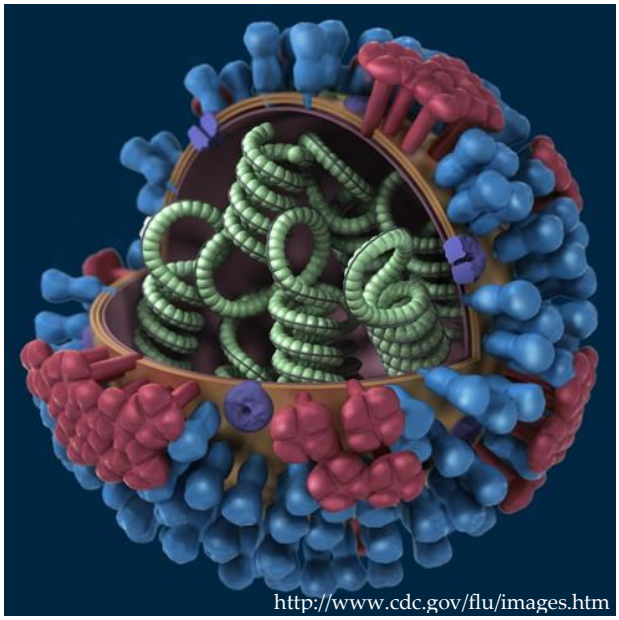
INFLUENZA IN MARYLAND 2016-2017 SEASON REPORT



October 2016 – May 2017

Influenza in Maryland 2016-2017 Season Report

OCTOBER 2, 2016 TO MAY 20, 2017

DIFFERENT TYPES OF INFLUENZA SURVEILLANCE

Surveillance is the systematic collection and analysis of data, and the distribution of the information derived from that data to support public health action and decision making. Maryland uses several different systems to collect influenza data. These systems for the 2016-2017 season are unchanged from the 2015-2016 season, except that data from Google Flu Trends are no longer presented, as that project was discontinued in 2015. The systems are described below.

Syndromic Surveillance

Syndromic surveillance looks for cases based on clinical syndromes (combinations of signs and symptoms) rather than laboratory diagnoses. Influenza-like illness (ILI) is the syndrome used during the influenza season as a surrogate indicator for influenza in the absence of laboratory testing. The definition of ILI varies by surveillance system (see subsections below for individual definitions), but generally consists of fever combined with either cough or sore throat. The additional tracking of ILI, rather than only influenza cases confirmed by laboratory tests, gives us access to much more information about the impact of influenza on the community. Two of these syndromic surveillance systems (ILINet; ESSENCE) monitor visits to outpatient providers. The other system, MRITS, does not rely on healthcare visits and, therefore, can provide information on people who had not sought healthcare for their current illness.

ILINet

The U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet) is a network of healthcare providers ("sentinel providers") who report, on a weekly basis, the total number of patients visiting their practices for influenza-like illness. For this system, ILI is defined as a fever (greater than or equal to 100 degrees Fahrenheit) accompanied by a cough and/or a sore throat. The Centers for Disease Control and Prevention (CDC) manage ILINet in collaboration with the influenza surveillance coordinators in states and territories. In Maryland, a total of 43 sentinel providers participated in ILINet during the 2016-17 influenza season.

ILINet ILI = Fever + Cough and/or Sore Throat

ESSENCE

The Office of Preparedness and Response (OPR) at DHMH uses the Electronic Surveillance System for the Early Notification of Community-based Epidemics

ESSENCE ILI = Fever + Cough and/or Sore Throat OR Chief Complaint of "Influenza"

(ESSENCE) to keep track of visits to emergency departments for ILI. For this system, the definition of ILI is similar to the one used in ILINet. A person with a chief complaint of fever along with a cough or a sore throat, or complaining of "influenza" is classified as an ILI case in ESSENCE. Each week, OPR epidemiologists analyze the data reported from 45 emergency departments and share their findings with DHMH's influenza surveillance coordinator. Both the ILINet and ESSENCE systems will detect only people who are sick enough to seek healthcare, and have access to it.

MRITS

The Maryland Resident Influenza Tracking Survey (MRITS) is an email-based surveillance system where participants who register with the system are asked once a week if they experienced any symptoms of ILI. If they respond in the affirmative, they are then asked if they sought any medical care for their symptoms, if they traveled in the week prior to the onset of their symptoms, and if they missed any regular daily activities as a result of their symptoms. Upon registering, and also at the beginning of each influenza season, participants are asked about their influenza vaccination status and whether or not they work in a healthcare setting. This information can also be updated as necessary.

MRITS captures a subset of the population who may not be interacting with healthcare but are reporting symptoms electronically.

Laboratory Surveillance

There are many different respiratory viruses that commonly circulate around the same time as influenza and cause similar symptoms. While tracking ILI gives us access to more data, analyzing trends in laboratory testing and test results allows us to assess whether the ILI activity being reported is truly due to influenza. There are two surveillance systems we use to track influenza test results. These symptoms rely primarily on different types of influenza tests, which are able to provide us with different types of information.

Clinical Laboratories

This season, more than 60 clinical laboratories agreed to report the total number of tests performed each week along with the results. The most commonly reported tests performed are called rapid influenza diagnostic tests (RIDTs). These tests are fast, easy to perform, and the results are interpreted as "positive" or "negative." In most cases, the rapid test can differentiate between type A and type B influenza. Rapid tests cannot distinguish between different subtypes of influenza
(e.g., H1N1 vs. H3N2). The reliability of RIDTs depends largely on the conditions under which they are used. False-positive (and true-negative) results are more likely to occur when the disease prevalence in the community is low, which is generally at the beginning and end of the influenza

season and during the summer. While most results reported to DHMH were from RIDTs, there are a handful of reporting laboratories that use polymerase chain reaction (PCR) tests, which are often more reliable than RIDTs.

