Influenza 101: Flu Basics and Surveillance Systems

TEXAS Department of State Health Services

Outline

- Influenza Virology
- Influenza Disease
- Overview of Influenza SurveillanceLevels of Influenza Surveillance
 - Components of Influenza Surveillance
 - Mortality
 - Morbidity
 - Viral

FLU VIROLOGY AND COMMON LAB TESTS

Flu Virus Types

- Influenza A
- Influenza B
- Influenza C
- Influenza D





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Subtypes and Lineages

- Influenza A subtypes
 - Seasonal/regularly circulate in humans:
 - H1N1
 - H3N2
 - Novel/variant:
 - H5N1, H7N9, H3N2v, etc.
 - Usually don't infect people
- Influenza B lineages little to no cross-protection
 - Yamagata
 - Victoria

Antigenic Changes

- Antigenic drift
 - Small changes to the flu virus that happen slowly over time
 - Reason flu vaccine has yearly strain changes
- Antigenic shift
 - Flu A viruses only
 - Dramatic change resulting in novel subtype
 - Can lead to pandemics







BRIEF INTRODUCTION TO LAB TESTING FOR FLU

Lab Testing - Rapid Flu Tests

- Very rapid tests
- Can detect flu types only
- Accuracy Depends Upon Prevalence
 - False-positive (and true-negative) flu test results are more likely to occur when disease prevalence is low
 - False-negative (and true-positive) influenza test results are more likely to occur when disease prevalence is high
- Rapid tests should be not considered confirmatory
 - Outbreak? Suspected novel virus? Severe case? use PCR for confirmatory testing

Lab Tests - PCR and culture

- Gold standard tests, preferred
- Culture
 - Detects virus capable of causing infection (type, subtype, lineage)
 - Results in days to a weel

PCR

- Detects virus (type, subtype, lineage)
- Results in hours
- DSHS Austin (state lab) and all TX Laboratory Response Network labs do PCR testing for influenza (both seasonal and novel strains), year-round



Flu's Impact

 An estimated 5%-20% of population gets the flu each year



Influenza illness

- Respiratory disease caused by influenza (flu) virusesNot the "stomach flu"
 - Not caused by *Haemophilus influenzae*
- Symptoms: fever, cough, sore throat, runny nose, muscle aches, headaches, fatigue
 - Sometimes GI symptoms



Transmission



- Transmission: droplet spread (e.g., coughing), direct contact (e.g., kissing), contaminated surfaces
- Incubation period: average of 2 days (range: 1-4 days)
- Communicability:
 - Infected persons can transmit virus 1 day before symptoms begin
 - Viral shedding greatest in first 3-5 days of illness
 - Kids, immunocompromised shed longer

Risk Groups for Flu Complications

- <5 years of age</p>
- \geq 65 years of age
- Persons with chronic pulmonary, cardiovascular, endocrine, renal, hepatic, neurologic, hematologic or metabolic disorders
- Immunosuppressed persons
- Pregnant or postpartum women
- <19 years of age and receiving long-term aspirin therapy</p>
- Residents of nursing homes/LTCFs
- Persons with morbid obesity (BMI \geq 40)
- American Indians and Alaskan Native

Antiviral Medications

- Adamantanes Problems with antiviral resistance
- Neuraminidase inhibitors
 - Oseltamivir (Tamiflu)
 - Zanamivir (Relenza)
 - Peramivir, IV only (Rapivab)





Flu Vaccine Production



Flu Vaccine

- Vaccines are either trivalent or quadrivalent
 - Trivalent: influenza A (H1N1) strain, influenza A (H3N2) strain, one influenza B lineage
 - Quadrivalent: same as trivalent, plus the second influenza B lineage
- Two main options for route:
 - Injectable
 - Nasal spray: not available in 2016
- Several formulations/options: standard dose, highdose, recombinant egg-free, intradermal, etc.
- Recommended annually for everyone 6 months of age and older without a contraindication

FLU REPORTING AND SURVEILLANCE

Key Term: ILI

- Influenza-like Illness (ILI)
 - Fever >100°F, plus:
 - Cough and/or
 - Sore throat
 - In the absence of another known cause other than influenza

What's Reportable in Texas

- Novel influenza A cases in humans
- Pediatric flu deaths
- Deaths associated with influenza in person < 18 years</p>

• Outbreaks (flu, influenza-like illness, etc.)



