



Public Health Surveillance & Response in a Large Evacuation Shelter Post Hurricane Harvey: Successes and Challenges in Harris County, TX

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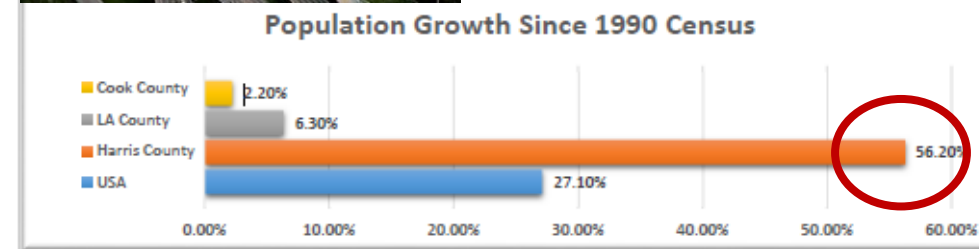
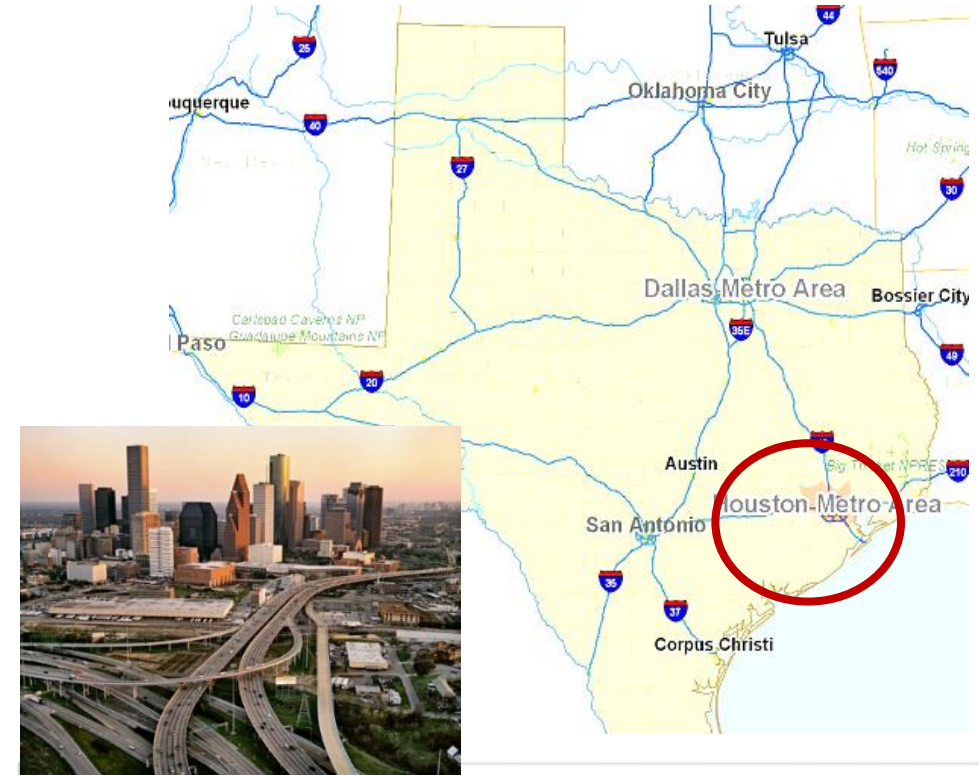
Harris County & HCPH

Harris County, TX:

- Third most populous county with over **4.7 million people**
- Geographically spread over **1,778 square miles** (size of Rhode Island)
- Home to 4th largest city (**Houston**), world's largest medical center, and one of world's busiest ports.

Harris County Public Health (HCPH):

- Local health department for Harris County with over **700** public health professionals and over **\$100 million** budget **& growing**
- Annually, see over **100,000** patients in 16 wellness clinics & WIC sites, inspect **7,500** food establishments, house **25,000** animals in our shelter.
- Serve unincorporated Harris County outside of City of Houston. Provide refugee health screening, mosquito control, Ryan White HIV/AIDS funding for entire community, including City of Houston.