Maryland DHMH Laboratories Administration

The Maryland DHMH Laboratories Administration performs complex laboratory tests on respiratory specimens to detect and identify influenza virus. These tests are PCR and viral culture. Both PCR and culture provide the ability to determine the subtype of the influenza virus in the specimen. PCR testing can also provide information about antiviral resistance.

Influenza-Associated Hospitalizations

The Emerging Infections Program (EIP) at DHMH conducts active surveillance for laboratory-confirmed, influenza-associated hospitalizations in Maryland. A person with an overnight hospital stay along with a positive influenza test of any kind (e.g., RIDT or PCR) is considered an "influenza-associated hospitalization" for purposes of influenza surveillance. All 47 acute care hospitals participate in weekly reporting of influenza-associated hospitalizations.

Influenza-Associated Pediatric Mortality

Maryland participates in national tracking of deaths of persons under 18 years of age who had a positive influenza test during their course of illness leading to death, and for whom no other disease or condition can be established.

During the 2016-2017 influenza season, one such case was reported to DHMH. Due to confidentiality considerations, details of these cases are not discussed in this report. Please refer to the additional readings section at the end of this report for more information on influenza-associated pediatric deaths in the United States.

Outbreaks of Respiratory Disease in Institutional Settings

In Maryland, disease outbreaks of any kind are reportable. For influenza surveillance, data collected during the investigation of outbreaks of influenza, ILI, pneumonia, and other respiratory diseases are analyzed. The investigation of outbreaks is done in collaboration with local health departments and staff at the facilities where the outbreaks occur.

Influenza Geographic Spread and Intensity

Every week, the influenza surveillance coordinator consults with the state epidemiologist to determine the extent of influenza's geographic spread. This geographic spread is based on a number of variables, including the number of laboratory-confirmed cases, the proportion of visits

for ILI to sentinel providers, and the locations of these cases. There are five levels of geographic spread, ranging from "no activity" to "widespread." These levels do not indicate the severity of the influenza season, only where influenza may be active. Current and historical geographic spread data may be accessed at https://gis.cdc.gov/grasp/fluview/FluView8.html

Beginning with the 2008-2009 influenza season, CDC has been reporting the level of intensity of influenza-like illness in each state for every week of the influenza surveillance season. This "ILI Activity Level" has 10 levels from "minimal" to "high." This level is determined by comparing the number of ILI cases reported through ILINet with the season's "baseline" level. Current and historical intensity data can be accessed at http://gis.cdc.gov/grasp/fluview/main.html

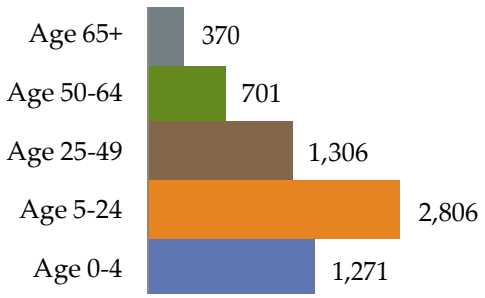
INFLUENZA SURVEILLANCE DATA RESULTS

In the following sections, the data collected during the 2016-2017 influenza season with the systems described above will be displayed. It should be noted that the data are subject to change even after the final drafting of this report, as more data are reported from the participants in the different systems.

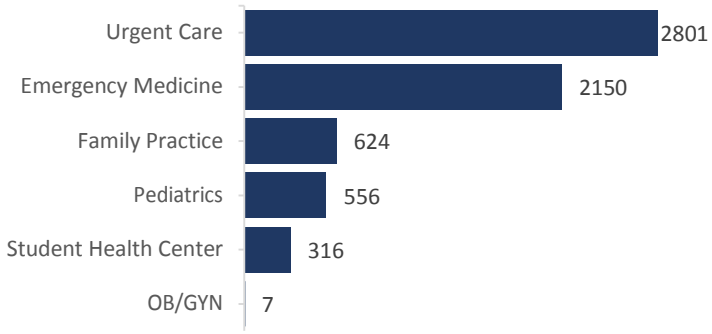
ILINet

During this season, a total of 43 sentinel providers participated in ILI surveillance. There are sentinel providers in all regions of the state, including in Baltimore City, and Allegany, Anne Arundel, Baltimore, Calvert, Cecil, Charles, Frederick, Howard, Montgomery, Prince George's, Somerset, Washington, Wicomico, and Worcester counties.

Of the 288,029 total visits to all sentinel providers during the season, 6,454 (2.2%) were for ILI. The largest proportion of the ILI visits were in the 5-24 age group (43%), followed by the 0-4 age group (20%) and the 25-49 age group (20%). The 50-64 and over 65 age groups together made up only 17% of all ILI visits to sentinel providers.