Influenza Surveillance

- The Influenza Surveillance System is a multicomponent surveillance network with local, regional, state and national activities.
- Data collection is based on a reporting week that starts on Sunday and ends on Saturday of each week.
 - Designated as Week 32 or week ending 9/05
 - aka CDC MMWR week
 - Flu surveillance season: week 40 to week 20
- Reporting is voluntary except where noted

Goals of Influenza Surveillance

- Find out when and where influenza activity is occurring,
- Determine what type of influenza viruses are circulating,
- Detect changes in the influenza viruses,
- Track influenza-related illness and
- Measure the impact influenza is having on deaths in the United States.









Influ	ienza Surv	eillance	Compone	ents
	Influe	nza Surveillance		
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→ CHS Surveillance	N S FluSurv- Net − L	→ S ILI Activity L	$\rightarrow \begin{array}{c} N \\ \textbf{S} \\ \textbf{Absenteeism} \\ \textbf{L} \end{array}$	
Data		N S RVSP/IISP L	N S Syndromic L	
S State L Local				



Influenza-Associated Pediatric Mortality

- Activity: Influenza-Associated Pediatric Mortality
- **Level:** National (2004); state, regional and local (2007)
- **Who:** As required by law in Texas
- What: Individual reports on influenza associated deaths in anyone <18 years old

Year Round Reporting

• How: Individual report form faxed to health department within 1 work day

Influenza-Associated Pediatric Mortality

Report form available on the DSHS website at http://www.dshs.state.tx.us /ideu/investigation/forms/ PedFlu.pdf

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Influenza-Ariociated Pediatric Murtality Case Report Form

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122 Cities Mortality Reporting System

- Activity : 122 Cities Mortality Reporting System
- **Level:** National
- Who: Vital Statistics offices in 122 US cities (7 cities in Texas)
- What: total number of death certificates received by age group and the number citing influenza and/or pneumonia
- **How:** Directly to CDC each week

Center for Health Statistics (CHS) Mortality Surveillance Data

- Activity: Pneumonia and Influenza (P&I) Mortality Surveillance
- Level: National and State
- Who: Vital Statistics offices across the US (including Texas) & CHS offices (National and state)
- What: P&I death percentages at the national level and total number of P&I deaths of Texas residents at the state level
- How: Vital Statistic offices send death certificate data to National CHS office who then sends death certificate data back to the state CHS office who then sends a weekly P&I death report to the State Influenza Coordinator

Year Round Reporting

Morbidity - Influenza Morbidity Flu S Influenza I Influenza I Influenza

Novel/Variant Influenza

- **Activity:** Novel Influenza reporting
- **Level:** State, regional and local
- Who: As required by law in Texas; typically laboratories
 Note: Only public health labs can confirm a novel/variant flu infection
- What: Individual reports on patients with influenza that is confirmed by a laboratory to be novel or variant

How: Call to local health departme	nt
Year Round Reporting	
Spe	cial Reporting

FluSurv-NET

- Activity: Flu expansion of Emerging Infections Program
- **Level:** National
- Who: Select hospitals in 13 states; no participating sites in Texas
- What: lab confirmed influenza in hospitalized people <18 years old and adults
- **How:** Directly to CDC

Seasonal Reporting



ILINet

- Activity : US Outpatient Influenza-Like Illness Surveillance Network
- **Level:** National with a state level coordinator
- Who: Over 2,900 providers are enrolled in this network; 176 were in Texas for the 2015-2016 flu season
- What: Aggregate count all patients seen and of ILI patients by age group
- **How:** Reported weekly through the CDC website

Year Round Reporting





ILI Activity (other than ILINet)

- Activity : Health Department Seasonal Influenza Surveillance
- **Level:** Regional and local
- Who: private providers, clinics, hospitals and others
- What: Aggregate count of ILI and Flu (rapid tests: Flu A, Flu B and Undifferentiated Flu) by county
- **How:** Faxed or emailed weekly to health department

Seasonal Reporting

RVSP/IISP

- Activity : Respiratory Virus Surveillance Project/Influenza Incidence Surveillance Project
- **Level:** National with a state level coordinator
- Who: 12 awardees in the US including Texas;
 5 providers in Texas
- What: Aggregate count by age group of all patients seen and of patients with ILI; specimens submitted on first 10 patients seen each week
- How: Reported weekly via fax or email to DSHS Year Round Reporting

Morbidity - Other
Morbidity
Other
N S Outbreaks L
→ Schools / Absenteeism
N S Syndromic L



Outbreaks

- Activity : Outbreak reporting
- **Level:** Local, regional, state
- **Who:** As required by law
- What: Report of suspected outbreak or cluster of illness
- How: Call to health department ; Surveillance data analysis