Hurricane Harvey in Texas, August 25th, 2017

- A category 4 storm
- Record flooding of at least 18 inches in 70% of Harris County
- Tens of thousands of residents were displaced and 36 deaths occurred due to the devastation.
- At least 53 temporary shelters opened in various parts of Harris County.
- August 29, 2017, 10,000 bed mega-shelter was set up at NRG Center by Harris County and community partners.
- HCPH was responsible for ongoing public health surveillance.



Before Harvey



After Harvey



Chronic Disease



Food Safety



Emergency Preparedness



Environmental Health



Infectious Diseases



Injury



Social, Mental, and Emotional Wellbeing



Wettest tropical cyclone in the United States

Total rainfall in Nederland, TX: 60.58 inches

Hurricane Harvey Aftermath

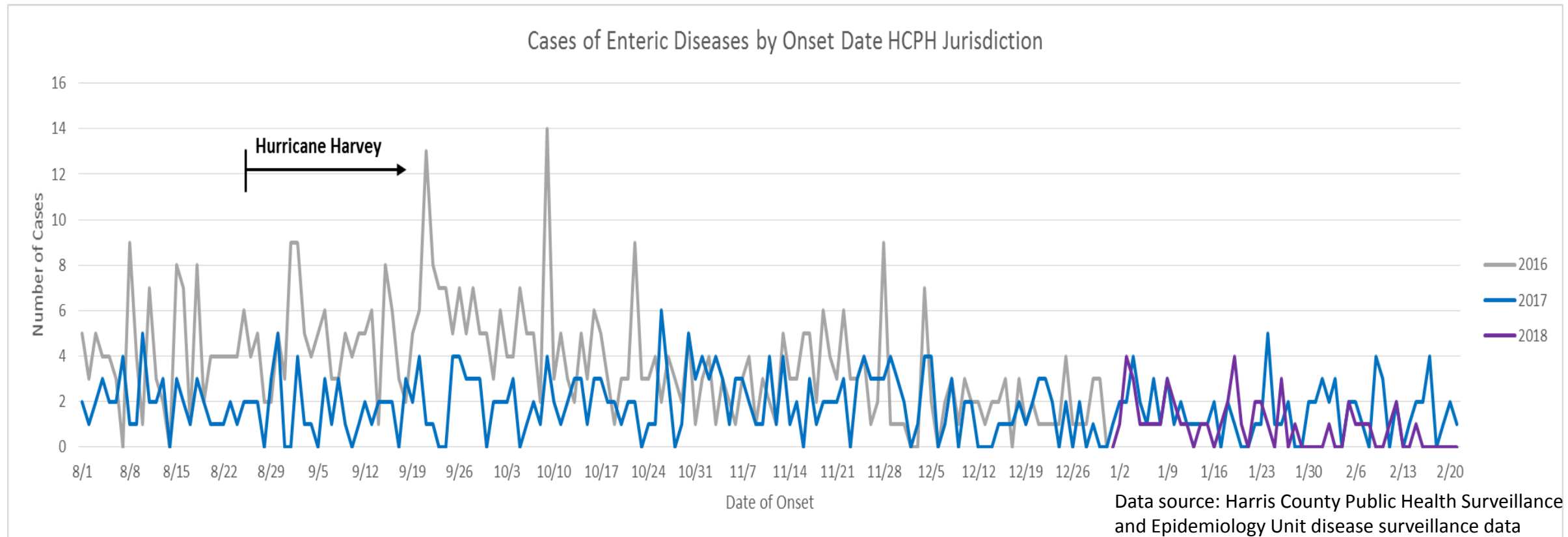


HCPH Surveillance and Response Post Harvey

- Multi-agency collaboration
- Multi-faceted holistic approach:
 - Functional Needs Medical Refuge (FNMR)
 - NRG mega-shelter surveillance
 - Community shelter surveillance
 - Hospital surveillance
 - Enhanced communicable disease surveillance
- Community outreach
 - Mobile unit services
 - WIC services
 - Mosquito and vector control activities
 - VPH services
 - CASPER (Community Assessment for Public Health Emergency Response)

