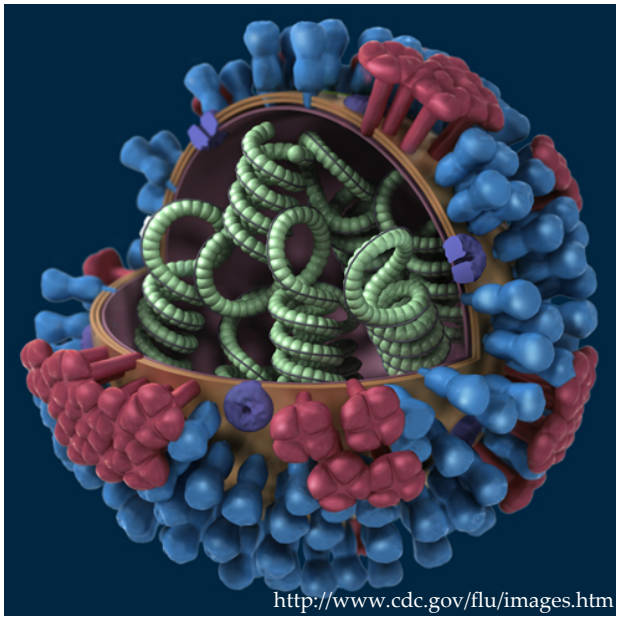
INFLUENZA IN MARYLAND 2015-2016 SEASON REPORT



October 2015 – May 2016

Influenza in Maryland 2015-2016 Season Report

OCTOBER 4, 2015 TO MAY 21, 2016

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 2015-2016 season are unchanged from the 2014-2015 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

ILINet ILI = Fever + Cough and/or Sore Throat

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 44 sentinel providers participated in ILINet during the 2015-16 influenza season.

ESSENCE

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

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

(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 50 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 2015-2016 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 http://www.cdc.gov/flu/weekly/WeeklyFluActivityMap.htm

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

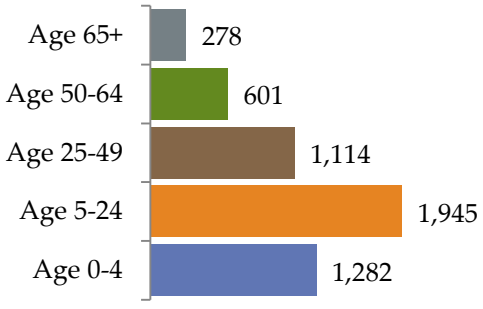
INFLUENZA SURVEILLANCE DATA RESULTS

In the following sections, the data collected during the 2015-2016 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.

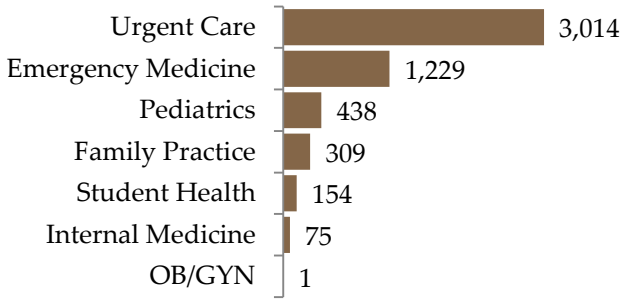
ILINet

During this season, a total of 44 sentinel providers participated in ILI surveillance. There are sentinel providers in all regions of the state, including in Baltimore City, as well as in Allegany, Anne Arundel, Baltimore, Calvert, Cecil, Charles, Frederick, Howard, Montgomery, Prince George's, Somerset, Washington, Wicomico, and Worcester counties.

Of the 268,131 total visits to all sentinel providers during the season, 5,220 (1.9%) were for ILI. The largest proportion of the ILI visits were in the 5-24 age group (37.3%), followed by the 0-4 age group (24.6%) and the 25-49 age group (21.3%). The 50-64 and over 65 age groups together made up only 17% of all ILI visits to sentinel providers.