Year Round Reporting

School Surveillance

- Activity : Varies
- **Level:** Regional and local
- **Who:** School nurses and/or attendance clerks
- What: number of students sent home with ILI and/or who called in sick with ILI or absenteeism in general
- How: Faxed or emailed weekly to health department; some electronic systems are available

Seasonal Reporting

Syndromic Surveillance

- Activity : Syndromic programs: ESSENCE, RODS, BioSense, etc.
- **Level:** Regional and local
- **Who:** Hospitals with emergency rooms
- What: emergency room visits categorized by syndrome, age, zip code, date (de-identified)
- How: Electronic data automatically sent from hospital to syndromic servers. Frequency of reports may occur hourly, daily or weekly.

Year Round Reporting







NREVSS / WHO

- Activity : National Respiratory and Enteric Virus Surveillance System and WHO Collaborating Labs
- **Level:** National coordination
- Who: Volunteer public health and hospital laboratories
- What: Total number of respiratory specimens tested and number of positives
- **How:** Reported weekly to CDC
- **Note:** Tracks multiple respiratory pathogens. Not all labs report all pathogens.

Year Round Reporting





Laboratory Surveillance

- Activity : Influenza Laboratory Surveillance (PCR)
- **Level:** State, regional, and local coordination
- **Who:** Selected providers
 - Identified by health departments
 - May include ILINet providers
- What: Specimens from patients suspected of having influenza
- How: Specimens sent to the DSHS lab or Texas LRNs
- Note: Subset of submitted specimens sent every two weeks to CDC for further testing
 Year Round Reporting



Reporting

Flu reports

- DSHS flu reports and information:
 - <u>www.TexasFlu.org</u>
 - www.dshs.state.tx.us/idcu/disease/influenza
- CDC FluView: <u>www.cdc.gov/flu/weekly/</u>

DSHS Flu Surveillance Workshop

- Annual meeting of Texas regional and local influenza surveillance coordinators and public health laboratorians
- Held in Austin during the summer
- 2017 will be the 10th year
- Topics:
 - Flu surveillance methods
 - Laboratory testing
 - Outbreak response
 - Etc.

DSHS Influenza Surveillance Handbook



EAIDB Investigation Guidelines

ttps://www.dshs.texas.gov/IDCU/investiga

Pediatric flu deaths





Influenza Surveillance Resources

- DSHS Influenza Resources Webpage: https://www.dshs.state.tx.us/idcu/disease/influenza
 - Flu conference presenta
 - Texas pandemic plan
 - Important CDC publications
 - Etc.
- Overview of Influenza Surveillance in the United States
 - http://www.cdc.gov/flu/weekly/overview.htm

Outbreak Resources

- DSHS Flu Surveillance Handbook
- CDC infection control for healthcare facilities: http://www.cdc.gov/flu/professionals/infectioncontrol/index
- Unexplained Respiratory Outbreaks: <u>https://www.cdc.gov/urdo/</u>

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Research CEC Accounty	diagnests bed way set be available locally. This website is designed to help health professionals and public health partners investigate unexpl
and the second se	requisitory disease outlemans (JMDD) and identify an etiology. The following settingers provide information and resources to avoid in URDO investigations.
Public process and Papersonal	

Flu Vaccine Resources

- DSHS Immunization Unit flu vaccine information: <u>https://www.dshs.texas.gov/immunize/flu.shtm</u>
- CDC vaccine FAQ page: http://www.cdc.gov/flu/protect/keyfacts.htm
- CDC vaccine supply: <u>http://www.cdc.gov/flu/about/qa/vaxsupply.htm</u>
- HealthMap vaccine finder: <u>https://vaccinefinder.org/</u>

Novel Influenza Resources

- EAIDB Investigation Guidelines, Novel/variant flu chapter
- **CDC** Avian Influenza:
 - http://www.cdc.gov/flu/avianflu/healthprofessionals.htm

 - Laboratory guidanceTreatment and prophylaxis (including close contacts)
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 - Case definitions
 - = H5N1: <u>http://www.edc.gov/flu/avianflu/h5n1/case-definitions.h</u>
 - definitions.htm
 - H7N9: <u>http://www.cdc.gov/flu/avianflu/h7n9/case-definitions.htm</u>

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Questions?

- Email comments, feedback, and suggestions to <u>flutexas@dshs.state.tx.us</u>
- Thank you for your participation!
- Pdf of presentation posted at http://www.dshs.texas.gov/idcu/disease/influenza/links/, under the heading "DSHS Influenza Resources"