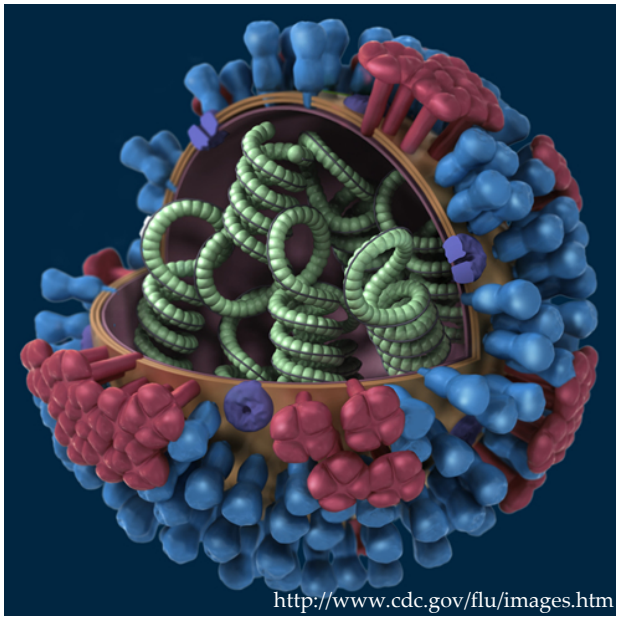
INFLUENZA IN MARYLAND 2017-2018 SEASON REPORT



October 2017 – May 2018

Influenza in Maryland 2017-2018 Season Report

OCTOBER 1, 2017 TO MAY 19, 2018

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 2017-2018 season are unchanged from the 2016-2017 season; they 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 41 sentinel providers participated in ILINet during the 2017-18 influenza season.

ILINet ILI= Fever +

Cough and/or Sore Throat

ESSENCE

The Office of Preparedness and Response (OPR) at MDH 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 MDH'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 systems 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 MDH 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 Department of Health Laboratories Administration

The MDH 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 MDH 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 2017-2018 influenza season, three such cases were reported to MDH. 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://www.cdc.gov/flu/weekly/usmap.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

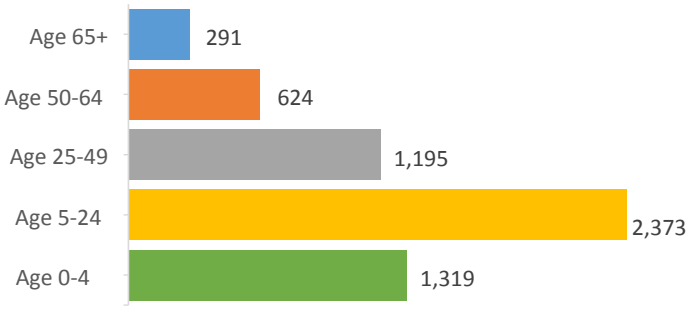
INFLUENZA SURVEILLANCE DATA RESULTS

In the following sections, the data collected during the 2017-2018 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.

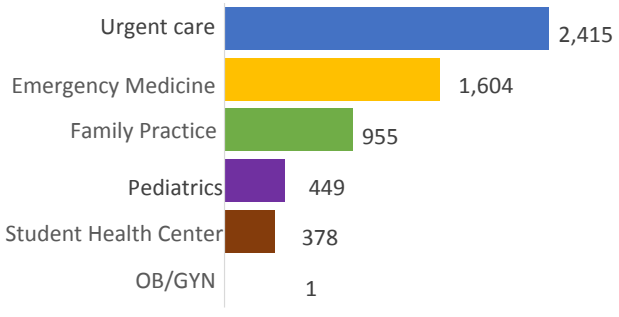
ILINet

During this season, a total of 41 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 250,763 total visits to all sentinel providers during the season, 2.3% were for ILI. The largest proportion of the ILI visits were in the 5-24 age group (40.9%), followed by the 0-4 age group (22.7%) and the 25-49 age group (20.6%). The 50-64 and 65 and over groups together made up only (15.8%) of all ILI visits to sentinel providers.