NUMBER OF ILI VISITS TO SENTINEL PROVIDERS BY AGE GROUP

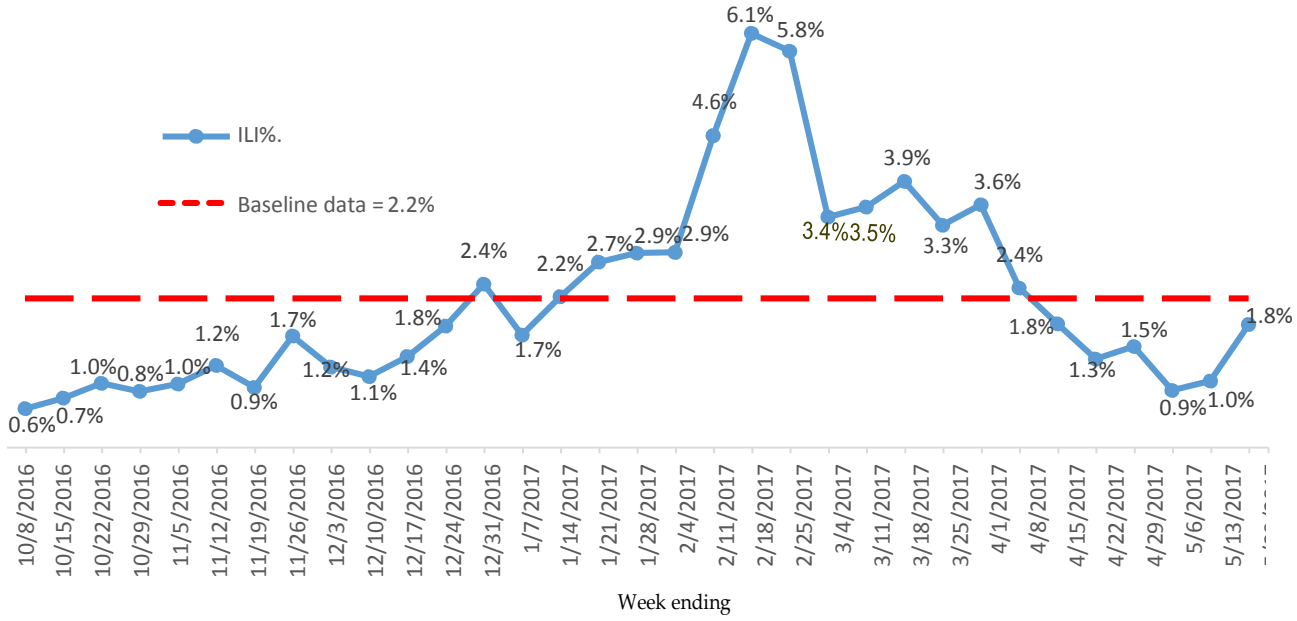


NUMBER OF ILI VISITS TO SENTINEL PROVIDERS BY PRACTICE TYPE

The baseline proportion of ILI is the average proportion of patient visits for ILI during non-influenza weeks. The baseline is calculated using data from the three prior seasons. For the 2016-2017 influenza season, the baseline proportion of visits for ILI was 2.2% for Maryland (represented by the horizontal dotted line on the graph below). This is higher than the baseline of 1.8% assigned to Maryland for the 2015-2016 season.

Broken down by week, the proportion of visits to sentinel providers for ILI was evenly distributed at a median and mean of 1.1% for the first twelve weeks of the season. The week ending December 31, 2016 saw the first ILI elevation (2.4%) above baseline, which then dropped below baseline the next week (1.7%). Following that, ILI rose consistently and peaked at 6.1% for the week ending February 18, 2018.

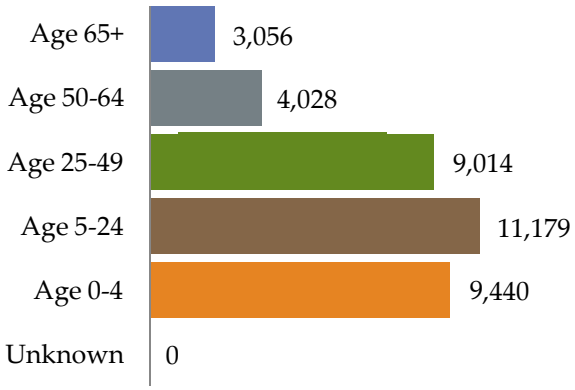
ILI remained above baseline levels for a total of 12 weeks (January 21, 2017 through April 8, 2017). The sentinel providers reported being below baseline for the final six weeks of the surveillance season.



PROPORTION OF VISITS TO SENTINEL PROVIDERS FOR ILI BY WEEK (RED LINE INDICATES BASELINE)

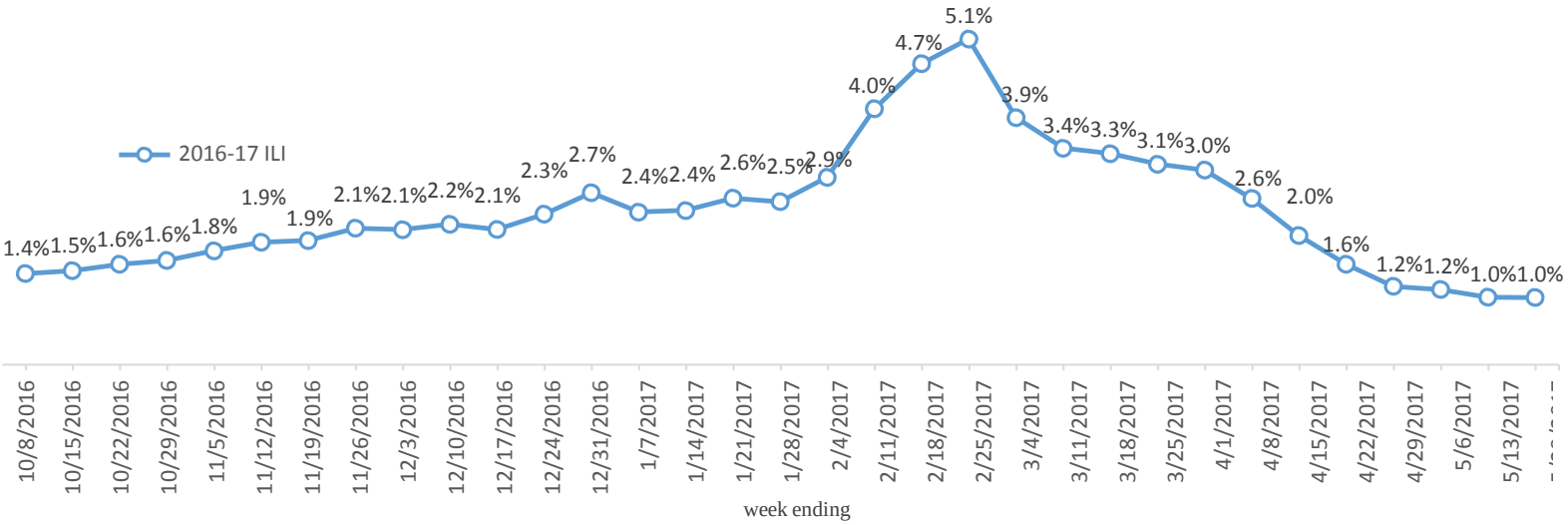
ESSENCE ILI Surveillance

There were a total of 1,523,674 visits to emergency departments reported this season through ESSENCE. Of those, 36,717 (2.4%) were visits for ILI. The largest number of ILI visits was by those in the 5-24 age group (30%), followed by the 0-4 (26%) and the 25-49 (25%) age groups.