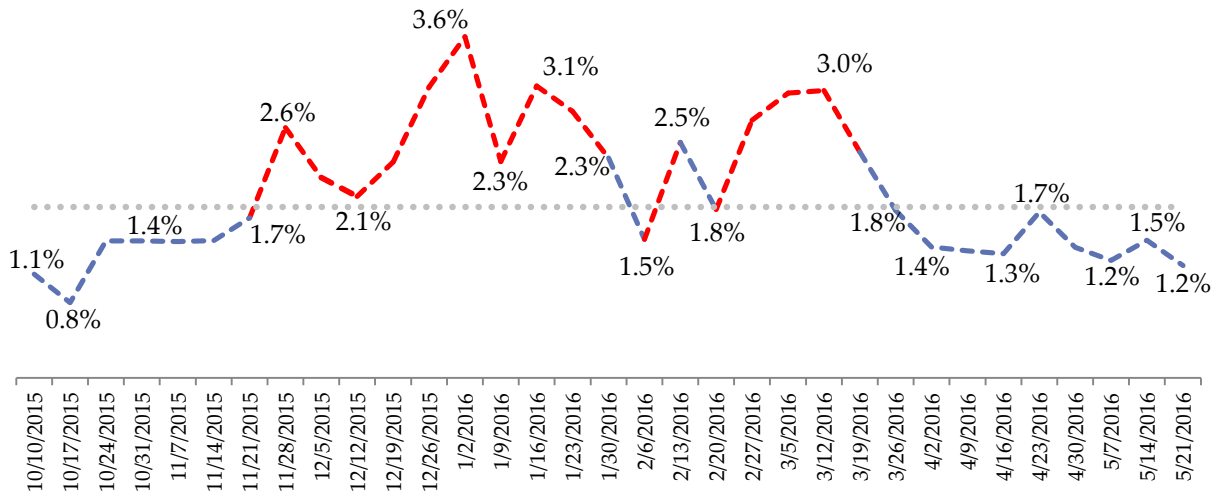


NUMBER OF ILI VISITS TO SENTINEL PROVIDERS BY AGE GROUP



NUMBER OF ILI VISITS TO SENTINEL PROVIDERS BY PRACTICE TYPE

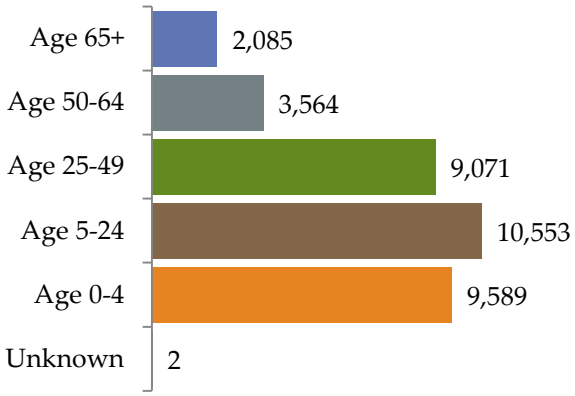
For the 2015-2016 influenza season, the baseline proportion of visits for ILI was 1.8% for Maryland (represented by the horizontal dotted line on the graph below). This is lower than the baseline of 2.0% assigned to Maryland for the 2014-2015 season. Broken down by week, we can see that the proportion of visits to sentinel providers for ILI had two separate periods of elevated activity, with the first beginning to climb in mid-November 2015 and peaking in early January 2016. Laboratory testing for influenza suggested that this early rise in ILI was not due to actual influenza and may be, in part, attributable to other respiratory viruses (many of which cause symptoms similar to influenza) that were circulating at elevated levels at that time. ILI levels began to decline throughout late January and into February. ILI began to increase again in late February. Laboratory testing for influenza confirmed that this second period of elevated ILI was primarily due to influenza. ILI remained above baseline levels for four weeks, peaking at 3.0% for the week ending March 12, 2016. The level of ILI reported for the week ending March 26 was at Maryland's baseline of 1.8%, and providers reported being below baseline for the final eight weeks of the surveillance season.



