

## Syndromic Surveillance, Other Epidemiologic Practices & Tools to Improve Surveillance of Morbidity and Mortality After a Hurricane

### Use of Syndromic Surveillance During a Hurricane Response

Article	Summary/how it helps	Link	Reference (authors, title, journal, year, volume, pages)
Use of Syndromic Data for Surveillance of Hurricane-Related Injuries in Miami-Dade County, FL	Syndromic surveillance data has some utility for injury surveillance before, during, and after hurricanes. Knowledge of common injuries associated with hurricane preparation and recovery efforts can help public health officials to target prevention messages appropriately.	<a href="http://faculty.washington.edu/lober/www.isdsjournal.org/htdocs/articles/921.pdf">http://faculty.washington.edu/lober/www.isdsjournal.org/htdocs/articles/921.pdf</a>	Zhang et al. (2007). Use of Syndromic Data for Surveillance of Hurricane-Related Injuries in Miami-Dade County, FL. Miami-Dade County Health Department (MDCHD).
Health Impact Assessment of Cyclone Bejisa in Reunion Island (France) Using	Syndromic surveillance system allows for the rapid assessment of the health impact after a disaster.	<a href="https://www.cambridge.org/core/journals/prehospital-and-disaster-medicine/article/health-impact-assessment-of-cyclone-bejisa-in-reunion-island-france-using-">https://www.cambridge.org/core/journals/prehospital-and-disaster-medicine/article/health-impact-assessment-of-cyclone-bejisa-in-reunion-island-france-using-</a>	Vilain et al. (2015). Health Impact Assessment of Cyclone Bejisa in Reunion Island (France) Using Syndromic Surveillance. Published online

Syndromic Surveillance		<a href="https://www.cambridge.org/core/journals/disaster-medicine-and-public-health/article/syndromic-surveillance/D7D7AB96390C5098CF58D49DFB341A1A">syndromic-surveillance/D7D7AB96390C5098CF58D49DFB341A1A</a>	by Cambridge University Press. Vol 30, Issue 2. pp. 137-144.
Utilizing Syndromic Surveillance for Hurricane Irma-Related CO Poisonings in Florida	Florida Poison Information Center Network (FPICN) and emergency department (ED) data accessed through Florida's syndromic surveillance system can be used to conduct near real-time carbon monoxide (CO) poisoning surveillance and active case finding.	<a href="https://ojphi.org/ojs/index.php/ojphi/article/view/9940/8041">https://ojphi.org/ojs/index.php/ojphi/article/view/9940/8041</a>	Mulay et al. (2019). Utilizing Syndromic Surveillance for Hurricane Irma-Related CO Poisonings in Florida. Online Journal of Public Health Informatics. Vol 11, No 1.
Increased Seizure Activity in Florida Associated with Hurricane Irma, September 2017	Routine post-storm surveillance was able to identify an increase in seizure visits at emergency departments in Florida. This hurricane-related increase, while not detected using our syndromic surveillance system during previous storms, supports findings of increased emergency medical service calls for convulsions and seizures after hurricanes.	<a href="https://ojphi.org/ojs/index.php/ojphi/article/view/9796/7938">https://ojphi.org/ojs/index.php/ojphi/article/view/9796/7938</a>	Atrubin, D., Hamilton, J. (2019). Increased Seizure Activity in Florida Associated with Hurricane Irma, September 2017. Online Journal of Public Health Informatics. Vol 11, No 1.
Monitoring Out-of-State Patients during a 2017 Hurricane Response using ESSENCE	Demonstrates the use of ESSENCE in the BioSense Platform to monitor out-of-State patients seeking emergency healthcare in Tennessee during hurricanes.	<a href="https://ojphi.org/ojs/index.php/ojphi/article/view/8936/7373">https://ojphi.org/ojs/index.php/ojphi/article/view/8936/7373</a>	Weideman et al. (2018). Monitoring Out-of-State Patients during a 2017 Hurricane Response using ESSENCE. Online Journal of Public Health Informatics. Vol 10, No 1.
Development and Application of	Results from this study yielded valuable state preparation	<a href="https://www.cambridge.org/core/journals/disaster-medicine-and-public-health/article/development-and-application-of-syndromic-surveillance/D7D7AB96390C5098CF58D49DFB341A1A">https://www.cambridge.org/core/journals/disaster-medicine-and-public-</a>	Tsai et al. (2016). Development and Application of Syndromic