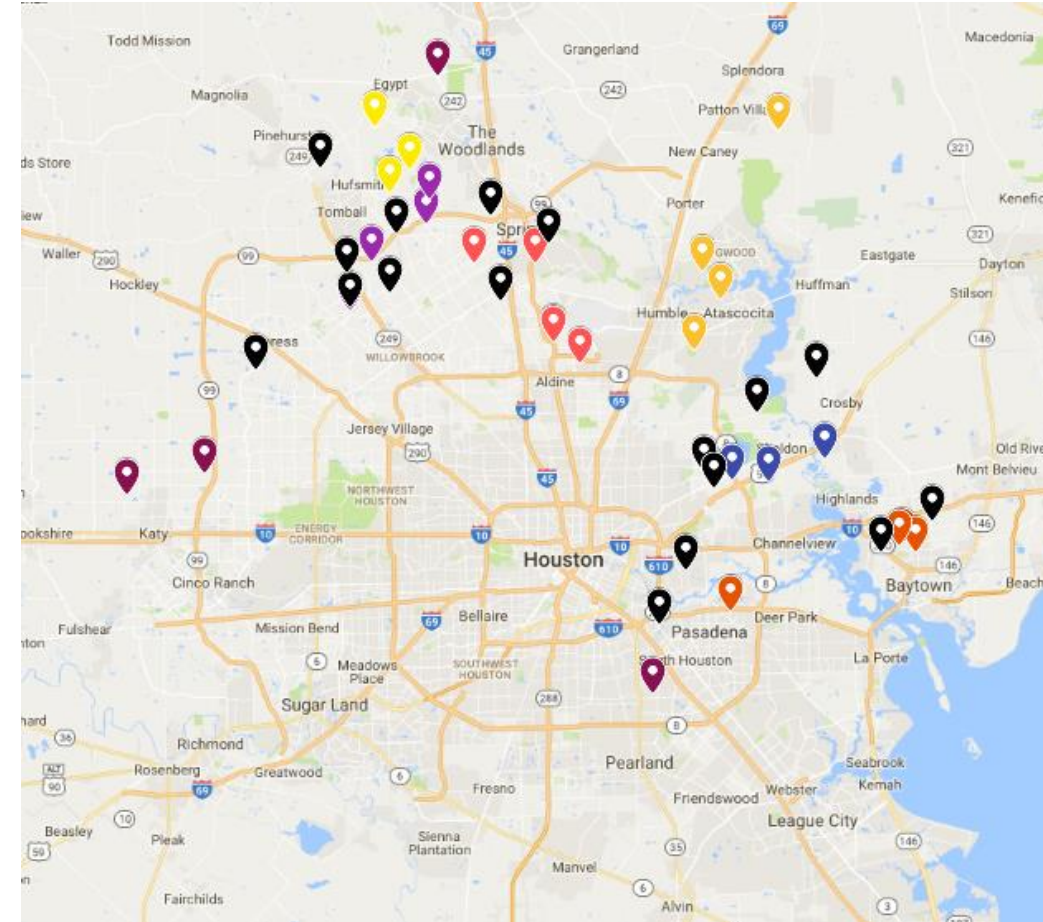
Enhanced Community Disease Surveillance

- Conditions potentially related to hurricane and flood were monitored
- No major outbreaks observed post-Harvey