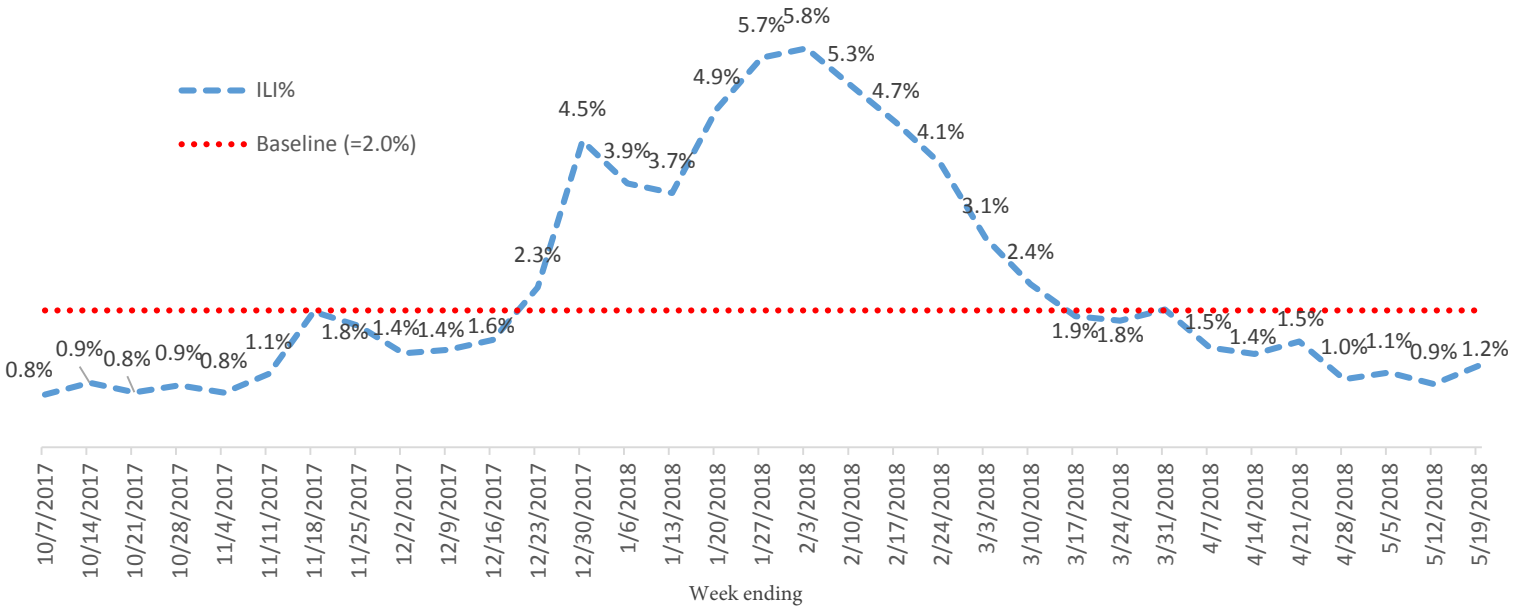


NUMBER OF ILI VISITS TO SENTINEL PROVIDERS BY AGE GROUP



NUMBER OF ILI VISITS TO SENTINEL PROVIDERS BY PRACTICE TYPE

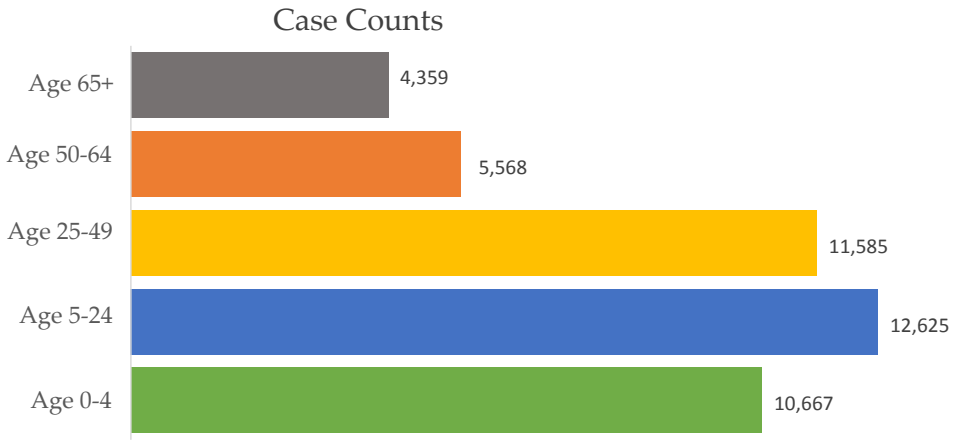
The baseline proportion of ILI is the average proportion of patient visits for ILI during non-influenza weeks. The baseline is calculated using data from the three prior seasons. For the 2017-2018 influenza season, the baseline proportion of visits for ILI was 2.0% for Maryland (represented by the horizontal dotted line on the graph below). This is slightly less than the baseline of 2.2% for the 2016-2017 season. Broken down by week, we can see that the proportion of visits for ILI was below baseline for the first eleven weeks of the influenza season. Starting with the week ending December 23, 2017, ILINet sentinel providers reported elevated ILI activity for twelve consecutive weeks. Activity peaked at 5.8% in early February 2018. In mid-March 2018, ILI activity dropped below baseline and remained there for the rest of the season.