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

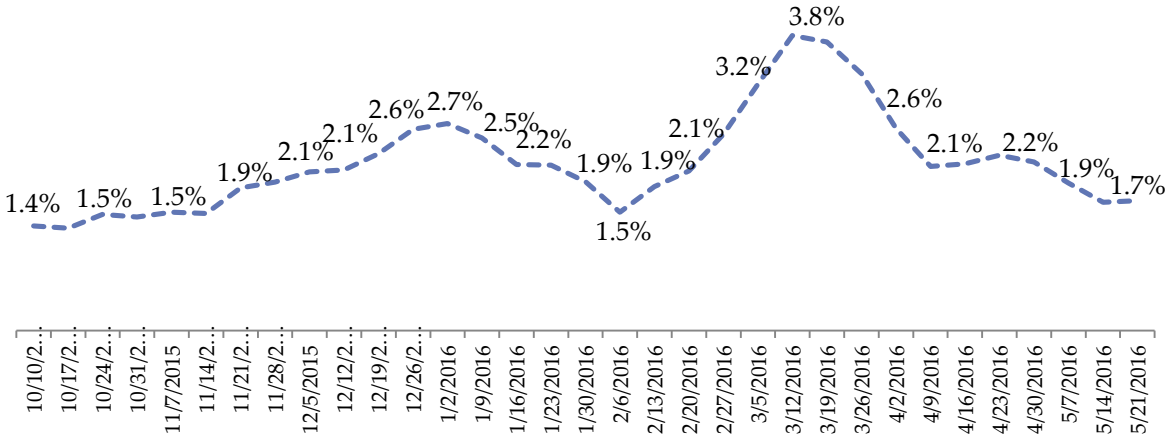
ESSENCE ILI Surveillance

There were a total of 1,593,513 visits to emergency departments reported this season through ESSENCE. Of those, 34,864 (2.2%) were visits for ILI. The largest number of ILI visits was by people in the 5-24 age group (30.3%), followed by the 0-4 (27.5%) and the 25-49 (26.0%) age groups.



VISITS TO EMEMERGENCY DEPARTMENTS FOR ILI BY AGE GROUP

Looking at the data by week (below), the proportion of visits to emergency departments for ILI rose slowly beginning in mid-November 2015. Similar to what we observed with ILI visits to Sentinel Providers, ILI visits to emergency departments saw two separate periods of elevated activity. Again, laboratory testing indicated that much of this early ILI activity was not due to influenza activity. This earlier period of activity peaked in early January 2016, and then gradually declined through early February. The proportion of visits for ILI to emergency departments began to rise again during the second half of February and reached a peak of 3.8% during the week ending March 12, 2016. Following this peak, activity slowly declined, but remained elevated into April, and closed-out the surveillance season at 1.7%.

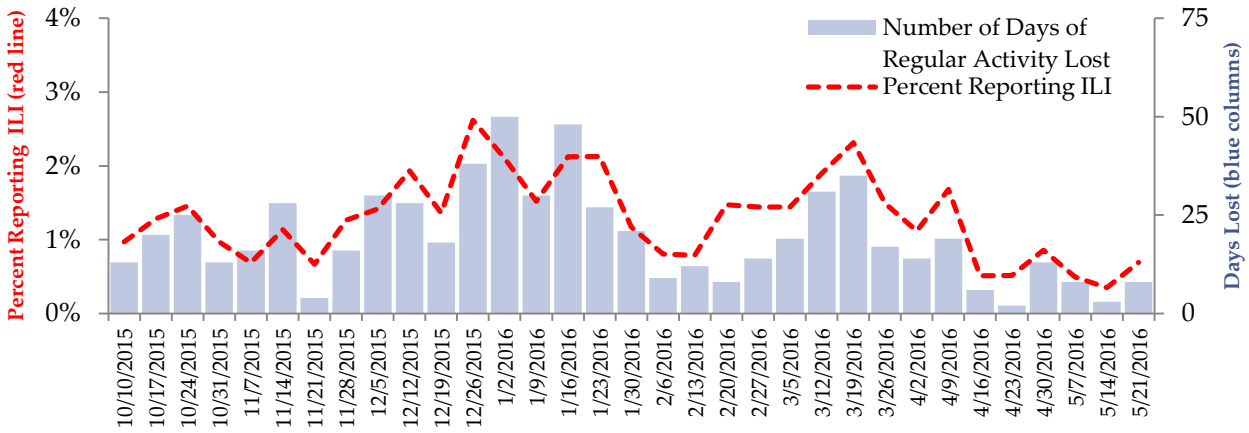


PROPORTION OF VISITS TO EMERGENCY DEPARTMENTS WITH CHIEF COMPLAINT OF ILI BY WEEK

Maryland Resident Influenza Tracking Survey (MRITS)