Community Shelter Surveillance

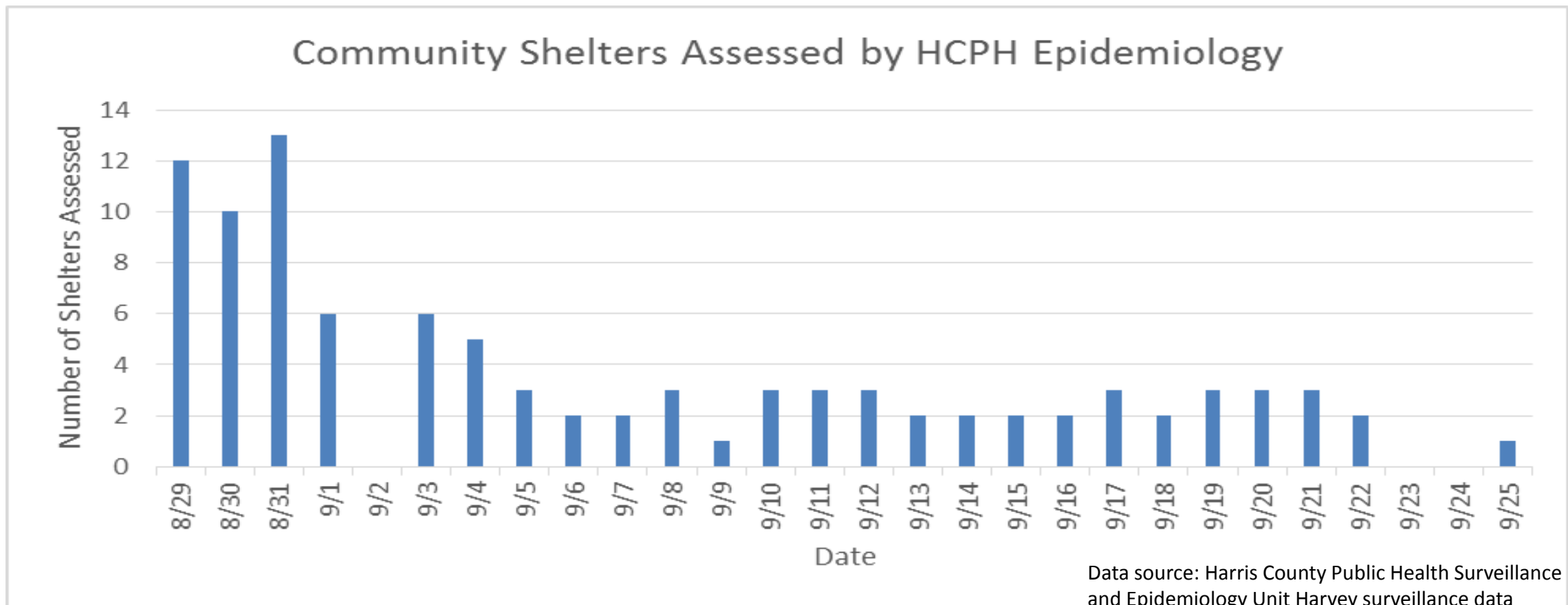
- 53 community shelters identified in HCPH jurisdiction
- Utilized modified CDC shelter assessment form
- Monitored once a day in person or by phone
 - Shelter census
 - Illnesses/symptoms of concern
 - Hospitalizations/ER visits
 - Any supplies/medications needed
- Environment Public Health inspections
- Requests for supplies sent to OEM



Data source: Harris County Public Health Surveillance and Epidemiology Unit Harvey surveillance data

Community Shelter Surveillance

- Most community shelters closed by September 5th



Post-hurricane CASPERS

- Two post-hurricane CASPERS in September
- Goals
 - Gauge health status of residents
 - Assess hurricane-caused property damage
 - Determine immediate health care/functional needs
 - Provide information to guide post-disaster response
 - Provide necessary resources to communities