VISITS TO EMERGENCY DEPARTMENTS FOR ILI BY AGE GROUP

Looking at the data by week (below), the proportion of visits to emergency departments for ILI rose slowly through January, 2017. Then, similar to ILI reported by the sentinel providers, ILI visits to emergency departments rose sharply for several weeks peaking at 5.1% for the week ending February 25, 2017. Following this peak, activity steadily declined, but remained elevated into April. It closed out the surveillance season at 1.0%.

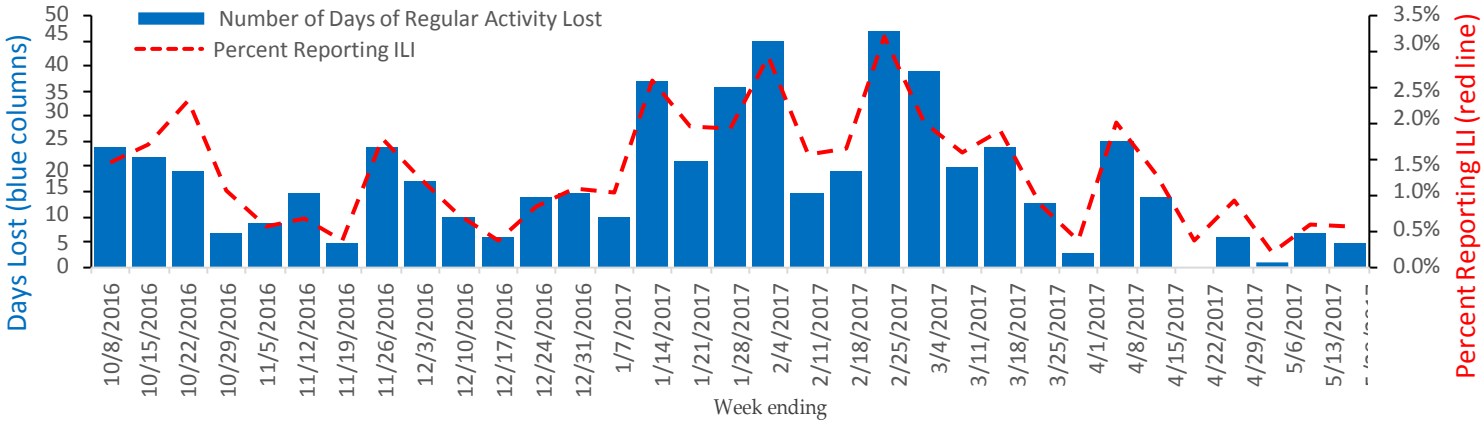


PROPORTION OF VISITS TO EMERGENCY DEPARTMENTS WITH CHIEF COMPLAINT OF ILI BY WEEK

Maryland Resident Influenza Tracking Survey (MRITS)

There was an average of 2,489 participants enrolled in MRITS over the course of the 2016-2017 influenza season, with an average of 557 (22.4%) reporting each week. Over the course of the season, ILI symptoms were reported for 246 (1.3%) of 18,389 surveys DHMH received, causing respondents to miss a cumulative 574 days of work, school, and/or other regular daily activities.

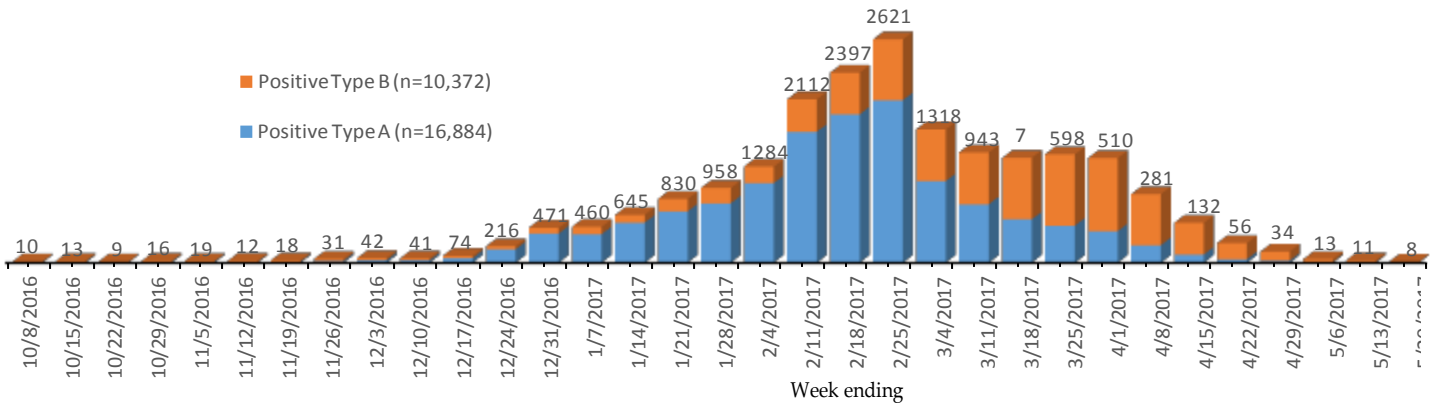
As seen in the graph below, ILI activity reported through MRITS was highly variable throughout the season. It peaked the week ending February 25, 2017, when 3.2% of respondents reported ILI symptoms. As with the other two syndromic indicators, ILI activity reported in MRITS was generally greater in February and March. Laboratory testing confirmed that true influenza activity peaked through the same period and gradually declined throughout April and May as the season drew to a close.