There was an average of 2,426 participants enrolled in MRITS over the course of the 2015-2016 influenza season, with an average of 611 (25.2%) reporting per week. Over the course of the season, ILI symptoms were reported for 262 (1.3%) of 20,153 surveys DHMH received, causing

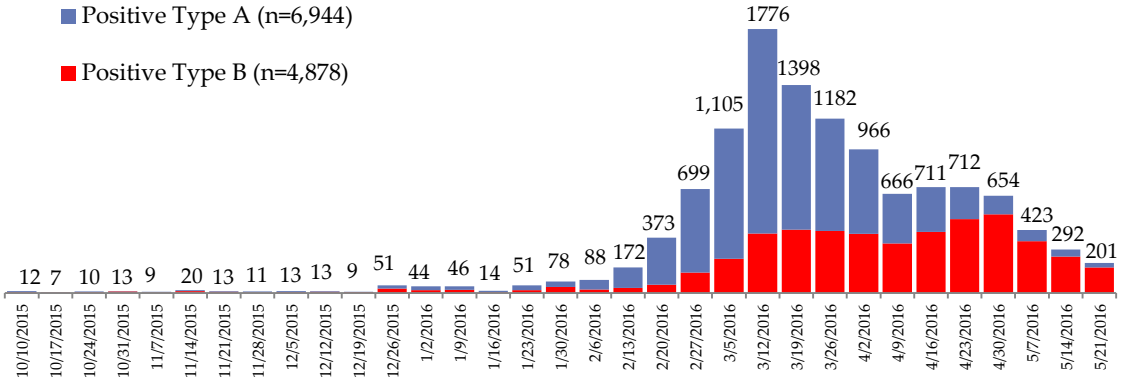
respondents to miss a cumulative 643 days of work, school, and/or other regular daily activities. ILI activity reported through MRITS was highly variable throughout the season, but peaked for the week ending December 26, 2015, when 2.6% of respondents reported ILI symptoms. As with the other two syndromic indicators, the first wave of ILI activity reported through MRITS started to decline in late January, then a second wave began to climb starting in early February. Laboratory testing confirmed that the prevalence of influenza also began to rise during this second wave of activity, peaking in mid-March and gradually declining 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