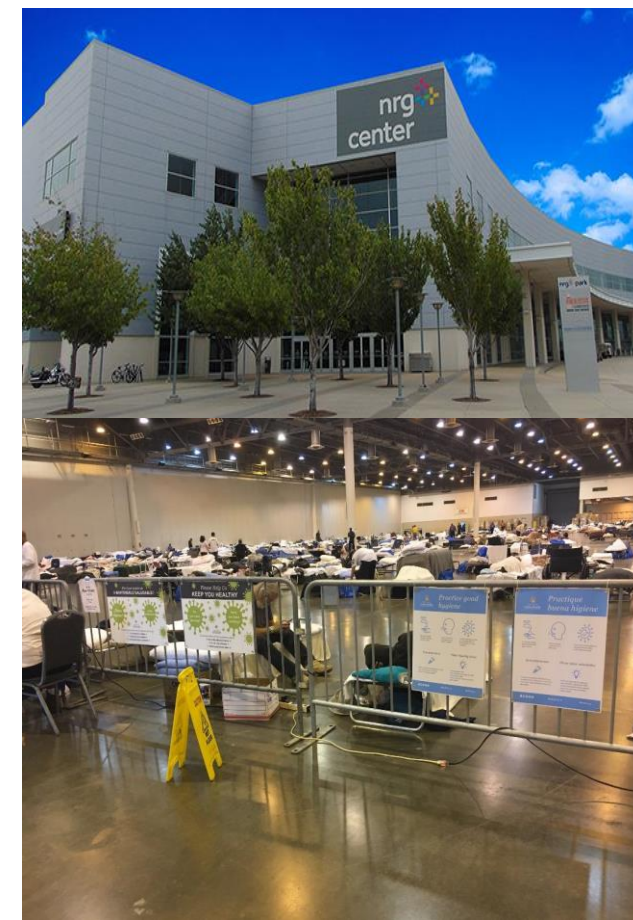
	Area 1		Area 2	
	Frequency	%	Frequency	%
Damage to house	2227	32.5	12497	62.3
Used generator since hurricane	229	3.3	1864	9.3
Used generator outside house	131	57.1	669	35.9
Used charcoal grill/camp stove since hurricane	672	9.8	2900	14.4
Used charcoal grill/camp stove outside house	541	80.6	2215	76.4

Data source: HCPH CASPER data- weighted

NRG Mega-Shelter

On August 29, 2017, the County and community partners set up a 10,000 bed mega-shelter at NRG Center.

- Monitor resident health status and identify their needs on a daily basis.
- Identify infectious diseases and outbreaks in the shelter in a timely manner and implement effective control measures to prevent further spread of illness
- Identify severe exacerbation of chronic conditions, including new or existing mental issues and provide interventions.
- Timely dissemination of health alerts and services available to shelter residents and information sharing between HCPH and partners
- Apply One Health principle to achieve a holistic approach to public health surveillance incorporating various types of disease surveillance along with environmental surveillance and animal health consideration.



FNMR (August 29th – September 2nd)

- ✓ Provided care to those require minor or continuous medical care
- ✓ Took in displaced residents with medical conditions (hospital discharges, nursing homes)
- ✓ Staffed with medical providers
- ✓ Approximately 90 people came through (median age of 79)
- ✓ Epidemiologists reviewed medical charts twice daily and completed assessment

- Chronic diseases (HTN, DM, dementia)
- 2 scabies cases
- 2 patients with drug withdrawal symptoms
- Supply needs
 - Glasses, walkers, wheelchairs
 - Ostomy bag, CPAP, prescriptions



NRG Shelter Surveillance Activities

- 20 days of active surveillance
- 24 hour coverage of on-site surveillance station
 - Day shift (7am – 7pm)
 - Night shift (7pm – 7am)
- Nightly cot-to-cot survey
- Daily data abstraction from patient visits to on-site clinics
- Daily monitoring of vaccine administrations and Tamiflu prescriptions in on-site pharmacies

Daily Cot-to-Cot Survey

- Survey teams were comprised of HCPH Epidemiologists and staff, student volunteers from local universities.
- Just in Time Training before survey and briefing after survey were provided every night.
- Messages regarding services available and health alerts were delivered to residents daily through surveyors during interviews.
- Epidemiologists led survey teams and conducted epidemiological consultations as needed.



