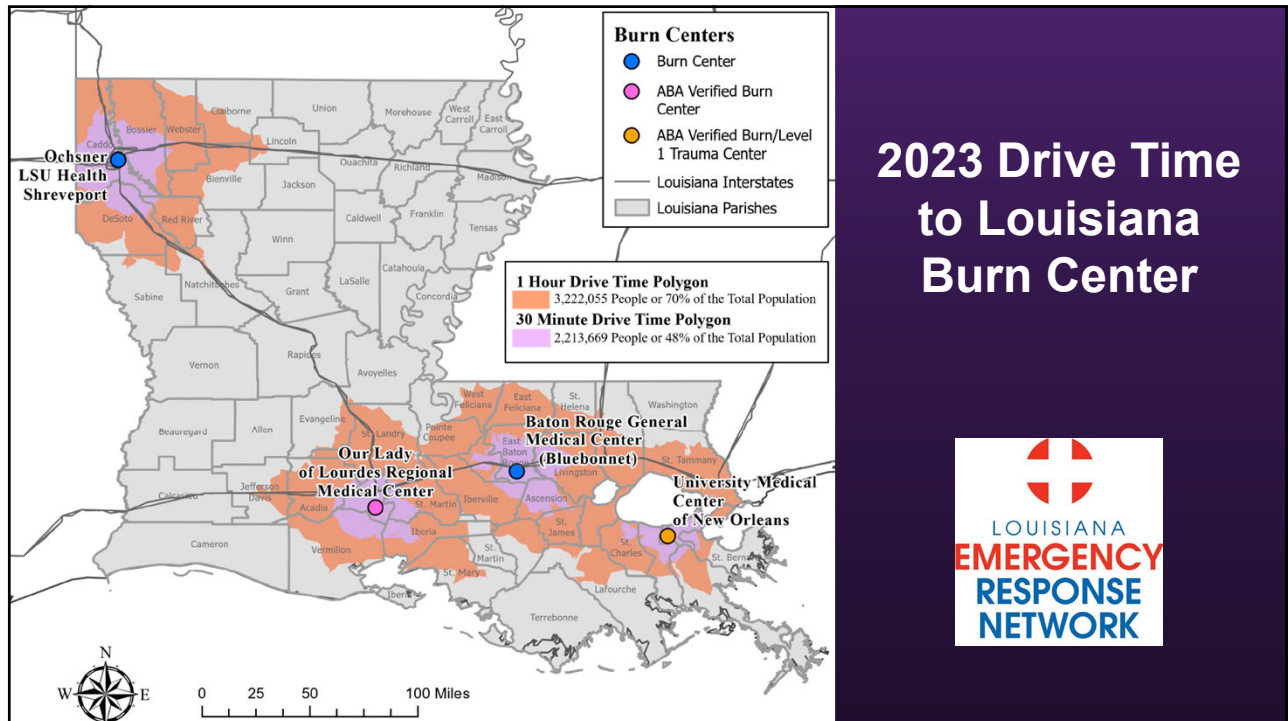
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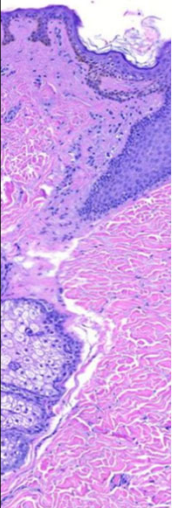
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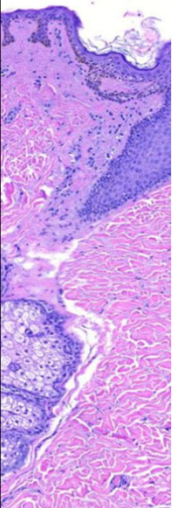
Know Your Resources