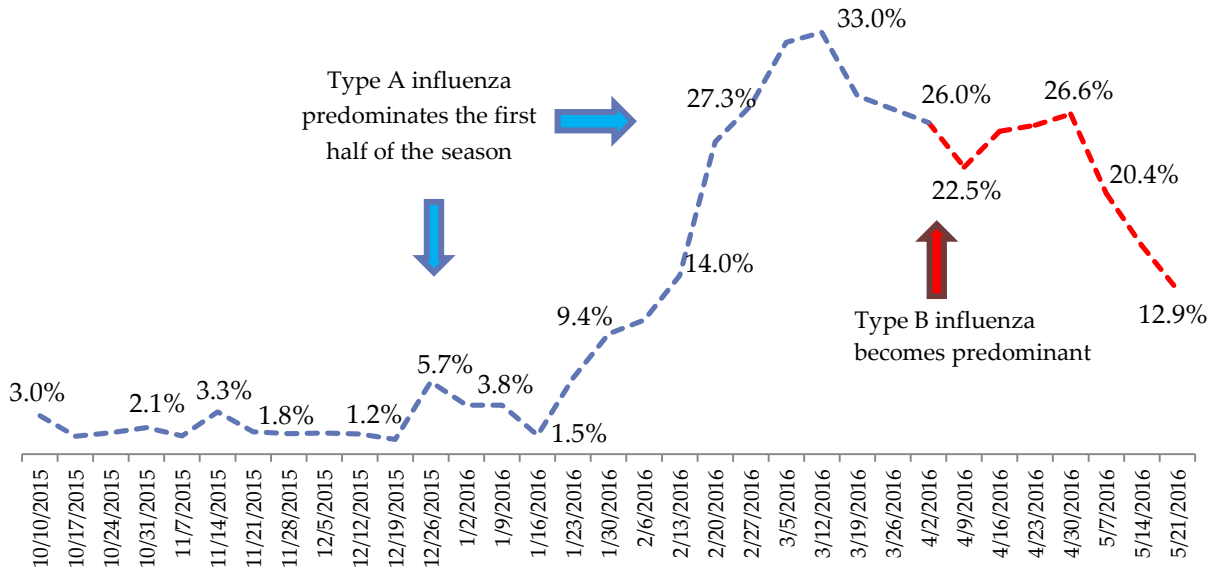
Clinical Laboratory Testing

This season, over 50 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 57,442 influenza diagnostic tests were reported over the entire 2015-2016 influenza season, with 11,832 (20.6%) specimens testing positive. Of those specimens testing positive 6,944 (58.7%) were influenza type A and 4,878 (41.2%) were type B.



NUMBER OF POSITIVE INFLUENZA TESTS REPORTED BY CLINICAL LABS BY WEEK

The graph below shows that the proportion of positive tests reported by clinical laboratories. The proportion remained low throughout the first three months of the season, but began to increase rapidly in mid-January 2016, peaking at 33.0% during the week ending March 12. 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.



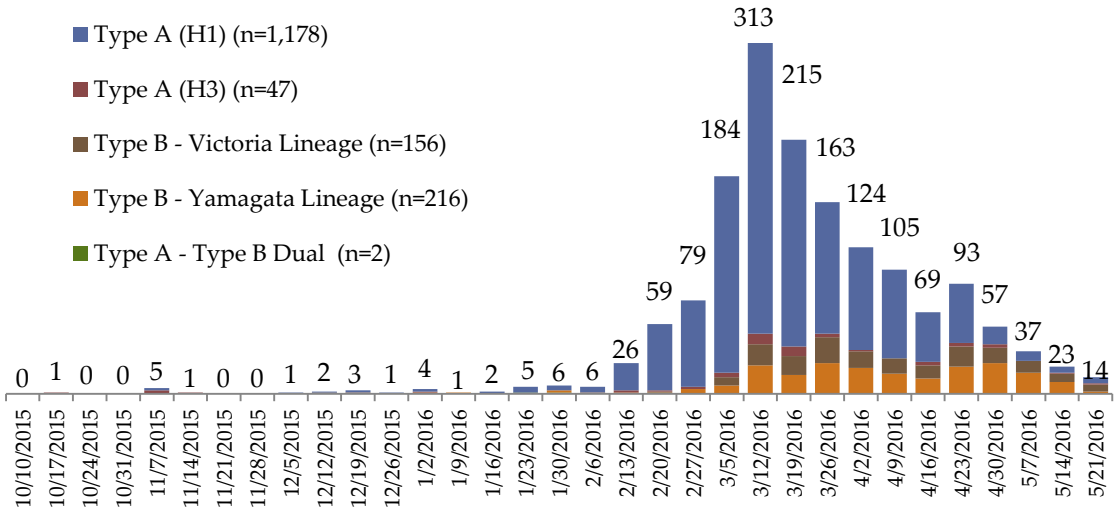
PROPORTION OF POSITIVE INFLUENZA TESTS BY WEEK (RED LINE INDICATES WEEKS WITH TYPE B INFLUENZA PREDOMINANCE)

Influenza Testing at the State Laboratories Administration

The DHMH State Laboratories Administration performed a total of 4,513 PCR tests for influenza. PCR testing is more reliable than rapid influenza diagnostic testing, which is what many of the clinical laboratories use. Of those specimens tested by the state lab, 1,599 (35.4%) were positive.

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, 2015. As with the clinical laboratory testing, DHMH laboratory activity was low throughout the first few months of the season, but saw a substantial increase beginning in late January. The number of specimens testing positive peaked during the week ending March 12, 2016, when 313 specimens tested positive for influenza. Similar to the rapid testing results, the number of specimens testing positive for type B started to increase later on in the season; however, type A influenza was still the predominant strain detected most weeks, even towards the end of the season.