PROPORTION OF RESPONDENTS REPORTING ILI & NUMBER OF DAYS OF DAILY ACTIVITY LOST BY WEEK

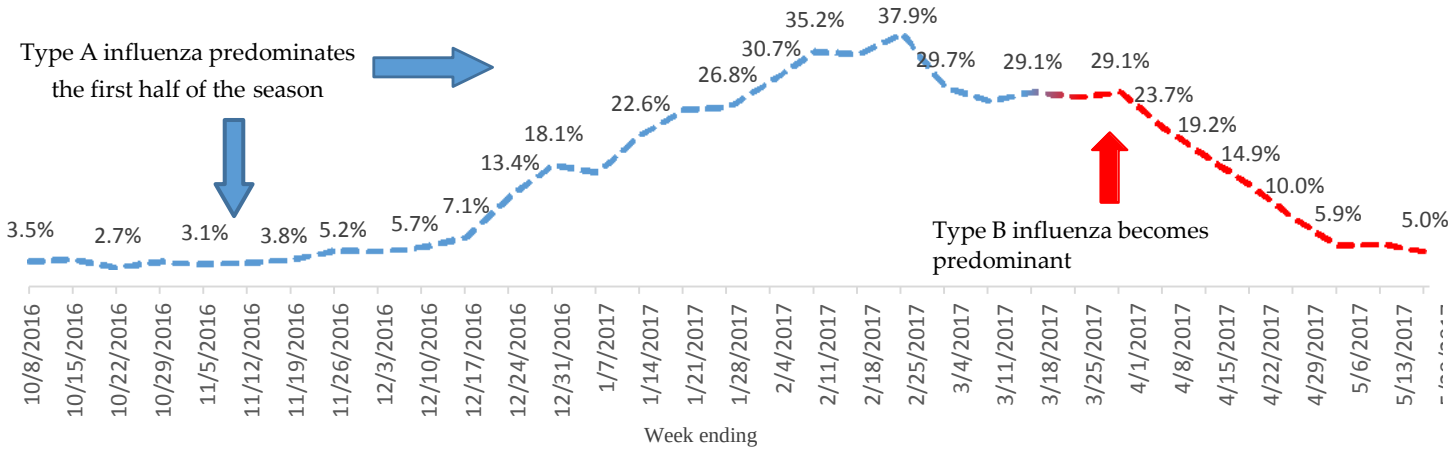
Clinical Laboratory Testing

This season, an average of 60 clinical laboratories agreed to report the total number of influenza tests they performed, along with the number of positive tests and the proportion of positives that were type A or type B. The results of 108,235 influenza diagnostic tests were reported over the entire 2016- 2017 influenza season, with 25.2% specimens testing positive. Of those specimens testing positive 61.9% were influenza type A and 38.1% were type B. The graph below shows the number positive each week.



NUMBER AND TYPE OF POSITIVE INFLUENZA TESTS REPORTED BY CLINICAL LABS BY WEEK

The graph below shows that the proportion of positive tests reported by clinical laboratories. High proportions are an indicator that most ILI activity is due to influenza virus rather that other respiratory pathogens producing similar symptomatology. The proportion of positive tests began to increase rapidly mid-December 2016, and reached a peak of 37.9% during the week ending February 25, 2017. Most of this first peak was due to influenza type A, which often predominates the first half of the season, with influenza type B predominating later on.



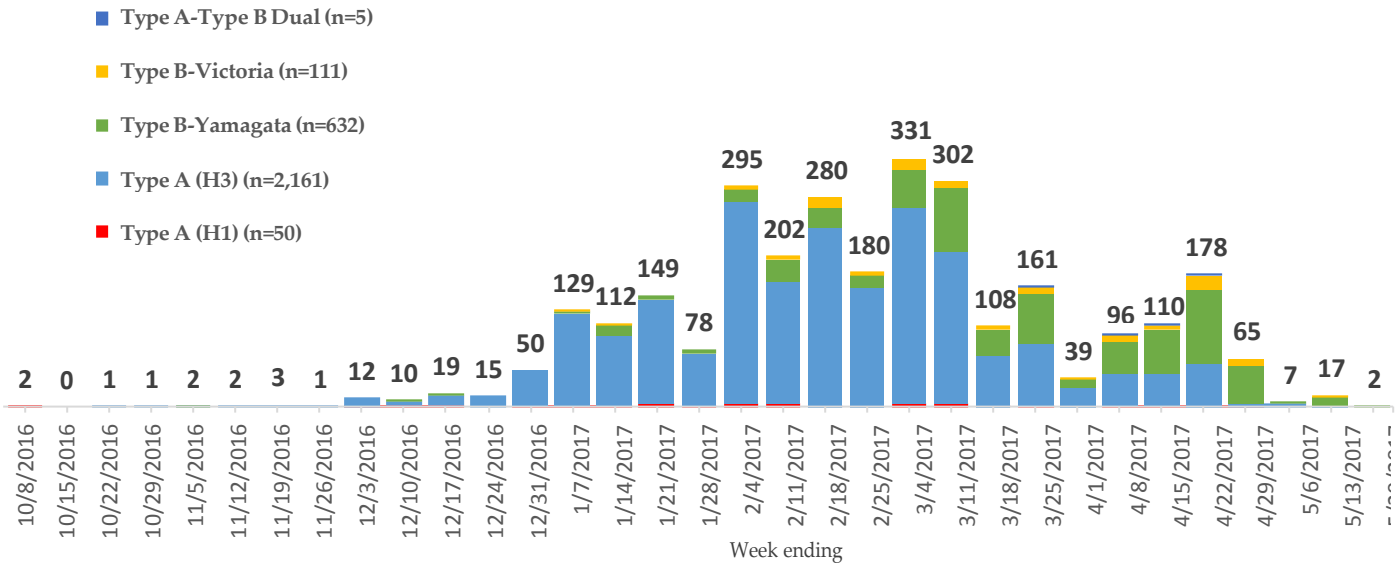
PROPORTION OF POSITIVE INFLUENZA TESTS BY WEEK (RED LINE INDICATES WEEKS WITH TYPE B INFLUENZA PREDOMINANCE)

Influenza Testing at the State Laboratories Administration

The DHMH State Laboratories Administration performed a total of 5,927 PCR tests for influenza. PCR testing is more reliable than rapid influenza diagnostic testing, which is what many of the clinical laboratories use. The higher proportion of positive results at the state laboratory (50%) compared to clinical laboratories (25%), is the result of the population being tested throughout the entire season. Much of the testing at the state laboratory is for confirmation of positive results from other facilities and testing of patients in an outbreak setting.

