Enhancement of sentinel surveillance for influenza-like illness through electronic medical record data aggregation and GIS mapping

Virginia L. Headley, PhD[1] and Emily L. Styles, MPH[2]
[1]Williamson County and Cities Health District, [2]Lone Star Circle of Care, Georgetown, TX, USA

INTRODUCTION

Influenza is not a communicable disease that is required by Texas law to be reported by providers to the local health authority. In lieu of required reporting of all cases, Williamson County and Cities Health District (WCCHD) collects voluntary information from a variety of provider sources throughout the year on both laboratory-confirmed influenza and incidences of influenza-like illness (ILI). This "sentinel" surveillance system does not intend to capture all instances of influenza or ILI, but rather seeks to have a representative picture of illness due to influenza in the community.

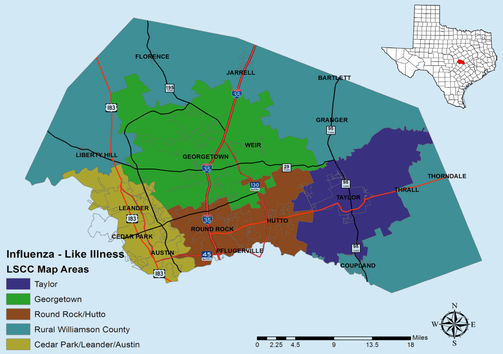
Sentinel surveillance has a number of limitations. As the reports are voluntary, data are not necessarily provided on a consistent basis, and the number of reporters varies from week to week. There is also only a limited amount of information provided. Methods for classifying ILI vary from provider to provider depending on provider type. Demographic information such as age or gender is lacking. Trends in school absences from week to week in a given district provide a very limited assessment of ILI in that particular community, but due to the size differences in school districts, comparisons cannot be made between them. Hospitals report ILI encounters in their facilities, as well as number of laboratory-confirmed influenza cases, but again without demographic or geographic details. Consequently, sentinel data do not provide any information regarding the populations most vulnerable to serious consequences of influenza infection such as the very young, the very old, and pregnant women, nor the specific communities affected.

An important provider partner in Williamson County is the Federally Qualified Health Center, Lone Star Circle of Care (LSCC). A significant provider of care to Williamson County residents, the client base of LSCC represents a potentially data-rich source of information concerning those affected by influenza. A data enhancement project for ILI surveillance was proposed by WCCHD to LSCC in order to determine if details concerning those patients seen for ILI at LSCC clinics could be used to develop a clearer picture of the incidence of influenza in Williamson County. The intent of the project is to improve the quality and utility of information WCCHD shares with providers, communities, and member cities in Williamson County to inform local policy and planning. Specific goals for data enhancement included collecting age-specific data, determining the burden of ILI in childbearing women, and obtaining community-level data more detailed than was available from school reporting.

METHODS

LSCC provided ILI surveillance reports to WCCHD on all patients whom they identified as Williamson County residents. Data on the total number of patient visits and the total number of ILI visits were provided on a weekly basis based on an executed data sharing Business Associates Agreement. LSCC uses the NextGen® Electronic Medical Record (EMR) system. Using SQL database programming, LSCC extracted data from the EMR to identify patients presenting with symptoms meeting the case definition of ILI: documented fever with cough and/or sore throat, plus one of the following ICD-9 codes: 079.99 (unspecified viral infection), 462 (acute pharyngitis), 465 (acute upper respiratory infections of multiple or unspecified sites), 487 (influenza), 488 (influenza due to certain identified influenza viruses), 780.60 (fever, unspecified), 784.1 (throat pain), 786.2 (cough), or 780.99 (other general symptoms with associated assessment "influenza-like symptoms"). Data were aggregated by ZIP code, sex, age group, and pregnancy status. WCCHD compiled and analyzed data from September 30, 2012 through September 28, 2013. WCCHD aggregated data further into five ZIP code-defined communities using ArcGIS 10.1.