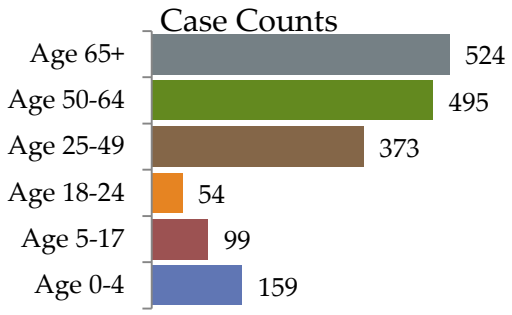
Of the 1,599 specimens that tested positive at the state lab, Type A (H1N1) was the predominant strain, accounting for 1,178 (73.7%) of the positive tests. Type B influenza accounted for 372 (23.3%) of the positive specimens, with a majority of those being of the Yamagata lineage. Additionally, there were two (<1%) specimens that were positive for both type A and type B. Type A (H3N2), the predominant subtype detected during the 2014-2015 season, was detected in only 47 (2.9%) of the positive specimens.



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

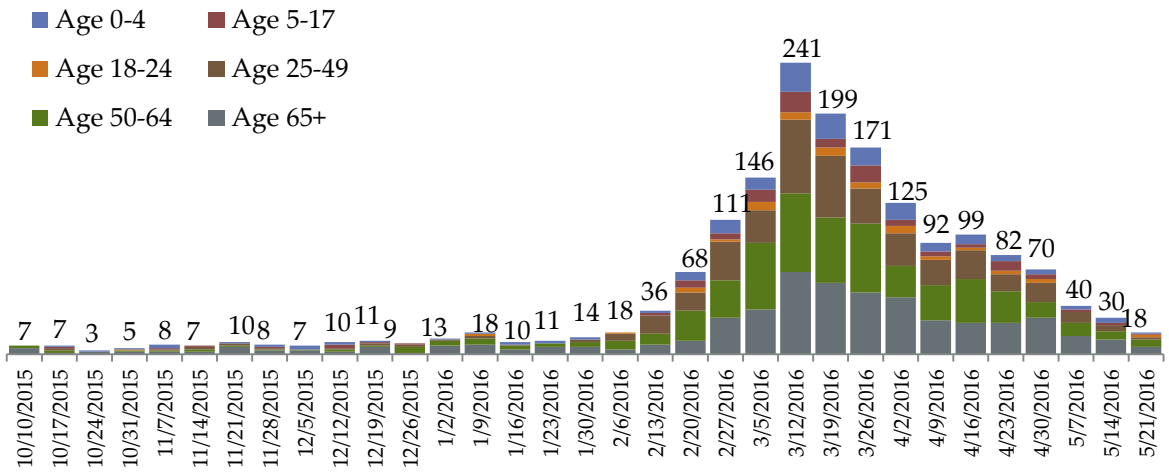
Influenza-Associated Hospitalizations

A total of 1,704 influenza-associated hospitalizations were reported to the Emerging Infections Program at DHMH during the season. This number is similar to what was reported during the 2013-2014 season (which was also predominated by the H1N1 subtype), but substantially lower than the 2012-2013 and 2014-2015 seasons (in which H3N2 was the predominant strain.) The 65 and older age group had the greatest proportion (30.8%) of hospitalized cases, followed by the 50-64 (29.0%) and 25-49 (21.9%) age groups. The 0-4, 5-17, and 18-24 age groups combined for the remaining 18.3% 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 beginning in early February 2016. The peak occurred during the week ending March 12, when 241 influenza-associated hospitalizations were reported. Reported hospitalizations dropped steadily following this peak, but remained elevated through 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