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

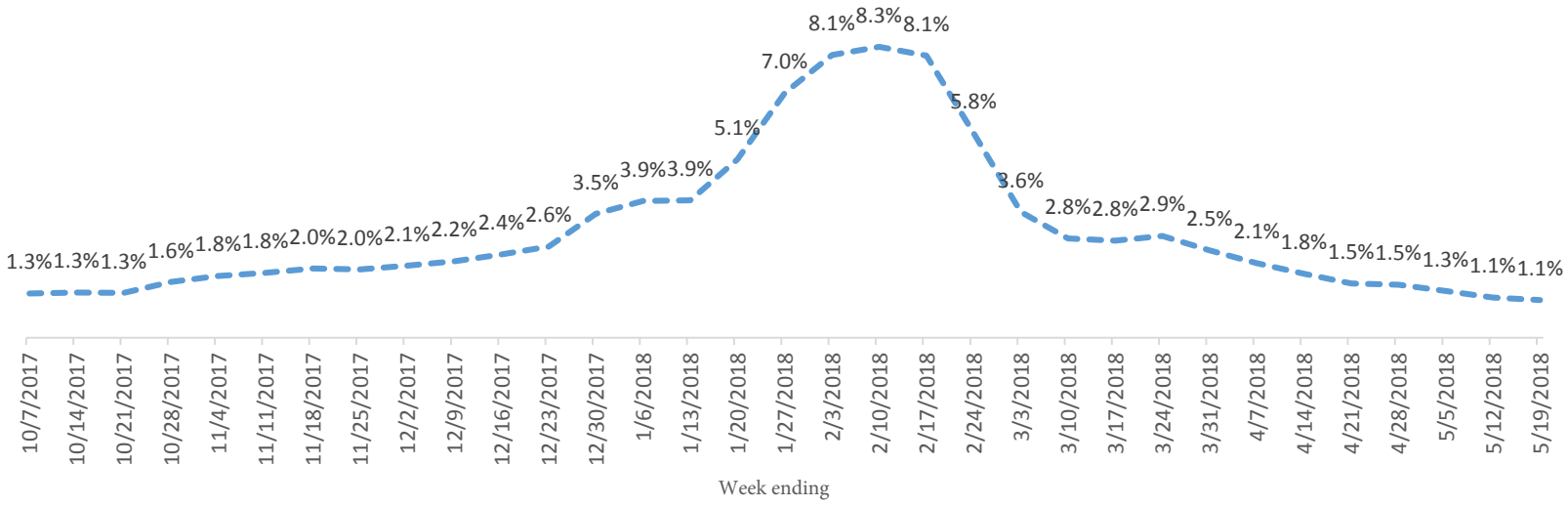
ESSENCE ILI Surveillance

There were a total of 1,440,290 visits to emergency departments reported this season through ESSENCE. Of those, 3.1% were visits for ILI. The largest number of ILI visits occurred in the 5-24 age group (28%), followed by those in the 25-49 age group (26%) and 0-4 (24%) age group.



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 mid-December 2017 but then began a rapid rise to the season peak. Similar to what was observed with ILI visits to sentinel providers the proportion of ILI visits to emergency departments peaked during the first three weeks of February 2018. Following this peak, activity declined quickly at first, but remained elevated into March, and closed-out the surveillance season at 1.1%.