The number of positive specimens reported each week by the state lab is presented in the graph below. The first PCR-positive specimen of the surveillance season was collected on October 8, 2016. As with the clinical laboratory testing, DHMH laboratory activity was low throughout the first few months of the season, but saw substantially higher levels from January through mid-March. The number of specimens testing positive peaked during the week ending March 4, 2017, when 331 specimens tested positive for influenza. Similar to the rapid testing results from clinical laboratories, the number of specimens testing positive for type B increased later in the season.

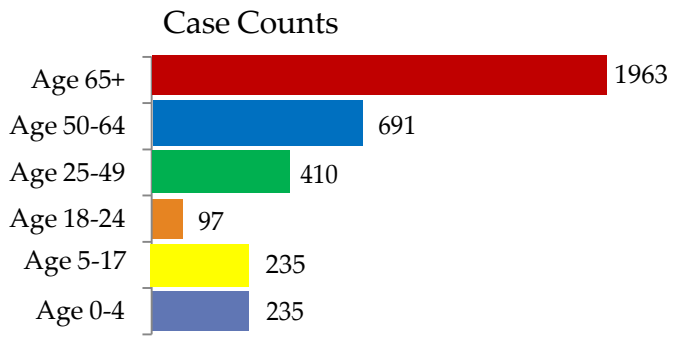
Of the 2,959 specimens that tested positive at the state lab, Type A (H3N2) was the predominant strain, accounting for 73% of the positive tests. Type B influenza accounted for 25.1% of the positive specimens, with a majority of those being the Yamagata lineage. Additionally, there were five (<1%) specimens that were positive for both type A and B. Type A (H1N1), the predominant subtype during the 2015-2016 season, was detected in only 1.7% of the positive specimens this season.



NUMBER OF PCR-POSITIVE TESTS BY INFLUENZA TYPE AND SUBTYPE AND WEEK REPORTED BY THE DHMH LABORATORIES ADMINISTRATION

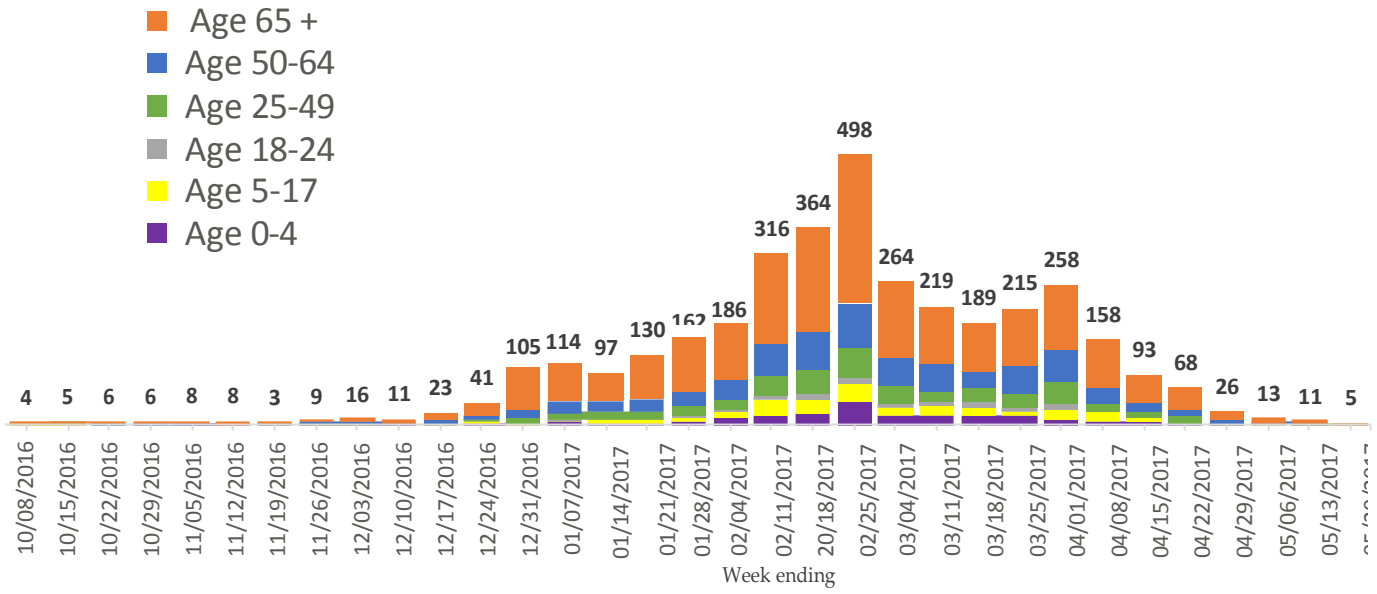
Influenza-Associated Hospitalizations

A total of 3,631 influenza-associated hospitalizations were reported to the Emerging Infections Program at DHMH during the season. This number more than doubled what was reported during the 2015-2016 season (n=1,704), where the predominant strain was the H1N1 subtype. It is also 1.7% lower than the 2014-2015 season (n=3,694) and 60.2% higher than the 2013-2014 season (n=1,446). The 65 and older age group had the greatest proportion (54.1%) of hospitalized cases, followed by the 50-64 age group (19.0%) and the 25-49 age group (11.3%). The three age groups making up the 0-24 range combined to contribute the remaining 15.6% of hospitalized cases.