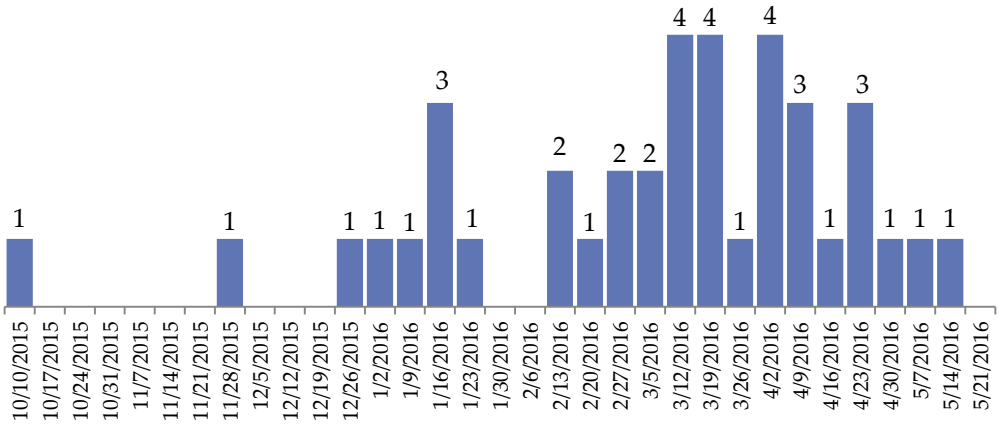
Respiratory Outbreaks in Institutional Settings

During the 2015-2016 influenza season, a total of 39 respiratory outbreaks were reported to DHMH. Outbreaks of influenza, ILI and pneumonia were most commonly reported in nursing homes (19, 49%), followed by assisted living facilities (8, 21%), elementary and secondary schools and daycare centers (7, 18%), and hospitals (3, 8%), with "other" settings accounting for the final 2 (5%) of the outbreaks reported this season.

Type of Setting	Influenza Outbreaks	ILI Outbreaks	Pneumonia Outbreaks	Total Outbreaks
Nursing Homes	9	3	7	19
Assisted Living Facilities	4	1	3	8
Schools / Daycares	4	1	2	7
Hospitals	2	1	--	3
Other	2	--	--	2
Total Outbreaks	21	6	12	39

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

There were a total of 39 respiratory outbreaks reported in the 2015-2016 influenza season, compared to 179 during the 2014-2015 season, and 39 in the 2013-2014 season. The largest number of outbreaks reported in any single week was 4, which happened on three separate occasions between mid-March and early April.



NUMBER OF RESPIRATORY OUTBREAKS BY WEEK

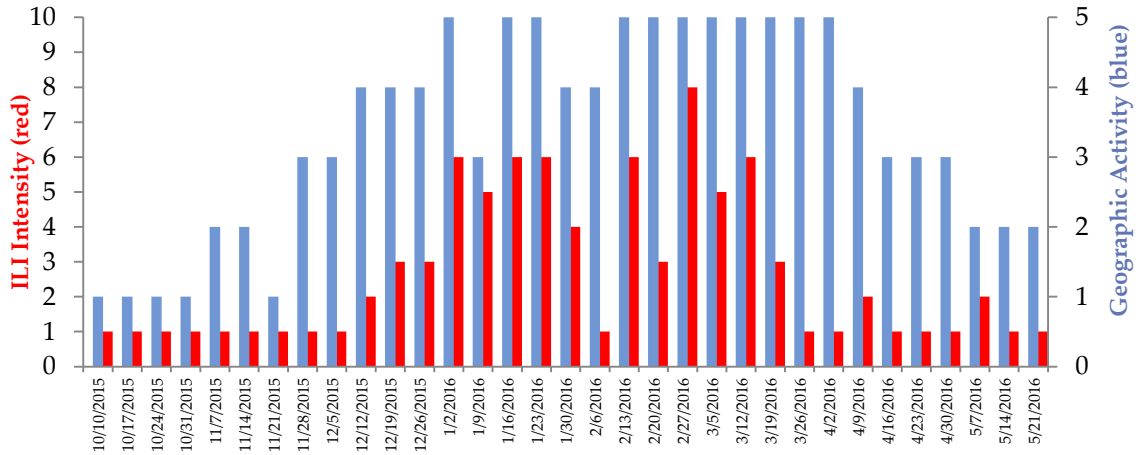
Geographic Spread and Intensity

The geographic spread and ILI intensity levels for the 2015-2016 influenza season can be seen in the chart below.