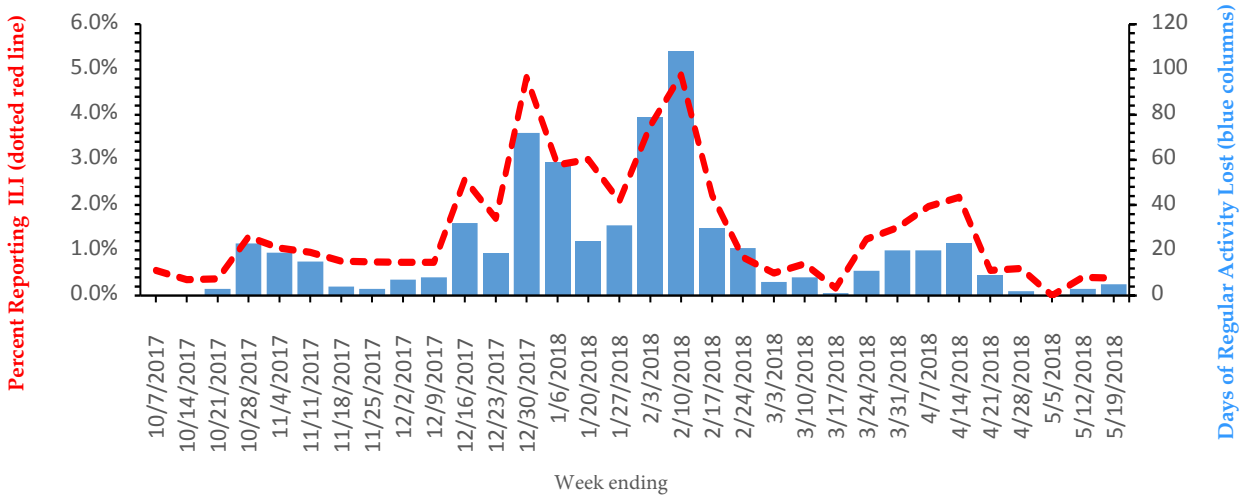
PROPORTION OF VISITS TO EMERGENCY DEPARTMENTS WITH CHIEF COMPLAINT OF ILI BY WEEK

Maryland Resident Influenza Tracking Survey (MRITS)

The number of participants in MRITS increased throughout the season from 2,414 to 2,640. There was an average of 2,534 participants enrolled, with an average of 22% reporting each week. Over the course of the season, ILI symptoms were reported on 1.5% of the 18,086 surveys MDH received, with greater than 316 days of missed 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 February 10, 2018 when 4.9% of respondents reported ILI symptoms. This is similar to the peaks in ILI reported by ILINet providers and emergency department in the first three weeks of early February.

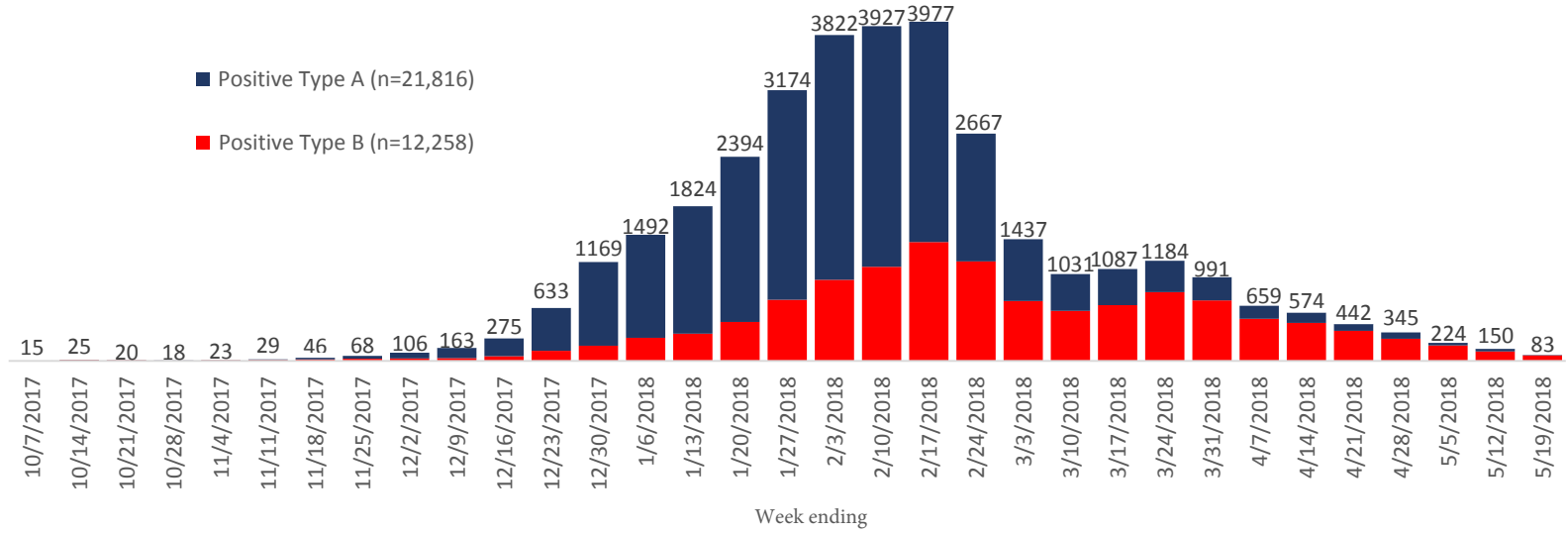
We are always looking for more participants for the MRITS. If you know someone who would like to participate, please direct them to our website: http://flusurvey.health.maryland.gov