INFLUENZA-ASSOCIATED HOSPITALIZATIONS BY AGE GROUP

The number of reported hospitalizations remained low and steady for the first several months of the season, and then began to rise sharply the last week of December 2016. The peak occurred during the week ending February 25, when 498 influenza-associated hospitalizations were reported. Reported hospitalizations dropped sharply following this peak, and then declined nearly every week until the end of the season. The graph below shows the number of hospitalizations reported each week by age group.



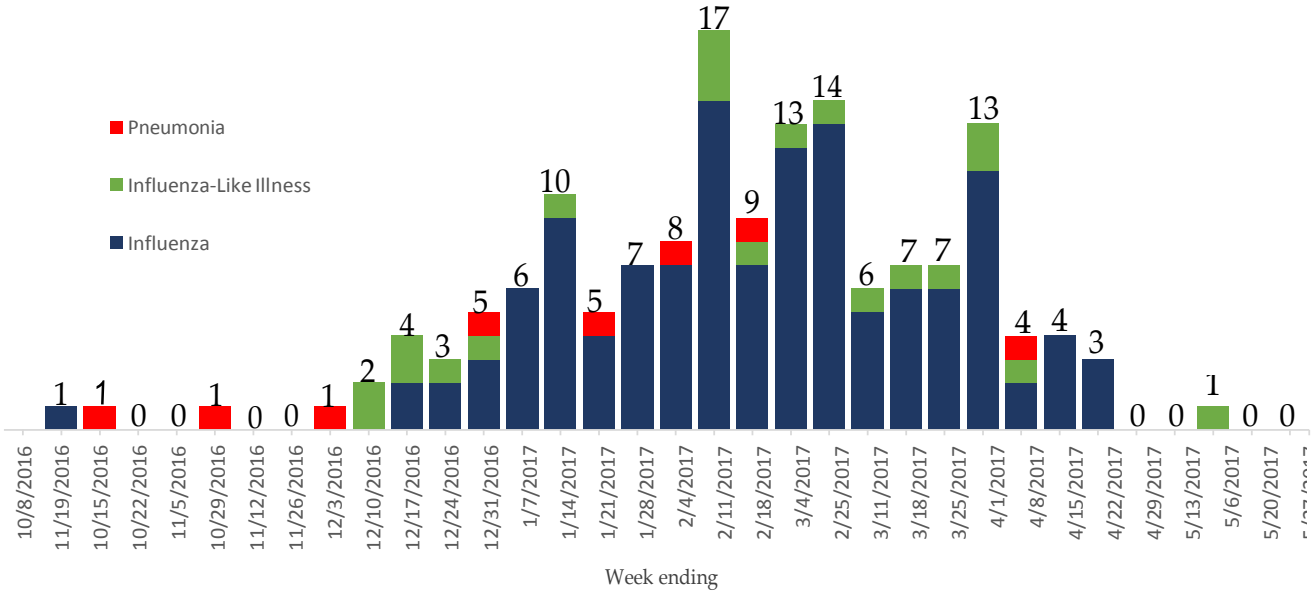
NUMBER OF INFLUENZA-ASSOCIATED HOSPITALIZATIONS BY AGE GROUP AND WEEK

During the 2016-2017 influenza season, a total of 152 respiratory outbreaks were reported to DHMH. Outbreaks of influenza, ILI and pneumonia were most commonly reported in nursing homes (93, 61.2%), followed by assisted living facilities (24, 15.8%), elementary and secondary schools and daycare centers (21, 13.8%), and other (8, 5.3%), with hospitals accounting for the final 6 (3.9%), of the outbreaks reported this season.

Type of Setting	Influenza Outbreaks	Influenza-like Illness Outbreaks	Pneumonia Outbreaks	Total Outbreaks
Nursing Home	77	9	7	93
Assisted Living	21	2	1	24
Hospital	6			6
Schools/ Daycares	13	8		21
Other	7	1		8
Total Outbreaks	124	20	8	152

REPORTED OUTBREAKS OF RESPIRATORY ILLNESS BY TYPE OF SETTING AND TYPE OF OUTBREAK

There were a total of 152 respiratory outbreaks reported in the 2016-2017 influenza season, compared to 39 during the 2015-2016 season, and 179 in the 2014-2015 season. The largest number of outbreaks reported in any single week was 17, which happened only once during the course of the season. Furthermore, five weeks had ten or more outbreaks reported.