Daily Cot-to-Cot Survey

- Head of household survey – health status, healthcare needs, and other public health concerns for the entire family.
 - Paper survey → → mobile survey done on mobile phone
- Epidemiology consultation – if symptoms of communicable diseases, exacerbation of chronic conditions, or mental health concerns were identified, further consultation would be conducted by an epidemiologist.
- Immediate referral to onsite clinics, education, and isolation were implemented when necessary.



Daily Cot-to-Cot Survey

- **3,365** evacuees at its peak.
- **3,606** household surveys were completed during 20 days.
- **395** epidemiology consultations were conducted



Daily Data Abstraction from On-site Clinics

Monitored for:

- Number of patients seen
- Infectious disease symptoms
 - Fever, diarrhea, vomiting, rash, etc.
- Chronic disease exacerbations
- Mental health complaints
- Injuries

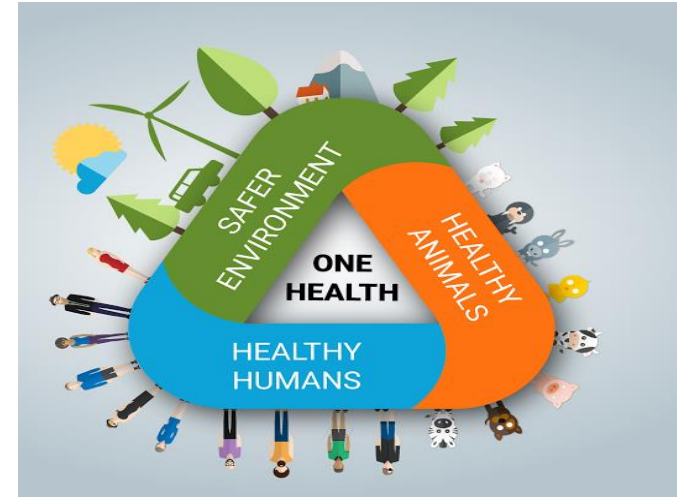
Daily Monitoring of Vaccine Administrations and Tamiflu Prescriptions in On-site Pharmacies

- Walgreens and CVS were on-site to fill prescriptions and provide influenza, tetanus, and other vaccinations.
- A form was provided to document number of prescriptions filled, number of vaccines given, the top 5 prescriptions filled, etc.
- Hurricane Harvey hit right before flu season
 - Concern for outbreak at the shelter
 - Flu vaccines provided to residents, staff, and volunteers



One Health Principles

Surveillance & Response Team:
Epidemiologists, Environmental Sanitarians, Veterinarians, and
Communication Specialists



- Epidemiology disease surveillance
 - Infectious diseases and outbreaks
 - Exacerbated chronic conditions and mental health issues
 - Bug or mosquito bites; animal bites
 - Control measures to prevent further spread of illness and interventions
- Environmental surveillance
 - Assessment of environmental risks
 - Coordinated hygiene efforts:
 - hand sanitizers throughout dormitory areas
 - ensured proper trash can placement
 - ensured frequent cleaning of common areas including bathroom facilities and eating areas
- Veterinary surveillance
 - On-site animal shelter
 - Routine assessments to ensure pets were vaccinated prior to entry in sleeping areas
 - A proposal to separate residents with pets and without pets
- Robust communication efforts included large and ubiquitous signage and messaging for disease prevention placed throughout the shelter