COMMUNITIES DEFINED BY ZIP CODE AGGREGATION



RURAL WILLIAMSON COUNTY HAD HIGHEST PEAK %ILI

COMMUNITY	TOTAL ENCOUNTERS[1]	ILI ENCOUNTERS[1]	MAX WEEKLY %ILI
Taylor	9,935 (191±29)	561 (11±7)	14.1%
Georgetown	28,380 (546±74)	1,666 (32±20)	13.8%
Round Rock/Hutto	52,820 (1,016±119)	2,938 (57±37)	14.9%
Rural Williamson County	11,484 (221±34)	655 (13±8)	16.5%
Cedar Park/Leander/Austin	17,094 (329±42)	975 (19±11)	15.5%
COUNTY TOTAL	119,713 (2,302±274)	6,795 (131±79)	13.0%

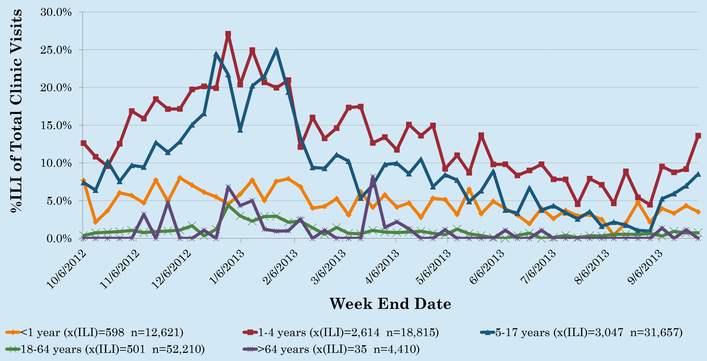
LSCC Encounters by ZIP Code-Aggregate Community for September 30, 2012 to September 28, 2013 (52 weeks). Date of week of maximum %ILI varied by community (date not shown), but all occurred between weeks ending 12/29/2012 and 2/2/2013 during the nationally observed peak season for influenza.
[1]Weekly average ± standard deviation shown in parentheses for both Total and ILI Encounters

LSCC CLINIC POPULATION YOUNGER THAN COUNTY

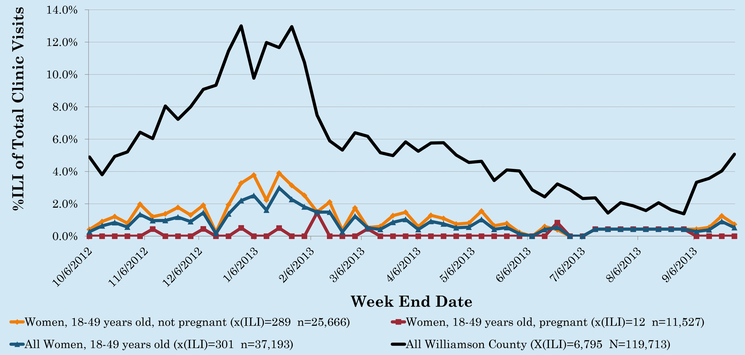
AGE GROUP	LSCC ENCOUNTERS (% OF TOTAL)	WILLIAMSON COUNTY[1] (%OF TOTAL)
Younger than 5 years	31,346 (26.3%)	33,371 (7.3%)
5-17 years of age	31,657 (26.4%)	93,549 (20.5%)
18-24 years of age	11,714 (9.8%)	36,012 (7.9%)
25-49 years of age	30,292 (25.3%)	173,996 (38.1%)
50-64 years of age	10,204 (8.5%)	74,543 (16.3%)
65 years and older	4,410 (3.7%)	44,761 (9.8%)

Age Distribution of LSCC Encounters September 30, 2012 to September 28, 2013 (52 weeks) as Compared to General Population of Williamson County.
[1]One-year Estimate for 2012, from Annual Estimates of the Resident Population for Selected Age Groups by Sex for United States, States, Counties and Puerto Rico Commonwealth and Municipios, April 1, 2010 to July 1, 2012. Source: US Census Bureau, American Community Survey

ILI HIGHEST IN PEDIATRIC POPULATION (1-17 YEARS)



