USE OF SYNDROMIC SURVEILLANCE DURING THE 2009-2010 INFLUENZA SEASON IN LOS ANGELES COUNTY

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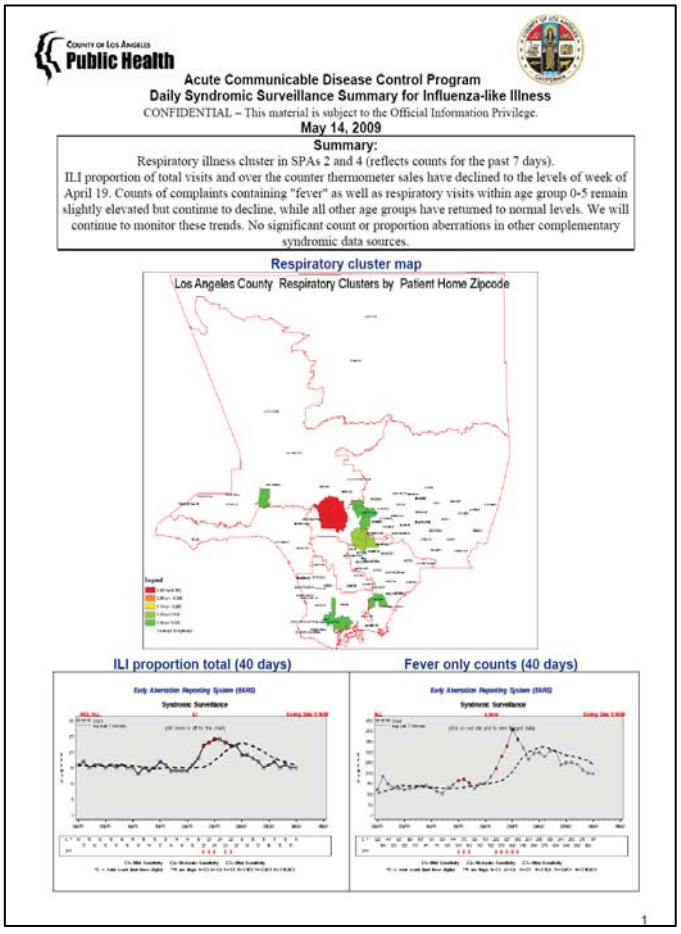
In April of 2009, several media reports and notifications from neighboring health jurisdictions warned of the possible circulation of a novel strain of influenza near central Mexico and the Mexico/US border. Later that month, these suspicions were confirmed by the World Health Organization (WHO) as the first confirmed cases of Pandemic Influenza (H1N1). As a large metropolitan region in close proximity to the potential outbreak, the Los Angeles County (LAC) Department of Public Health (DPH) Automated Disease Surveillance Section (ADSS) of Acute Communicable Disease Control Program (ACDC) began conducting enhanced surveillance for Influenza-like illness (ILI) activity in LAC through its pre-existing syndromic surveillance and complementary systems. In addition to this, a daily ILI report was created to provide key public health stakeholders and Departmental Operations Center (DOC) staff with near real-time ILI-related analysis results, trend graphs and temporal-spatial statistics and maps.

The LAC emergency department syndromic surveillance (EDSS) system analyzes data from approximately 60% of all emergency department (ED) visits throughout LAC. For every participating hospital, each ED visit is systematically classified into one of several syndrome categories based upon patient chief complaint. These include: rash, respiratory, gastrointestinal, neurological, and ILI. Each syndrome category is then tallied and compared to a threshold generated by the Centers for Disease Control and Prevention (CDC)-Early Aberration Reporting System (EARS) algorithm based upon the individual hospital's previous data. During the period from April to May 2009, ILI- and fever- classified counts obtained from the syndromic surveillance system were utilized to produce overall and age-group stratified trend graphs for a daily ILI report which summarized and displayed analysis results from several surveillance systems (Figure 1).

Figure 1. Influenza-Like Illness (ILI) Daily Report



Other data source results selected for the ILI report included information from SaTScan™, respiratory-classified nurse calls, respiratory-classified coroner's deaths, respiratory-related 911-calls, and emergency department volume biosurveillance (total ED visits and total ICU admissions from the ED). Most results were generated by SAS® in Cary, North Carolina and presented in trend graph format, with the exception of the respiratory SaTScan™ cluster map. Data sources were selected based upon prior knowledge about the quality of information, timeliness and consistency of reporting, relevancy with respect to ILI early-event detection surveillance, and additional value gained by inclusion in the report. Since the pandemic was the first observed since the foundation of early-event detection surveillance in LAC, the circumstances served as an opportunity to assess the utility of each of the data sources utilized and presented in the report for inclusion in any future report related to ILI. For this assessment, retrospective evaluation of daily ILI reports from mid April through May 2009 was conducted.