NUMBER OF RESPIRATORY OUTBREAKS BY TYPE

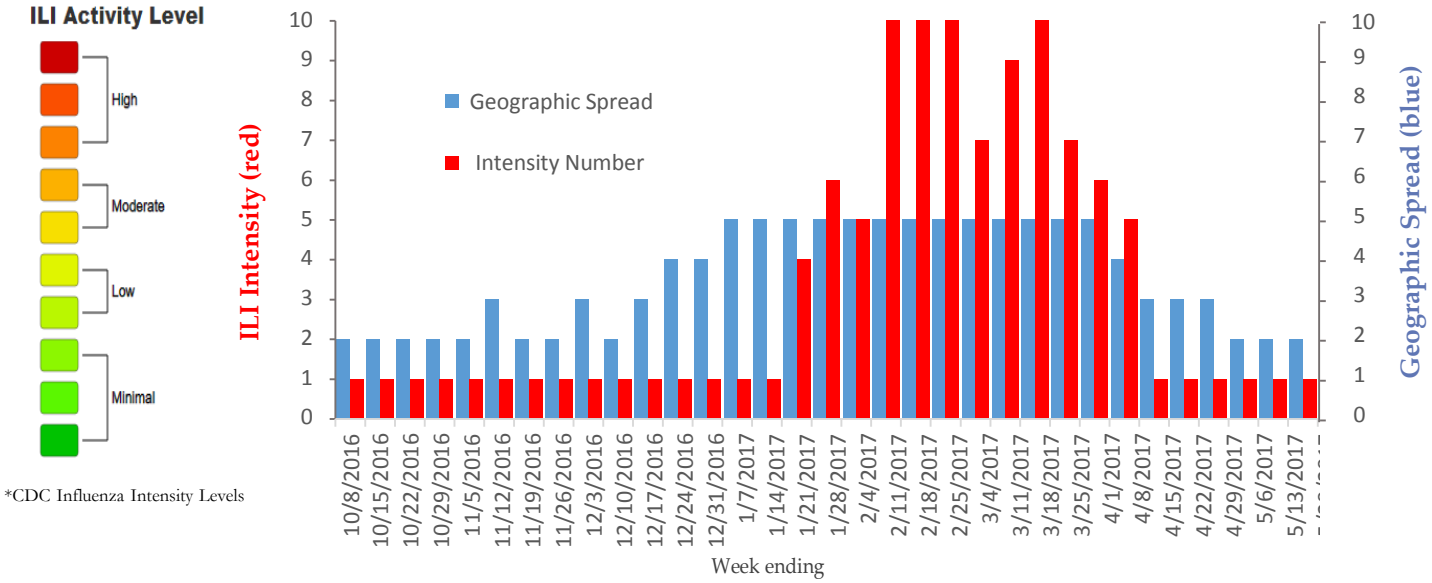
Geographic Spread and Intensity

The geographic spread and ILI intensity levels for the 2016-2017 influenza season can be seen in the chart below.

Geographic activity is determined by looking at ILINet, outbreak and laboratory data by geographic region. It is not a direct measure of the severity of influenza activity, but rather an indication of how widespread and intense the activity is.

The level of geographic spread was at “sporadic” or “local” for the first eleven weeks of the season and again the last six weeks. It was sustained at the "regional" and "widespread" levels for sixteen weeks during the peak of the season.

The level of ILI intensity was at "minimal" for the first 15 weeks of the season. It climbed dramatically during the week ending January 21 and remained at "moderate" to "high" through the end of January, thereafter dipping to "minimal" again for the remainder of the season.



*CDC Influenza Intensity Levels

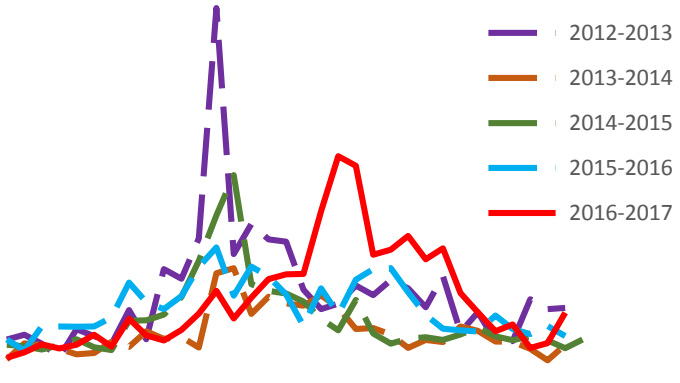
ILI INTENSITY AND GEOGRAPHIC SPREAD BY WEEK

To see the United States map of geographic spread of influenza throughout the season, please visit: https://gis.cdc.gov/grasp/fluview/FluView8.html.

To see an interactive map of the United States showing ILI intensity, please visit: https://gis.cdc.gov/grasp/fluview/main.html.

DISCUSSION

The first influenza virus detected at the DHMH laboratory during this season was an influenza type A (H1N1) virus. But influenza type A (H3N2) was the predominant strain seen during the 2016-17 influenza season, replacing influenza type A (H1N1) which was predominant in the 2015-16 season. And this season saw a 5.3% increase in emergency department visit for ILI compared to the prior season.



ILINET ACTIVITY FOR THE LAST FIVE SEASONS

There was a strong association between ILI activity this season and positive influenza test results (r=0.96). This suggests that the high level of ILI activity seen during the peak of the season, was likely attributed to influenza viruses that circulated around the same time, rather than other respiratory pathogens producing similar symptoms that also circulate during the influenza season.

Surveillance for influenza and other respiratory infections will continue year-round, not just in Maryland but around the world. We will work with our colleagues at all levels to monitor everything from single cases of disease to clusters and outbreaks, both within and beyond Maryland's borders.

ADDITIONAL READINGS

- "Frequently Asked Flu Questions 2016-2017 Influenza Season" Centers for Disease Control and Prevention, available at: http://www.cdc.gov/flu/about/season/flu-season-2016-2017.htm
- "Recommendations of the Advisory Committee on Immunization Practices – United States, 2016-17 Influenza Season" Centers for Disease Control and Prevention, available at: http://www.cdc.gov/mmwr/volumes/65/rr/rr6505a1.htm
- "Flu Activity & Surveillance" Centers for Disease Control and Prevention, available at: http://www.cdc.gov/flu/weekly/fluactivitysurv.htm
- "Weekly U.S. Influenza Surveillance Report" Centers for Disease Control and Prevention, available at: http://www.cdc.gov/flu/weekly/
- "Influenza: Preventive Steps" Centers for Disease Control and Prevention, available at: http://www.cdc.gov/flu/consumer/prevention.htm
- "Influenza Information for Specific Groups" Centers for Disease Control and Prevention, available at:http://www.cdc.gov/flu/groups.htm
- "CDC Reports About 90 Percent of Children Who Died From Flu This Season Not Vaccinated" Centers for Disease Control and Prevention, available at: http://www.cdc.gov/flu/spotlights/children-flu-deaths.htm
- "New CDC Study: Influenza Vaccination Reduces Risk of Hospitalization By More Than Half Among Seniors" Centers for Disease Control and Prevention, available at: http://www.cdc.gov/flu/news/study-vaccination-hospitalization.htm
- "The Compelling Need for Game-Changing Influenza Vaccines: An Analysis of the Influenza Vaccine Enterprise and Recommendations for the Future" Center for Infectious Disease Research and Policy, available at: http://www.cidrap.umn.edu/cidrap/center/mission/articles/ccivi-landing.html
- "H5 Viruses in the United States" Centers for Disease Control and Prevention, available at: http://www.cdc.gov/flu/avianflu/h5/index.htm