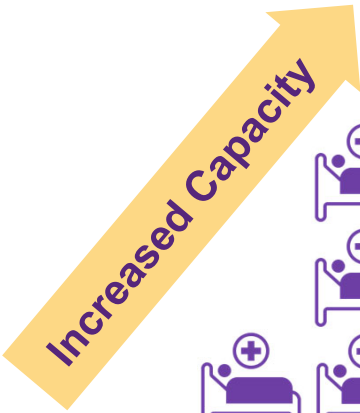
- 1. BARDA (Biomedical Advanced Research Development Authority)** promotes the advanced development of medical countermeasures to protect Americans and respond to 21st century health security threats
- 2. Medical Countermeasures**
 - A. Chemical, Biologic, Radiologic, & Nuclear (CBRN)
 - B. Influenza & Emerging Infectious Diseases
 - C. Detection, Diagnostics, & Device Infrastructure
 - D. Pharmaceutical Countermeasures

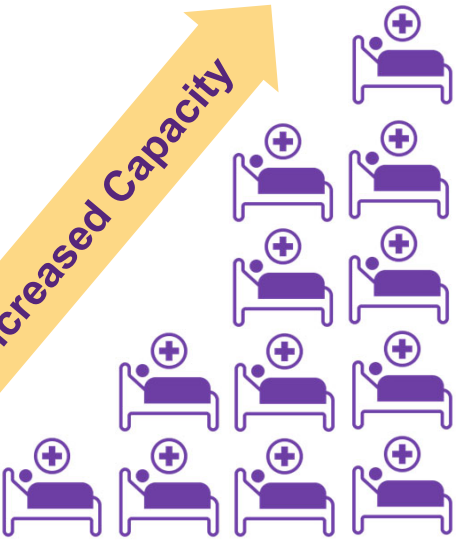
Source: BARDA Medical Countermeasures <https://www.medicalcountermeasures.gov/barda/cbrn/>


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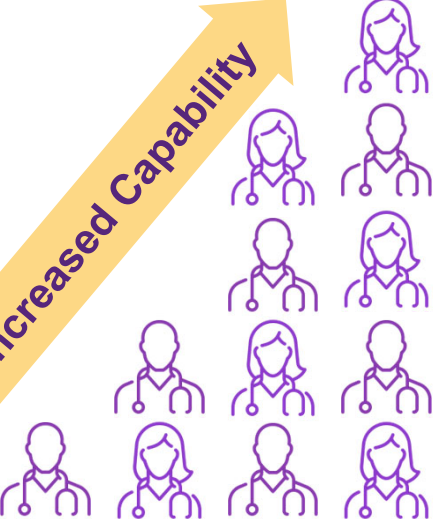