<p>Syndromic Surveillance for Severe Weather Events Following Hurricane Sandy</p>	<p>information to monitor the effects of future severe weather events.</p>	<p><a href="https://www.cdc.gov/eid/article/18/11/18-0311a1.htm">health-preparedness/article/development-and-application-of-syndromic-surveillance-for-severe-weather-events-following-hurricane-sandy/4EE35F5B54293727CD6B660CD0D4DD69</a></p>	<p>Surveillance for Severe Weather Events Following Hurricane Sandy. Published online by Cambridge University Press. Vol 10, Special Issue 3.</p>
<p>Houston Health Department - Hurricane Harvey (2017)</p>	<p>Showcases the importance and value of utilizing technology in a public health disaster response.</p>	<p><a href="https://www.dshs.texas.gov/txs2/Use-Cases-and-Success-Stories/Houston-Health-Department---Hurricane-Harvey-(2017).aspx">https://www.dshs.texas.gov/txs2/Use-Cases-and-Success-Stories/Houston-Health-Department---Hurricane-Harvey-(2017).aspx</a></p>	<p>Texas department of state health services. (2018). Houston Health Department - Hurricane Harvey (2017).</p>
<p>Syndromic Surveillance of Emergency Department Chief Complaints Post-Hurricane Wilma, Broward County, Florida 2005</p>	<p>The syndromic surveillance system ESSENCE (Electronic Surveillance System for the Early Notification of Community-based Epidemics) was used to describe the morbidity after Hurricane Wilma in Broward County, Florida.</p>	<p><a href="http://faculty.washington.edu/lober/www.isdsjournal.org/htdocs/articles/904.pdf">http://faculty.washington.edu/lober/www.isdsjournal.org/htdocs/articles/904.pdf</a></p>	<p>Kite-Powell and John Livengood. (2005). Syndromic Surveillance of Emergency Department Chief Complaints Post-Hurricane Wilma, Broward County, Florida 2005. <i>Epidemiology Section, Broward County Health Department, Florida Department of Health.</i> Vol 2, Issue 157.</p>
<p>Syndromic Surveillance: Adapting Innovations to Developing Settings</p>	<p>The tools and strategies of syndromic surveillance assure the improvement of public health security in developing countries. Successful applications show that the obstacles can be overcome.</p>	<p><a href="https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.0050072">https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.0050072</a></p>	<p>Chretien et al. (2008). Syndromic Surveillance: Adapting Innovations to Developing Settings. <i>PLOS Medicine.</i></p>
<p>Evaluation of Syndromic Surveillance Systems</p>	<p>Facilitating publication of the routine, episodic, and unique uses of syndromic surveillance would enable a fuller evaluation,</p>	<p><a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6198818/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6198818/</a></p>	<p>Thomas et al. (2018). Evaluation of Syndromic Surveillance Systems in 6 US State and Local Health</p>

in 6 US State and Local Health Departments	discovery of innovative methods, and expanded use of syndromic surveillance systems.		Departments. J Public Health Manag Pract. Vol 24, Issue 3.
A methodological framework for the evaluation of syndromic surveillance systems: a case study of England	Syndromic Surveillance may detect health threats faster than traditional surveillance systems permitting timelier and potentially more effective public health action.	<a href="https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-018-5422-9">https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-018-5422-9</a>	Colon-Gonzalez et al. (2018). A methodological framework for the evaluation of syndromic surveillance systems: a case study of England. BMC Public Health. Vol 18, Article 544.