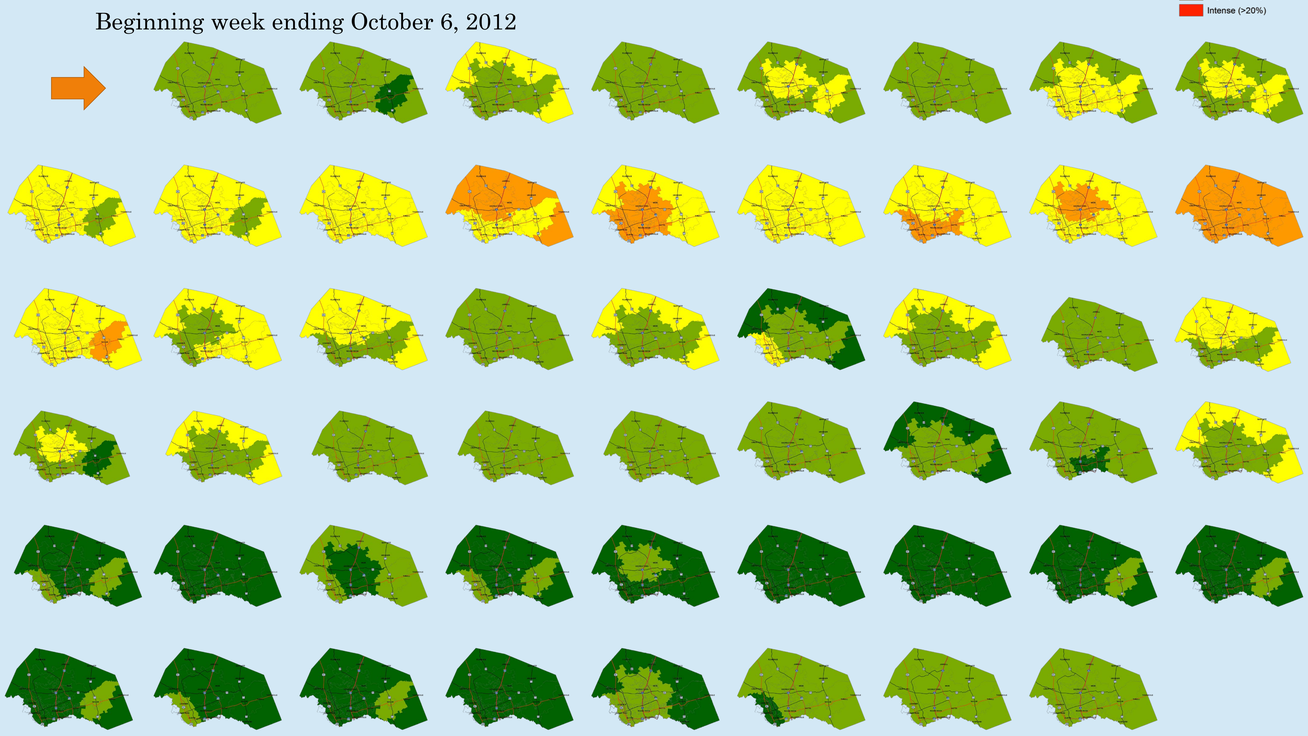
ILI LOW IN WOMEN, EXCEPTIONALLY LOW IN PREGNANT WOMEN



REFERENCES

1. Centers for Disease Control and Prevention. Overview of Influenza Surveillance in the United States. Dept Health and Human Services. October 6, 2014
2. Yuen CY, Tarrant M. A Comprehensive Review of Influenza and Influenza Vaccination during Pregnancy. J Perinat Neonatal Nurs. 28(4):261-270. 2014

WEEKLY RELATIVE ILI SEVERITY MAPPED THROUGHOUT YEAR



CONCLUSIONS

- The Business Associates Agreement between WCCHD and LSCC reduced barriers to ILI data collection and reporting.
- EMR technology allowed data to be extracted, summarized and submitted quickly and efficiently each week.
- Clinic data accurately reflected ILI incidence as compared to other available sources of information regarding ILI.
- EMR systems have the potential to improve reporting of notifiable diseases and other health states of interest.
- Prior to the implementation of this LSCC-WCCHD partnership project, WCCHD had very limited capabilities for understanding ILI incidence in the community.
- With the combination of clinical verification of ILI through the EMR data as well as the provision of key statistics such as age groups, gender, ZIP code and pregnancy status, this partnership has significantly improved WCCHD's capacity for preparedness.