Maryland's ILI intensity, which is determined by the data reported by ILINet providers, began climbing in early December, reaching an early peak in the first half of January. As discussed in several sections above, laboratory evidence suggested that little of this early ILI activity was attributable to true influenza. Later on in January, true influenza activity started to climb, leading to a second wave of ILI intensity (represented by the red columns in the table below) that peaked

at "high" for the week ending February 27, 2016. Intensity steadily dropped throughout the month of March, and remained at "minimal" or "low" for the last nine weeks of the season.

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 where influenza activity is occurring. This season, geographic activity started climbing in early November, and reached "regional" activity the week ending December 12, 2015. The activity remained at "regional" or "widespread" activity for 15 of the next 16 weeks, before dropping to "local" in April, and to "low" for the final three weeks of the season.

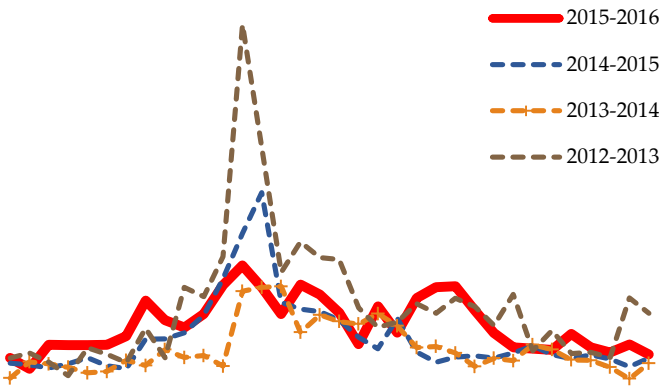


ILI INTENSITY AND GEOGRAPHIC SPREAD BY WEEK

To see the United States map of geographic spread of influenza throughout the season, please visit: http://www.cdc.gov/flu/weekly/WeeklyFluActivityMap.htm.
To see an interactive map of the United States showing ILI intensity, please visit: http://gis.cdc.gov/grasp/fluview/main.html.

DISCUSSION

The 2015-2016 influenza season saw moderate activity, and was comparable to the 2013-2014 season – the last season in which influenza type A (H1N1) was the predominant strain. While ILI activity saw an early rise, much of that was not true influenza activity, as there was not a corresponding rise in positive influenza test results. Some testing at the



ILINET ACTIVITY FOR THE LAST FOUR SEASONS

DHMH lab suggested that some of this early ILI activity may have been attributable to non-influenza respiratory viruses that circulate around the same time as influenza and cause similar symptoms. Maryland's first wave of ILI activity started declining in late January, before rising again in February. However, this second wave of ILI activity was primarily due to influenza viruses. The ILI activity remained elevated into May 2016, before approaching inter-seasonal levels by the end of the season.

The first influenza virus detected at the DHMH lab during this season was an influenza type A (H3N2) virus, which was the predominant strain of the 2014-2015 influenza season. However, influenza A (H1N1) was the strain that predominated this season, accounting for 74% of the specimens testing positive at the state lab. The two influenza type B lineages, Yamagata and Victoria, accounted for 14% and 10% of the specimens testing positive at the state lab, respectively.

Influenza activity arrived relatively late this season, compared to the last several seasons. True influenza activity did not begin to climb until late January and early February, and did not peak until mid-March, which is often the time of year when influenza activity has already subsided. Activity remained elevated through the end of the season. Unlike the previous few seasons, the 2015-2016 season was not bimodal – that is, there were not two distinct waves of true influenza activity (as previously discussed, the first wave of ILI activity this season was largely attributed to non-influenza respiratory viruses).

Generally speaking, influenza type A (H1N1)-predominant seasons tend to be less severe than seasons predominated by type A (H3N2), which is consistent with what was observed this season. By most of our surveillance indicators, activity was lower this season compared to the previous two seasons (2012-2013 and 2014-2015) in which influenza type A (H3N2) was the predominant strain. Activity this season was comparable to what was observed in the 2013-2014 season, the last time type A (H1N1) was predominant.

Surveillance for influenza and other respiratory conditions is year-round, not just in Maryland but around the world. We will continue to 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