### Possible Other tools to Improve Mortality and Morbidity Reporting after Hurricanes

<b>Tool</b>	<b>Response to disasters</b>	<b>Summary/How it helps</b>	<b>Link</b>
Social vulnerability index (SVI)	Hurricanes, flooding, extreme storms (including winter storms), droughts, chemical releases, radiological incidents	The SVI uses 15 US census variables at tract-level to help local officials identify communities that may need support in preparing for hazards or recovering from a disaster.	<a href="https://svi.cdc.gov/">https://svi.cdc.gov/</a>
Client Health Record	Hurricanes, flooding, extreme storms (including winter storms), chemical releases, radiological incidents	Client health record form for shelter in-take.	<a href="https://cdn.ymaws.com/cste.site-ym.com/resource/resmgr/DisasterEpi/ARC_client_Health_Record.pdf">https://cdn.ymaws.com/cste.site-ym.com/resource/resmgr/DisasterEpi/ARC_client_Health_Record.pdf</a>
Disaster Health Services Aggregate Morbidity Report Form	Hurricanes, flooding, extreme storms (including winter storms), chemical releases, radiological incidents	Form to report on all clients medically seen in shelter/site location over last 24 hours.	<a href="https://c.ymcdn.com/sites/www.cste.org/resource/dynamic/forums/20150121_133146_26219.pdf">https://c.ymcdn.com/sites/www.cste.org/resource/dynamic/forums/20150121_133146_26219.pdf</a>

Facility/Shelter Opening & Closing Inspection	Hurricanes, flooding, extreme storms (including winter storms), droughts, chemical releases, radiological incidents	Inspection form for facility/shelter opening and closing.	<a href="https://cdn.ymaws.com/cste.site-ym.com/resource/resmgr/DisasterEpi/ARC_Facility_Shelter_Opening.pdf">https://cdn.ymaws.com/cste.site-ym.com/resource/resmgr/DisasterEpi/ARC_Facility_Shelter_Opening.pdf</a>
CDC Emergency Responder Health Monitoring and Surveillance	Hurricanes, flooding, extreme storms (including winter storms), droughts, chemical releases, radiological incidents, infectious disease outbreaks	The ERHMS™ framework provides recommendations for protecting emergency responders during small and large emergencies in any setting.	<a href="https://www.cdc.gov/niosh/erhms/default.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fniosh%2Ftopics%2Ferhms%2Fdefault.html">https://www.cdc.gov/niosh/erhms/default.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fniosh%2Ftopics%2Ferhms%2Fdefault.html</a>
CDC Public Health Assessment and Surveillance after a Disaster Tools	Hurricanes, flooding, extreme storms (including winter storms), droughts, chemical releases, radiological incidents	Repository of public health assessment and surveillance forms.	<a href="https://www.cdc.gov/disasters/surveillance/index.html">https://www.cdc.gov/disasters/surveillance/index.html</a>
A Reference Guide for Certification of Deaths in the Event of a Natural, Human-induced, or Chemical/Radiological Disaster	Hurricanes, flooding, extreme storms (including winter storms), droughts, chemical releases, radiological incidents	This Reference Guide provides examples and recommendations for recording the name and type of disaster on the death certificate to ensure greater interjurisdictional consistency.	<a href="https://www.cdc.gov/nchs/data/nvss/vsrg/vsrg01.pdf">https://www.cdc.gov/nchs/data/nvss/vsrg/vsrg01.pdf</a>
Information for Disaster Evacuation Centers	Hurricanes, flooding, extreme storms (including winter storms), droughts, chemical releases, radiological incidents	A list of useful tools and informational resources for Disaster Evacuation Centers to use before, during, and after a disaster.	<a href="https://www.cdc.gov/disasters/evaccenters.html">https://www.cdc.gov/disasters/evaccenters.html</a>
Hurricane Season Public Health Preparedness, Response, and	Hurricanes, flooding, extreme storms (including winter storms)	Guidance and technical materials available in both English and Spanish to help communities prepare for hurricanes and floods.	<a href="https://www.cdc.gov/mmwr/volumes/66/wr/mm6637e1.htm">https://www.cdc.gov/mmwr/volumes/66/wr/mm6637e1.htm</a>