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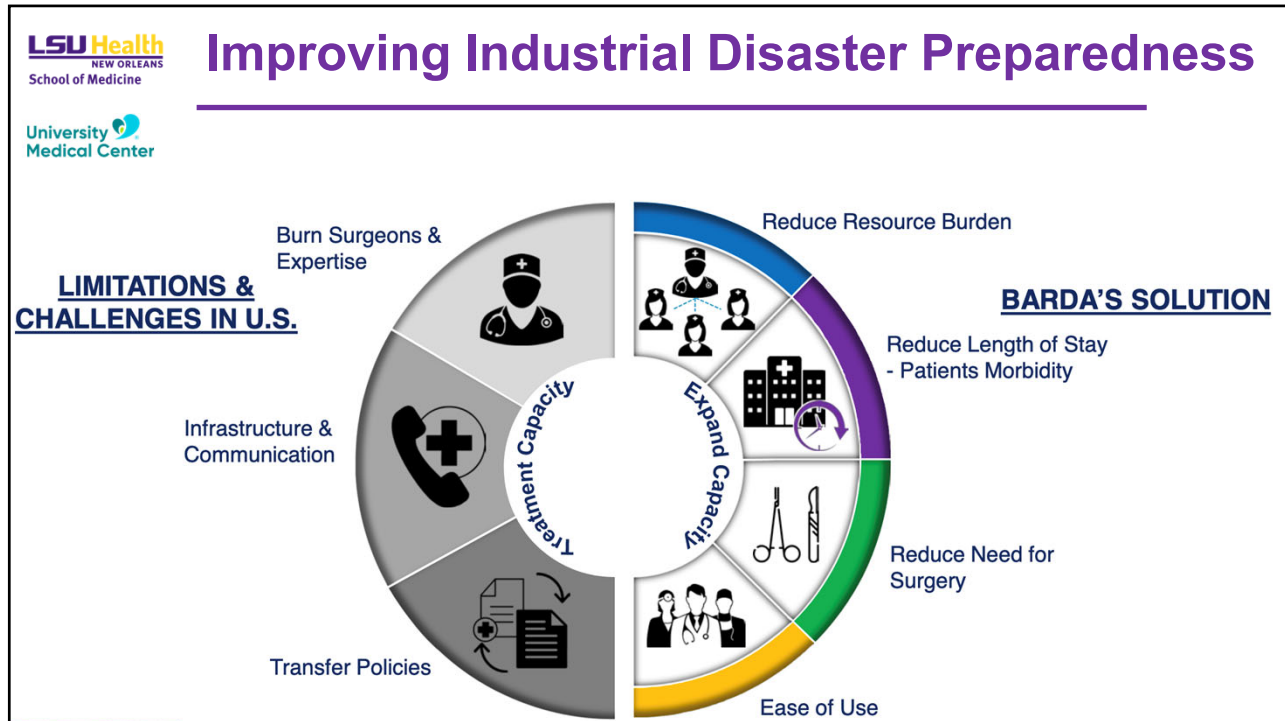









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 BARDA Chemical, Biological, Radiological, and Nuclear (CBRN) Medical Countermeasures			
Company	Product	Role	Contract & Options
Argentum Medical	Silverlon	Antibacterial dressing	\$16,500,000
Avita Medical	ReCell	Definitive wound closure partial & full-thickness	\$54,000,000
Keranetics	Kerastat	Radiation dermatitis	\$3,500,000
Mediowound	Nexobrid	Enzymatic debridement of partial & full-thickness	\$112,000,000
Philips North America	Lumify Ultrasound	AI-Ultrasound for lung injury/infection	\$35,000,000
PolyNovo	BTM	Temporary wound closure	\$36,000,000
Rivanna	Accuro XV	Ultrasound detection of fracture	\$65,000,000
Spectral MD	DeepView	AI-MSI for non-healing burn wounds	\$98,600,000
Stratatech/Mallinckrodt	Stratagraft	Definitive wound closure partial-thickness	\$247,000,000

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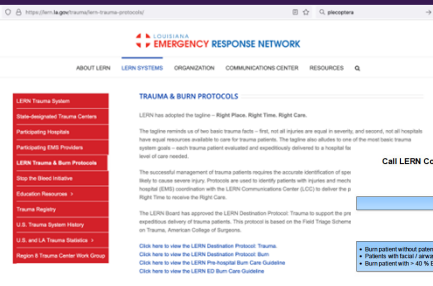



- ED Burn MCI Cart
- Hurricane Supplies for staff
- Pre-position supplies
- **STOP THE BURN**
 - Push Packs for BURN Disaster
 - 21 kits in Louisiana
 - 10 patients with 10% TBSA per kit
 - Aligns with SNS/BARDA & LERN
 - First Responder training

Source: Administration for Strategic Preparedness & Response [Home \(hhs.gov\)](https://www.hhs.gov). Accessed May 31, 2023.