*Insufficient data for week ending 1/13/2018 due to server maintenance, data not included

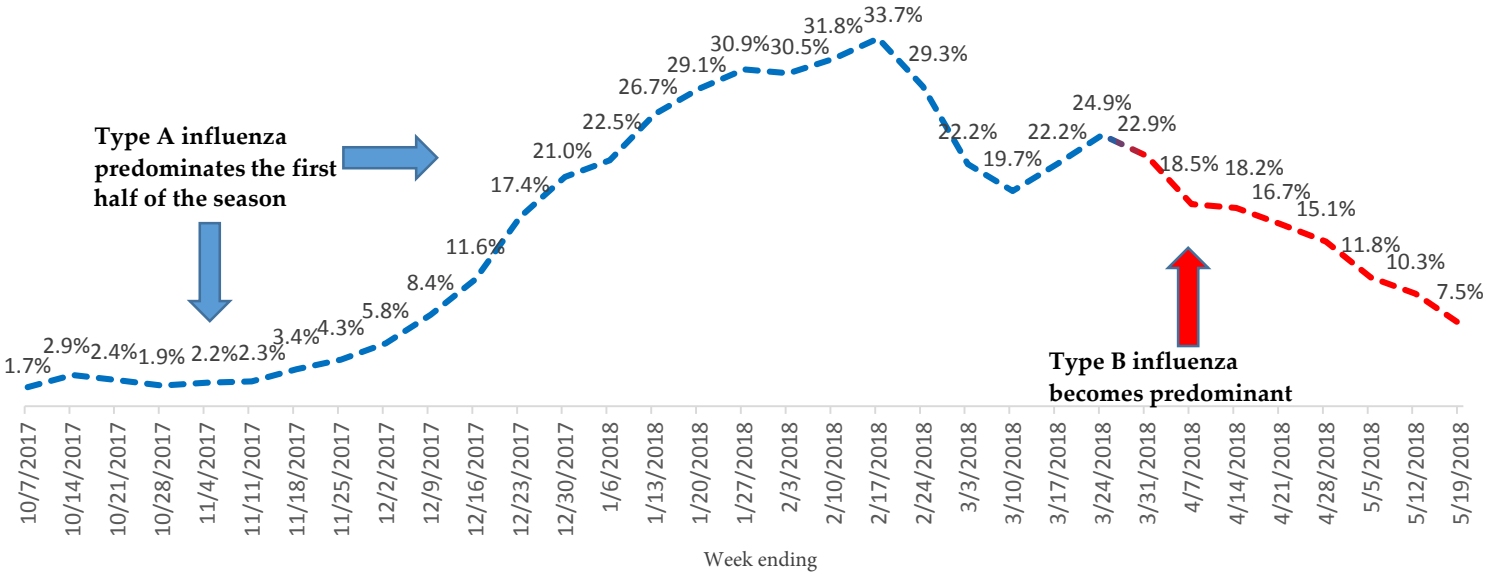
Clinical Laboratory Testing

This season, over 60 clinical laboratories agreed to report the total number of influenza diagnostic 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 143,636 influenza diagnostic tests were reported over the entire 2017- 2018 influenza season, with 24% specimens testing positive. Of those positive tests, 64.0% were influenza type A and 36.0% 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 nine weeks of the season, but began to increase rapidly in mid-December 2017, peaking at 34% during the week ending February 17. Most positive tests from October through March were influenza type A, which often predominates during the earlier part of our influenza seasons, with influenza type B predominating later on.