Each data source in the ILI report was retrospectively assessed for increasing trend from April through May, 2009, due to a known increase in confirmed cases of novel H1N1 influenza (H1N1) reported during this time period. From reviewing the reports, a sudden and significant increase in the proportion of total ED ILI visits (~8-10%) within the timeframe of a few days (Figure 2) is observed in combination with early signaling among EDSS fever-categorized visits during the same period (Figure 3), to suggest the possibility of an ILI outbreak in the community. Respiratory SaTScan™ cluster maps confirmed several clusters of local communities with significant respiratory activity during the analysis period (Figure 1). Age-stratified EDSS ILI data identified age categories in which the burden of illness was greatest (Figure 4), observing an increase in ILI ED visits among younger persons (<45 years old) and more specifically, those between the ages of 14-44 years old, with little to no difference in trend detected among those over 45 year old. Respiratory-classified nurse calls and total volume of ED visits biosurveillance data also confirmed increases in ILI-related encounters during the assessment period. In contrast, 911-calls and total ED-to-ICU transfers volume trend data remained static throughout the observation period and Coroner's results were unreliable due to delayed data receipt. For future reports, these data sources may not be as useful an indicator for detecting ILI activity.

Figure 2. Total EDSS ILI-classified visits per day

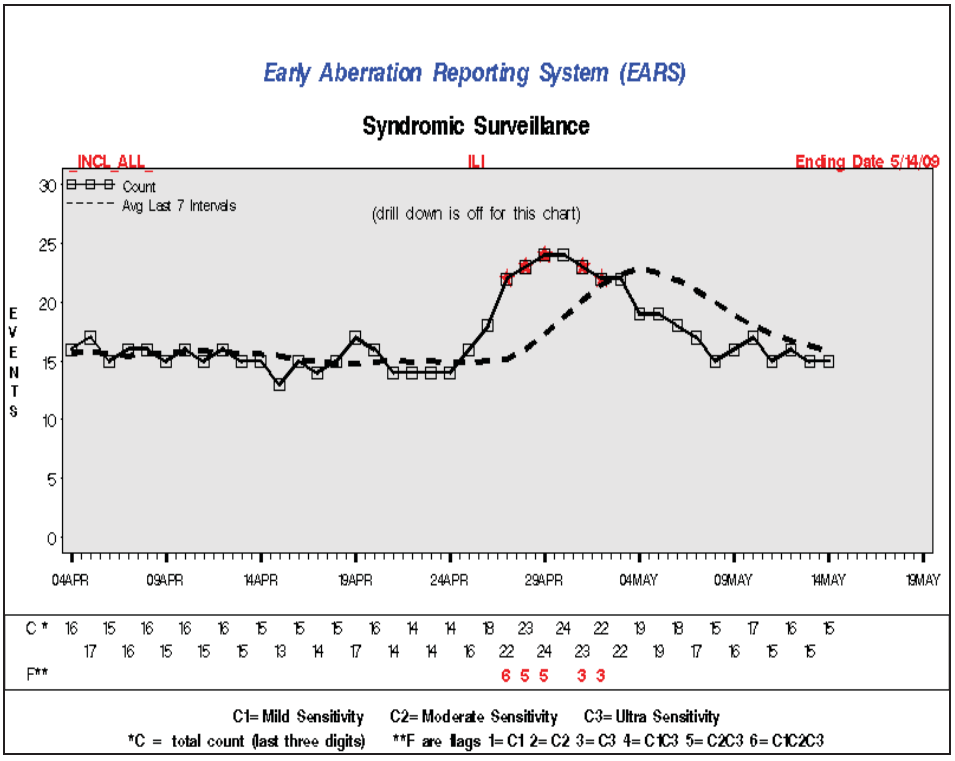


Figure 3. Total EDSS fever-classified visits per day

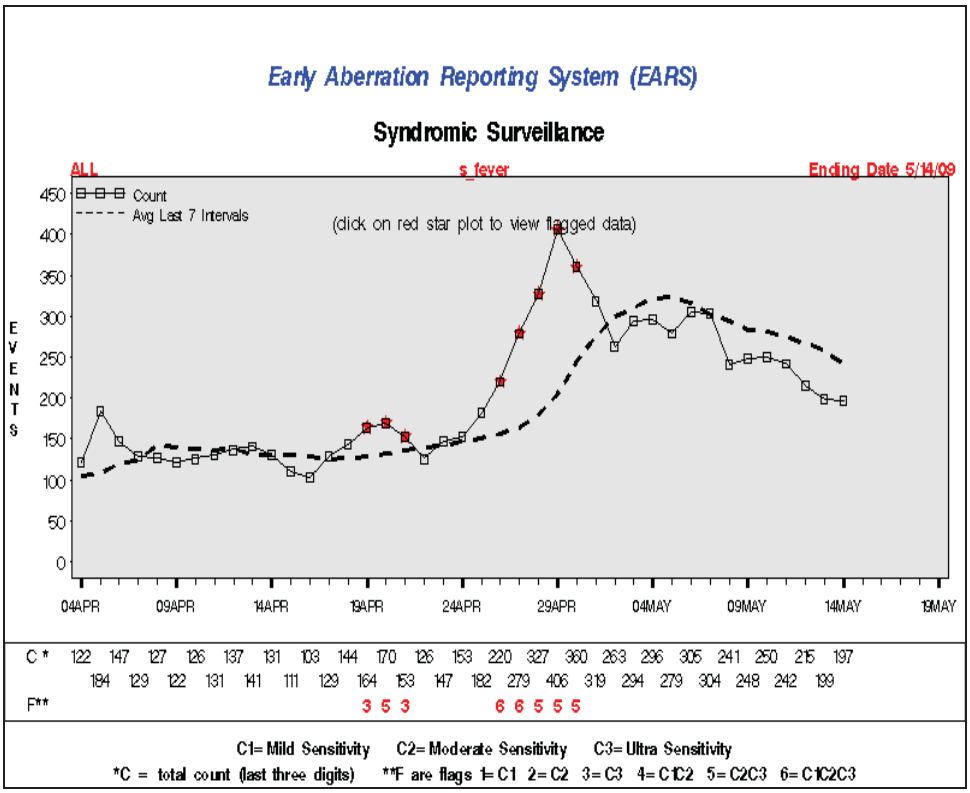
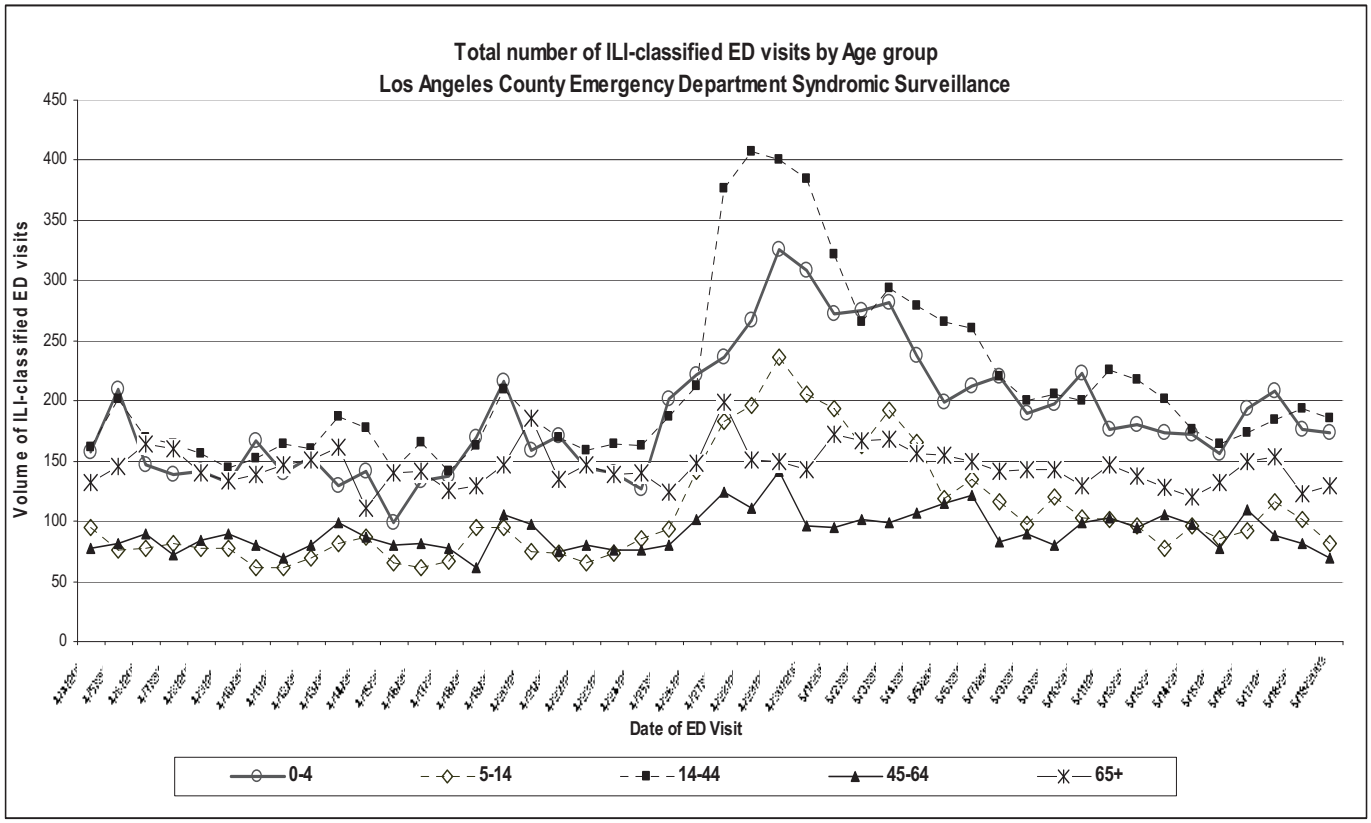
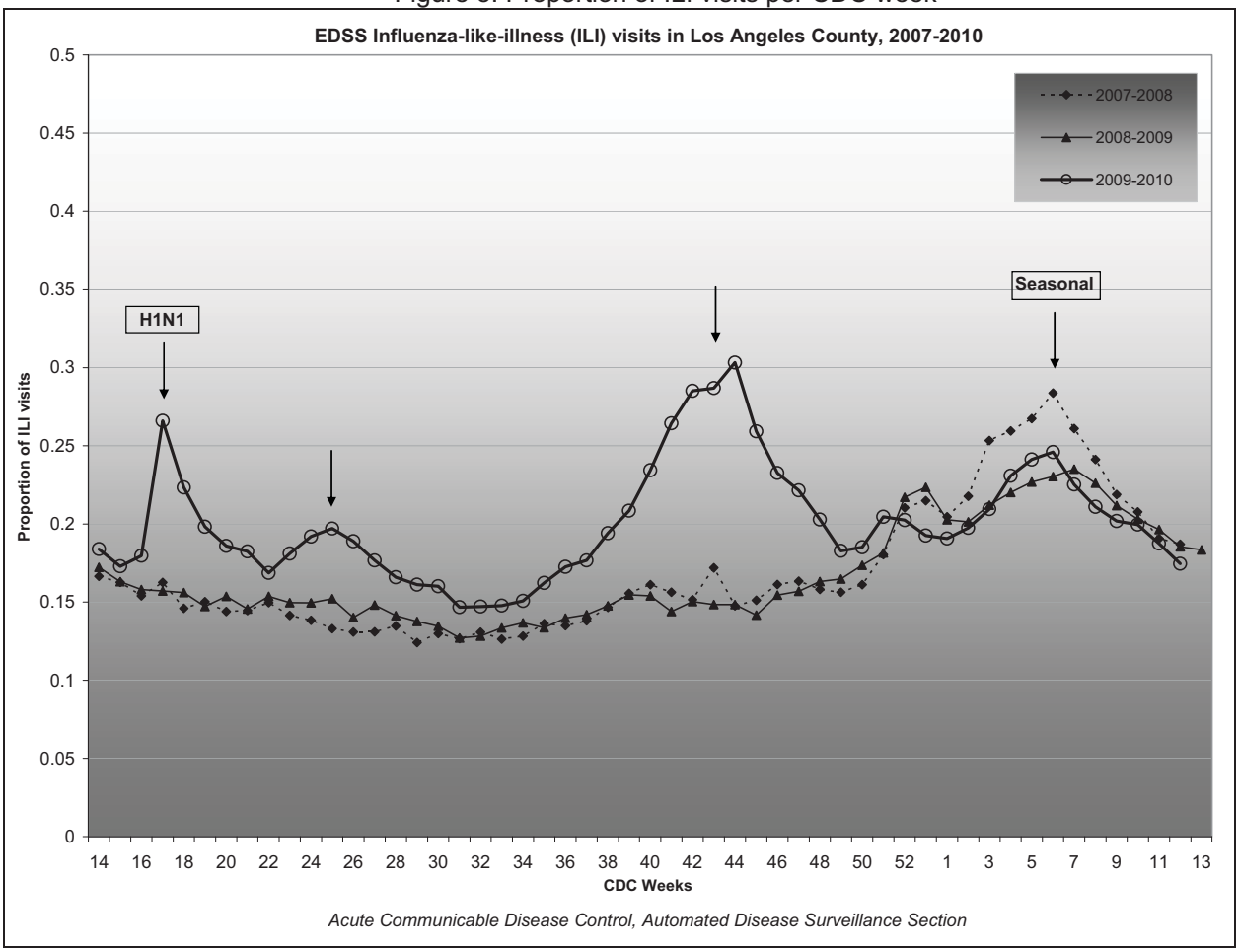