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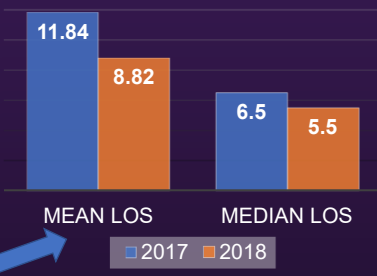
Be Prepared



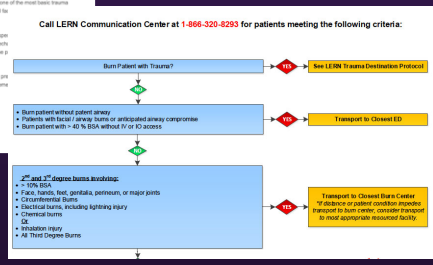
Established Prehospital

- Routing by EMS
- Standardized Care
- Implemented

Length of Stay for ALL Burn Injured Patients in Louisiana Before & After Routing by



Metric	2017	2018
MEAN LOS	11.84	8.82
MEDIAN LOS	6.5	5.5



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Improving Industrial Disaster Preparedness

- **Test Your Weaknesses**
 - Simulate often
 - Use endemic data from trauma/EM/burn case review
 - Welcome local experts




Source: Administration for Strategic Preparedness & Response [Home \(hhs.gov\)](https://www.hhs.gov). Accessed May 31, 2023.


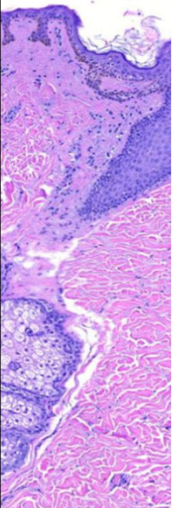
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Inhalation Injury



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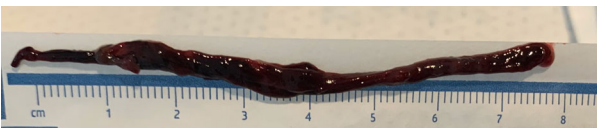
3 Phases:

1st Phase (0-36 hours)
CO, Cyanide, & Hypoxia

2nd Phase (24-72 hours)
Sloughing Airway, Edema, & Casts

3rd Phase (>72 hours)
Bronchopneumonia

Herndon Burns 3rd Ed

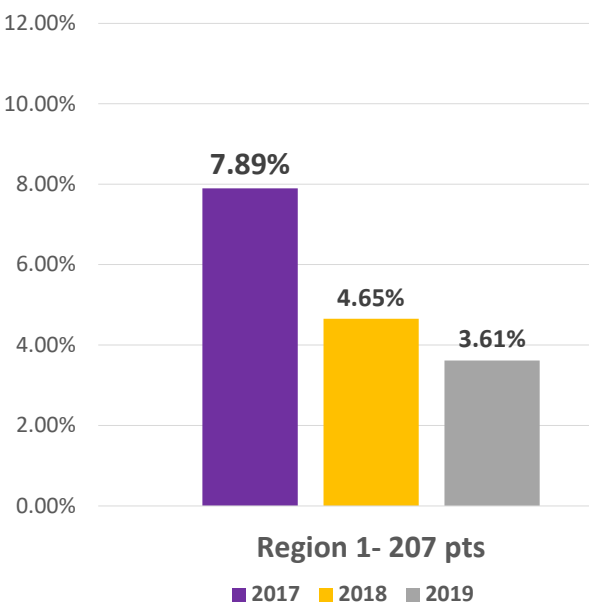




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Summary

1. Establish relationships with EMS & industry
2. Build routing pathways
3. Perform risk analysis
4. Look sentinel species
5. Know your resources
6. Test your weaknesses

Regional Mortality Louisiana's Trauma & Burn Centers



Year	Mortality Rate
2017	7.89%
2018	4.65%
2019	3.61%

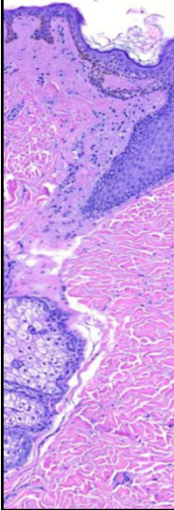
Region 1- 207 pts

■ 2017 ■ 2018 ■ 2019

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Thank You!

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