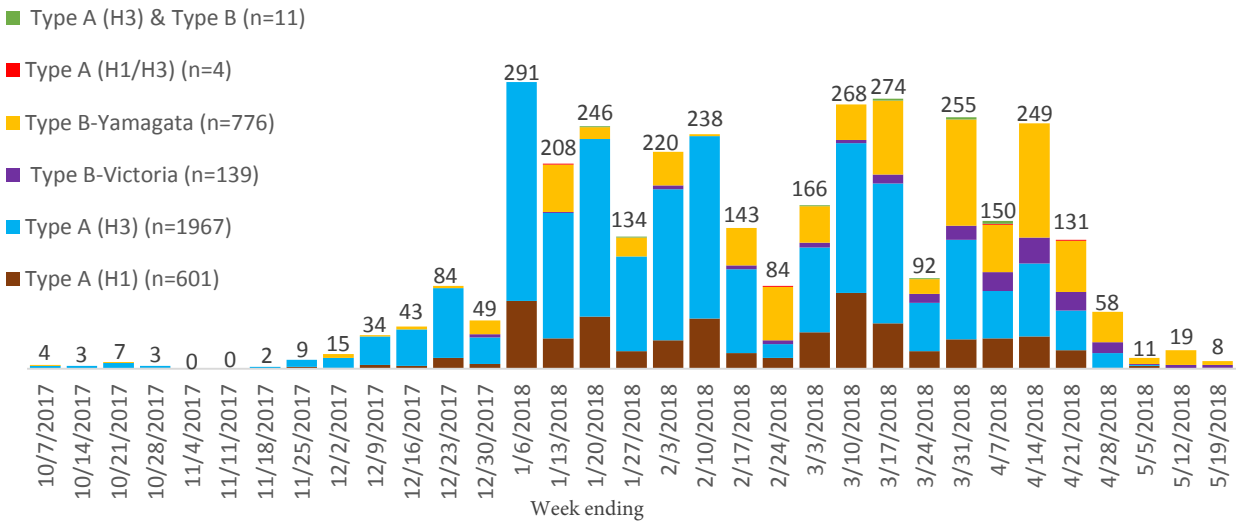


PROPORTION OF POSITIVE INFLUENZA TESTS BY WEEK (RED LINE INDICATES WEEKS WITH TYPE B INFLUENZA PREDOMINANCE)

Influenza Testing at the State Laboratories Administration

The MDH State Laboratories Administration performed a total of 6,526 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, 53.6% 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 reported in the first week of the season. As with the clinical laboratory testing, MDH laboratory activity was low throughout the first few months of the season, but saw a substantial increase beginning in early January. The number of specimens testing positive peaked during the week ending January 6, 2018, when 291 specimens tested positive for influenza. Similar to the rapid testing results, the number of specimens testing positive for type B started to increase later in the season; however, type A influenza was still the predominant strain detected most weeks, even towards the end of the season.

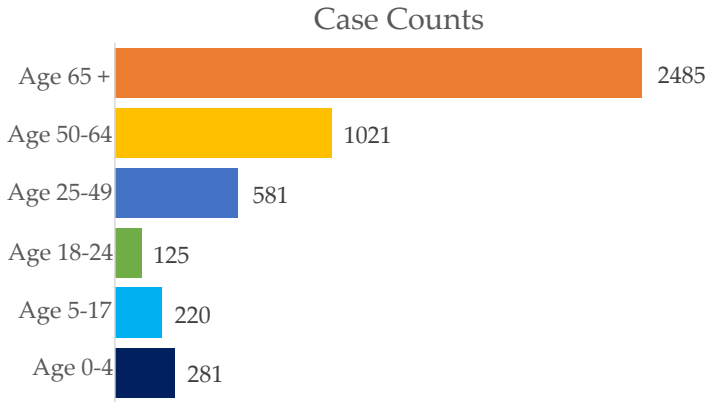
Of the 3,498 specimens that tested positive at the state lab, Type A (H3N2) was the predominant strain, accounting for 56% of the positive tests. Type B influenza accounted for 26%, with a majority of those being the Yamagata lineage. Additionally, there were a small number of specimens (<1%) that tested positive for multiple stains. Type A (H1N1), the predominant subtype detected during the 2014-2015 and 2015-2016 seasons, was detected in only 17% of the positive specimens this season.