Figure 4. Age-stratified EDSS ILI trend graph from April through May, 2009



Further retrospective assessment of overall ILI activity as captured by the LAC EDSS system, revealed several notable findings upon review of annual trend in proportion of ILI-classified ED visits for the same period each year between 2007 and 2010[1]. The first being the sudden appearance of a large increase in ILI activity early on in the 2009-2010 season (Figure 5, CDC weeks 16-20) followed by two more significant peaks which are observed to be absent from the two previous years. While these sharp increases are not based upon confirmed H1N1 novel influenza counts, they are consistent and positively associated with H1N1 influenza activity through cross-referencing with other data sources[2]. In contrast, the final peak (weeks 1-13) is seen across all three years and has been attributed to annual influenza, as both the length and timing of increasing ILI activity correlates with that of recurring seasonal influenza. In summary, the presence of these atypical yet significant increases in ILI activity early on in the 2009-2010 season following several local reports of confirmed H1N1, in conjunction with annually anticipated seasonal influenza activity suggest that the additional peaks can more than likely be attributed to novel H1N1 influenza activity.

Figure 5. Proportion of ILI visits per CDC week



[1] Prior to 2009, the novel H1N1 influenza virus had never been detected in a single influenza virus (source: www.flu.gov). All laboratory positive influenza tests prior to the 2009-2010 season were recorded as seasonal influenza.
[2] California Department of Public Health: ***Influenza and Respiratory Disease Surveillance Report***

The case for the presence of a novel strain of influenza, in addition to yearly expected seasonal influenza, was further supported by the comparison of the total number of EDSS ILI signals generated annually by all participating hospitals from 2007 through 2010. Whereas, the total number of syndromic surveillance ILI signals for the year beginning in April 2007 through 2008 was 37, and for the same time period the following year 38, by contrast, during the final year (2009-2010) the total number of ILI signals generated by EDSS reached 80, indicating a twofold increase in the number of statistically significant ILI signals observed across all LAC EDs the final year in comparison to the two previous years. This information in combination with records of only laboratory positive seasonal influenza prior to 2009, again suggests that the sharp increase in number of ILI signals along with the observation of several additional ILI peaks (increasing proportion of ILI ED visits) during the 2009-2010 season are more than likely attributable to a novel form of influenza, or H1N1 (Figure 6).

Figure 6. Total number of ILI syndromic surveillance signals generated by participating hospitals

April 1, 2007- March 31, 2008	April 1, 2008- March 31, 2009	April 1, 2009- March 31, 2010
37	38	80

Overall, several observations unique to the 2009-2010 influenza season are notable. LAC DPH began conducting enhanced surveillance in April, 2009, utilizing several pre-existing surveillance systems following local reports of increased ILI activity from neighboring jurisdictions and abroad. These analysis results were then compiled into a daily ILI report for distribution among Public health stakeholders and DOC personnel as status updates for the duration of the declaration of emergency for novel influenza (H1N1).

Upon retrospective review of the daily ILI reports between April through May, 2009, several data sources displayed concurrent trend increases with that of proportion of total EDSS-ILI trend graphs. These data sources included EDSS fever-classified visits, EDSS age-stratified ILI visits, respiratory-classified nurse calls, and total ED volume biosurveillance data, suggesting these particular results may be useful as supplementary data sources for inclusion in future ILI surveillance reports. EDSS data provided very useful information due to the type of data captured, enabling analysts to subset observations further by chief complaint (e.g., the keyword “fever”), and additionally, to stratify data by ZIP code or age-group. This not only identified certain age-groups as being more susceptible to ILI during the outbreak, but also informed health officials as to location of clusters of ILI activity in the community.

Furthermore, comparison of annual trends in proportion of EDSS ILI visits from 2007-2010 revealed an unusually high proportion of ED ILI visits during traditionally non-ILI months, in addition to normal levels of seasonal influenza ED ILI visits during the 2009-2010 season, in contrast to the two previous years. This was complemented by the observation of twice as many EDSS ILI signals from 2009-2010 in comparison to annual totals of EDSS ILI signals seen in prior years. Overall, these data sources, used collectively, may help detect ILI activity, in near real-time, when conducting surveillance during the course of an ILI emergency.