Recovery Guidance for Health Care Providers, Response and Recovery Workers, and Affected Communities – CDC, 2017			
County Health Department Epidemiology Hurricane Response Toolkit	Hurricanes, flooding, extreme storms (including winter storms)	Help you plan for and carry out the epidemiologic response to a natural disaster such as a hurricane.	<a href="https://cdn.ymaws.com/www.cste.org/resource/resmgr/disasterepi/CHD_Epidemiology_Hurricane_T.pdf">https://cdn.ymaws.com/www.cste.org/resource/resmgr/disasterepi/CHD_Epidemiology_Hurricane_T.pdf</a>
Disaster-related Mortality Surveillance Form	Hurricanes, flooding, extreme storms (including winter storms), droughts, chemical releases, radiological incidents	Method of surveillance for Disaster-related Mortality.	<a href="https://cdn.ymaws.com/cste.site-ym.com/resource/resmgr/DisasterEpi/KY_Disaster_Mortality_Form_2.pdf">https://cdn.ymaws.com/cste.site-ym.com/resource/resmgr/DisasterEpi/KY_Disaster_Mortality_Form_2.pdf</a>
Natural Disaster Individual Morbidity Report Form	Hurricanes, flooding, extreme storms (including winter storms), droughts, chemical releases, radiological incidents	Method of active surveillance in shelters with medical staff to report individual morbidity after a natural disaster.	<a href="https://cdn.ymaws.com/cste.site-ym.com/resource/resmgr/DisasterEpi/KY_INDIVIDUAL_Natural_Disast.pdf">https://cdn.ymaws.com/cste.site-ym.com/resource/resmgr/DisasterEpi/KY_INDIVIDUAL_Natural_Disast.pdf</a>
Health Survey 2010 After Action Report/Improvement Plan		“Health Survey 2010” was developed to test communications capability, emergency operations center management, and epidemiological surveillance and investigation capabilities.	<a href="https://cdn.ymaws.com/cste.site-ym.com/resource/resmgr/DisasterEpi/20100107_Health_Survey_AR-I.pdf">https://cdn.ymaws.com/cste.site-ym.com/resource/resmgr/DisasterEpi/20100107_Health_Survey_AR-I.pdf</a>
NC Department of Health and Human Services Public Health	Hurricanes, flooding, extreme storms (including winter storms), droughts, chemical releases, radiological incidents	Active Disaster Surveillance Forms to be used during a disaster for Disaster Mortality.	<a href="https://epi.publichealth.nc.gov/phpr/lhds.html">https://epi.publichealth.nc.gov/phpr/lhds.html</a>

## Additional Resources for Improving Disaster Related Surveillance

Article	Summary/How it helps	Link	Author(s)
Chapter 3 - Applications: Using Information Systems to Improve Surveillance During Disasters	There are various information system tools that are used for routine surveillance that can be adapted during an emergency response to perform surveillance for emerging threats, and manage, analyze, and disseminate data. This chapter demonstrates how the Georgia Department of Public Health has used the State Electronic Notifiable Disease Surveillance System to improve surveillance during a range of emergency responses.	<a href="https://www.sciencedirect.com/science/article/pii/B9780128093184000046">https://www.sciencedirect.com/science/article/pii/B9780128093184000046</a>	Laura Edison, Karl Soetebier, Hope Dishman. (2018). <i>Disaster Epidemiology: Methods and Applications</i> . Pages 31-39.
Preparedness and Response for Public Health Disasters	CDC's National Center for Environmental Health (NCEH) provides disaster epidemiology training and technical assistance to requesting state, tribal, local, territorial (STLT) health departments, other federal and international agencies, academia, and partner organizations.	<a href="https://www.cdc.gov/nceh/hsb/disaster/training.htm">https://www.cdc.gov/nceh/hsb/disaster/training.htm</a>	Centers for Disease Control and Prevention. (2019). <i>Training and Technical Assistance</i> .

<p>Disaster-Related Surveillance and Emergency Information Systems</p>	<p>Surveillance and exchange of gathered information guides emergency response as well as long-term planning. This chapter examines disaster epidemiology, emergency information systems throughout the disaster event, and public health surveillance in response to disaster.</p>	<p><a href="https://www.medscape.com/viewarticle/513259">https://www.medscape.com/viewarticle/513259</a></p>	<p>American Public Health Association. (2019). Disaster-Related Surveillance and Emergency Information Systems.</p>
<p>A Primer for Understanding the Principles and Practices of Disaster Surveillance in the United States</p>	<p>The audience for this primer is public health departments at state, local, tribal, and territorial levels. This document outlines how health departments can approach public health surveillance during a disaster and reviews principles and practices of disaster surveillance.</p>	<p><a href="https://www.cdc.gov/nceh/hsb/disaster/Disaster_Surveillance_508.pdf">https://www.cdc.gov/nceh/hsb/disaster/Disaster_Surveillance_508.pdf</a></p>	<p>Centers for Disease Control and Prevention (CDC). 2016. <i>A Primer for Understanding the Principles and Practices of Disaster Surveillance in the United States: First edition.</i></p>