Surveillance Findings

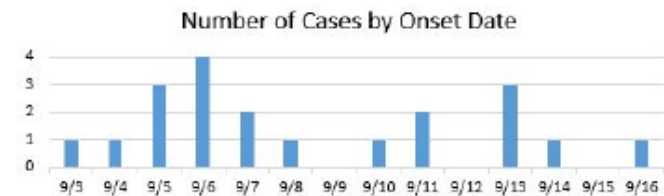
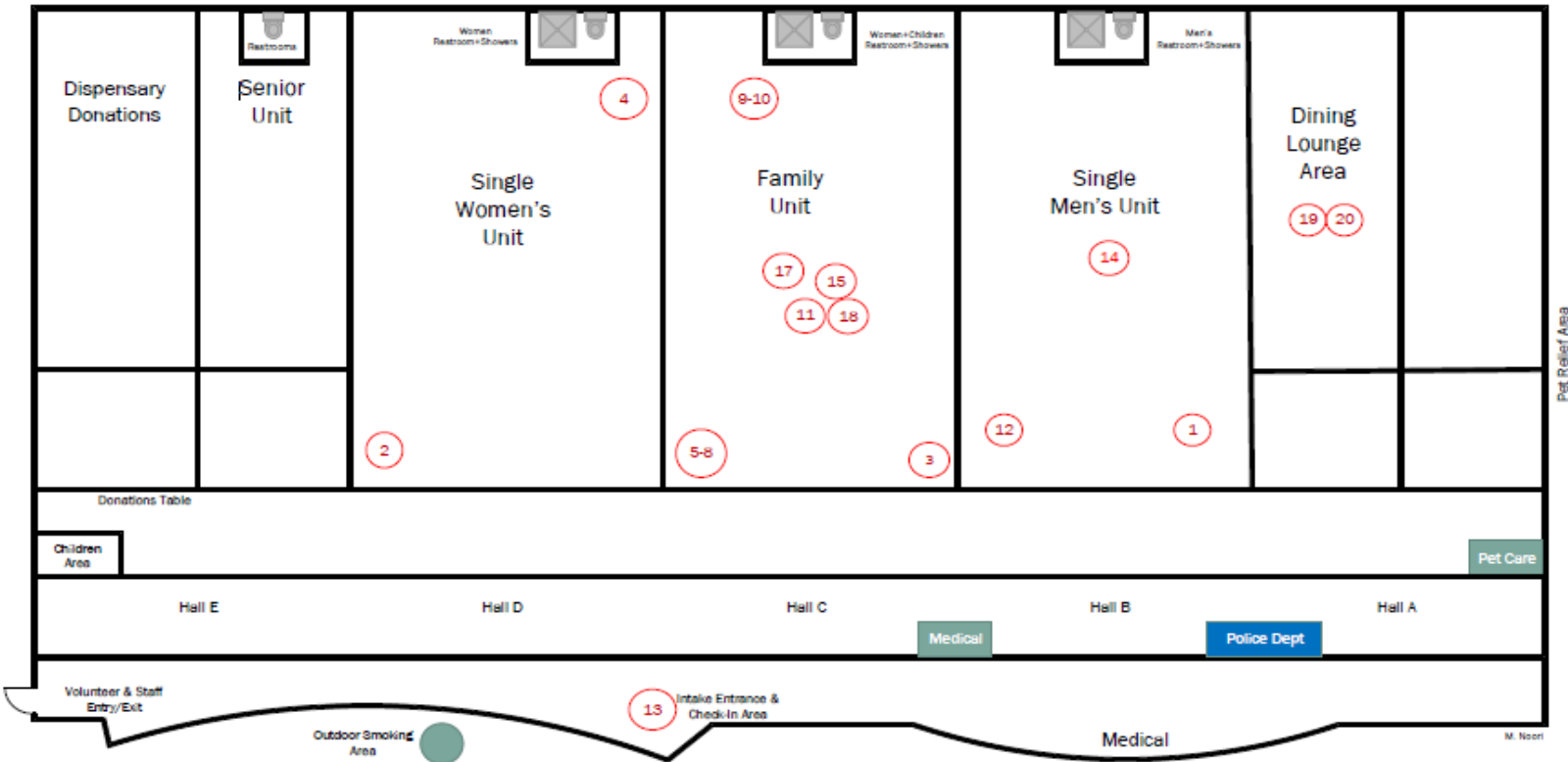
- A Flu A outbreak of 20 laboratory confirmed cases
- A Norovirus outbreak with 4 laboratory confirmed and 1 probable case
- Three isolated cases of strep throat
- A number of residents with mental health issues including one with suicidal ideation
- A number of residents with exacerbation of chronic conditions