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

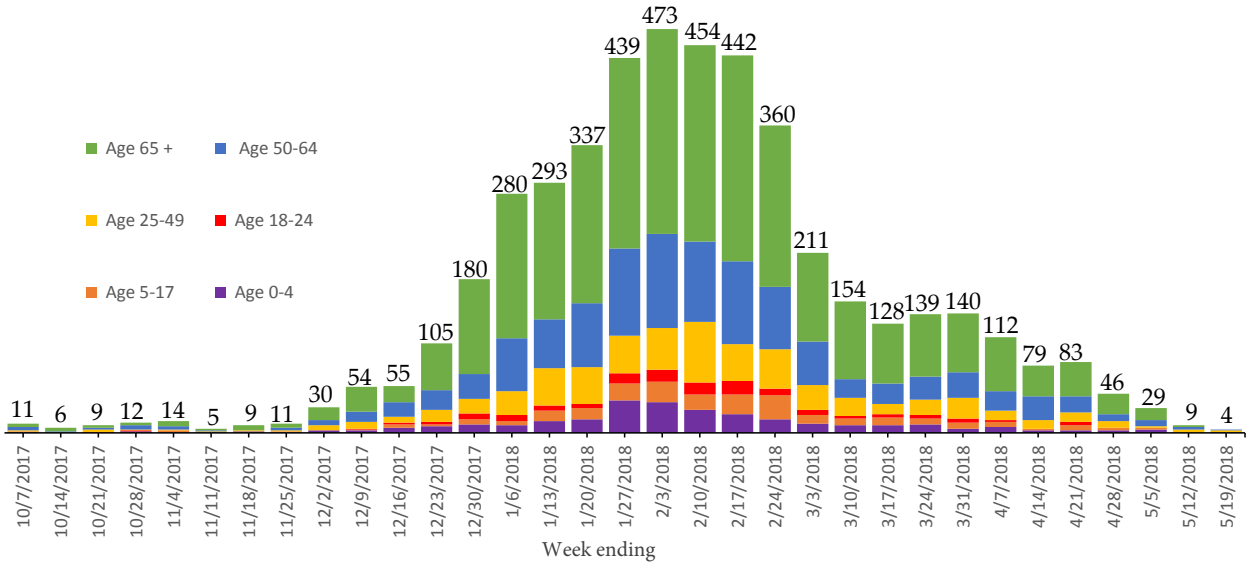
Influenza-Associated Hospitalizations

A total of 4,713 influenza-associated hospitalizations were reported to the Emerging Infections Program during the season. This number is higher than the 2016-2017 season (n=3631) (when the H3N2 subtype also predominated). The 65 and older age group had the greatest proportion (52.7%) of hospitalized cases, followed by the 50- 64 (21.7%) and 25-49 (12.3%) age groups. The 0-24 age groups combined for the remaining 13.3% of hospitalized cases.



INFLUENZA-ASSOCIATED HOSPITALIZATIONS BY AGE GROUP

The number of reported hospitalizations remained low for the first two months of the season, and then began to rise sharply beginning in December 2017. For a nine-week period extending from early January to early March, weekly hospitalizations exceeded 200 per week. The peak occurred during the week ending February 3, when 473 influenza-associated hospitalizations were reported. During March and April reported hospitilizations remainded elevated but at a lower level. The graph below shows the number of hospitalizations reported each week by age group. There were 165 deaths among the 4,212 adult influenza associated-hospitilizations yielding a case fatality proportion of 4%. Three influenza-associated pediatric deaths also occurred. Influenza-associated pediatric mortality is reported without regard to hospitalization.



NUMBER OF INFLUENZA-ASSOCIATED HOSPITALIZATIONS BY AGE GROUP AND WEEK

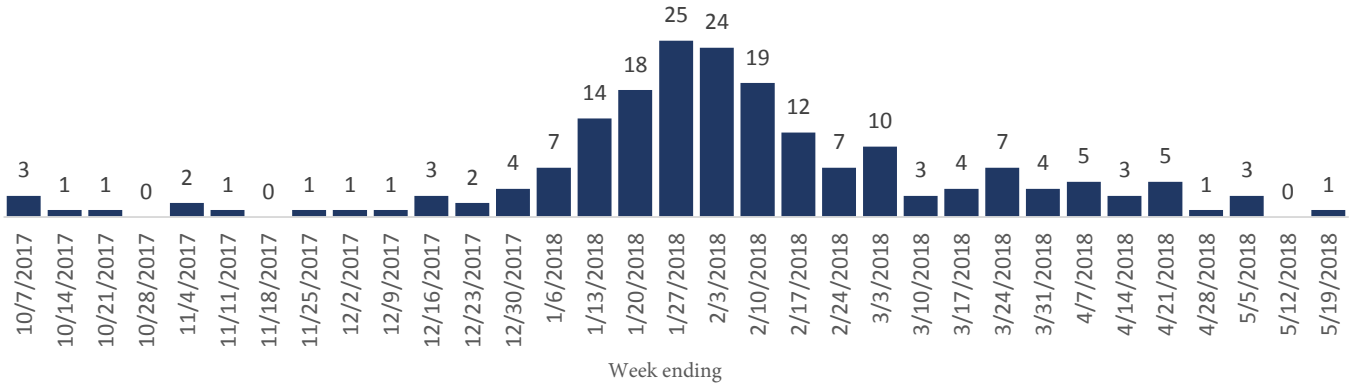
Respiratory Outbreaks in Institutional Settings

During the 2017-2018 influenza season, a total of 192 respiratory outbreaks were reported to MDH. Outbreaks of influenza, ILI and pneumonia were most commonly reported in nursing homes (49.5%). The occurrence of outbreaks reported from other setting is detailed in the table below.