An Influenza A Outbreak

Figure 1. Locations and Epi Curve of Identified Flu Cases – NRG Mega-Shelter, September 2017

NRG Center Mega-Shelter



Illness Onset Dates:

- | | | |
|----------------|--------------------------|----------------------|
| 1. 9/3 | 12. 9/13 | 19. 9/7 (HCPH Staff) |
| 2. 9/5 | 13. 9/11 (Peace Officer) | 20. 9/8 (HCPH Staff) |
| 3. 9/5 | 14. 9/13 | |
| 4. 9/5 | 15. 9/14 | |
| 5-8. 9/6 | 16. 9/13 (Peace Officer) | |
| 9-10. 9/7, 9/4 | 17. 9/10 | |
| 11. 9/11 | 18. 9/16 | |

Total Lab Confirmed Flu Cases	FLU A/H3 (+) by PCR	By Rapid test	
		A (+)	A & B (+)
20	14	5	1



Prevention and Control Measures at NRG

- Isolation rooms monitored daily
 - Flu and ILI
 - GI illness
 - Belongings of scabies cases disinfested
- 771 flu vaccines administered to residents, staff, volunteers
- Hand sanitizer and hygiene signage placement throughout shelter
- Bilingual public health service announcements in dormitory areas
- Environmental inspections of the entire facility

Do You Have **Diarrhea**?
Have You Been **Vomiting**?

• Go to the Medical Station



• Drink a lot of fluids



• Wash your hands often



Please Help Us Keep You Healthy



Success Achieved

- Timely identification and isolation of patients with influenza-like illness and gastrointestinal illness
- No widespread outbreaks of communicable diseases during the long operation
- Exacerbation of chronic conditions and mental health issues were intervened immediately
- Additional specimens were collected by HCPH surveillance team to confirm the diagnosis
- A mobile survey tool provided flexibility for an easy daily modification of questions and analyses



Challenges Encountered

- The number of surveyors changed daily depending on the availability of staff and volunteers
- Lack of pre-designed mobile survey tool (development on-site)
- Relatively new staff without sufficient response experience
- Shortage of Epidemiologists
- Simultaneous management of multiple surveillance activities within the community
- Personal hurricane-related losses experienced by HCPH staff



Chronic
Disease



Food
Safety



Emergency
Preparedness



Environmental
Health



Infectious
Diseases



Injury



Social, Mental,
and Emotional
Wellbeing

Acknowledgement

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- HCPH Programs: OPHPR, DCCP, EPH, OCEE, VPH, MCVD, TB
- Houston Health Department
- NRG shelter on-site clinics and pharmacies: Harris County Medical Society Urgent Care Clinic and Pediatric Urgent Care, Baylor College of Medicine/Harris Health Same Day Clinic and Mental Health Clinic, Baptist Child & Family Services, Walgreens, CVS
- Other Harris County partners
- Other volunteers



Questions?





Harris County Public Health

{ Vision }

- Healthy People,
- Healthy Communities,
- A Healthy Harris County

{ Values }

- Excellence
- Compassion
- Flexibility
- Integrity
- Accountability
- Professionalism
- Equity

{ Mission }

- Promoting a Health and Safe Community
- Preventing Injury and Illness
- Protecting You

www.hcphtx.org



Chronic Disease



Food Safety



Emergency Preparedness



Environmental Health



Infectious Diseases



Injury



Social, Mental, and Emotional Wellbeing