Facility Type	Influenza	Influenza-Like Illness	Pneumonia	Total Outbreaks
Adult Medical/Vocational Day Care	3	1		4
Assisted Living	37	4	3	44
Child day care	12	2		14
Hospital	5			5
School/college/university	18	5		23
Nursing Home	80	5	10	95
Other	7			7
Total	162	17	13	192

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

The 192 respiratory outbreaks reported in the 2017-2018 influenza season compares to 152 during the 2016-2017 season, and 39 in the 2015-2016 season. The peak occurrence of outbreaks corresponded with other measures of influenza activity. The largest number of outbreaks reported in any single week was 25, which occurred on the week ending January 27, 2018.



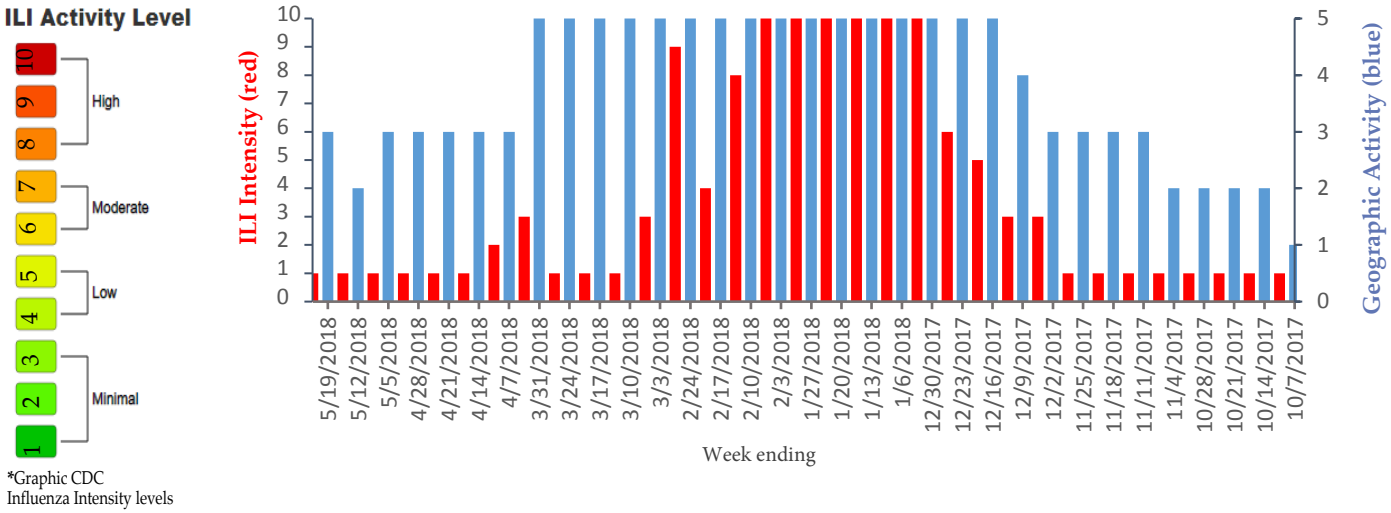
NUMBER OF RESPIRATORY OUTBREAKS BY WEEK

Geographic Spread and Intensity

The geographic spread and ILI intensity levels for the 2017-2018 influenza season can be seen in the chart below.

Maryland's ILI intensity, which is determined by the data reported by ILINet providers, was at "minimal" for the first twelve weeks of the season. During the week ending December 30, 2017, intensity rose to the "high" range and remainded there for seven of the next eight weeks. As discussed in several sections above, laboratory evidence suggested that most of this ILI activity could be attributable to infection with influenza viruses rather than other respiratory pathogens that also circulate during the influenza season. In late February, ILI intensity began to decline and remained at "minimal" intensity throughout the last ten weeks of the season.

The geographic spread 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, the level of geographic spread started climbing in early November, and reached the "regional" level during the week ending December 9, 2017. Activity remained elevated at the "widespread" level for the next sixteen weeks, before dropping to "local" or "sporadic" in April, and May.



*Graphic CDC Influenza Intensity levels

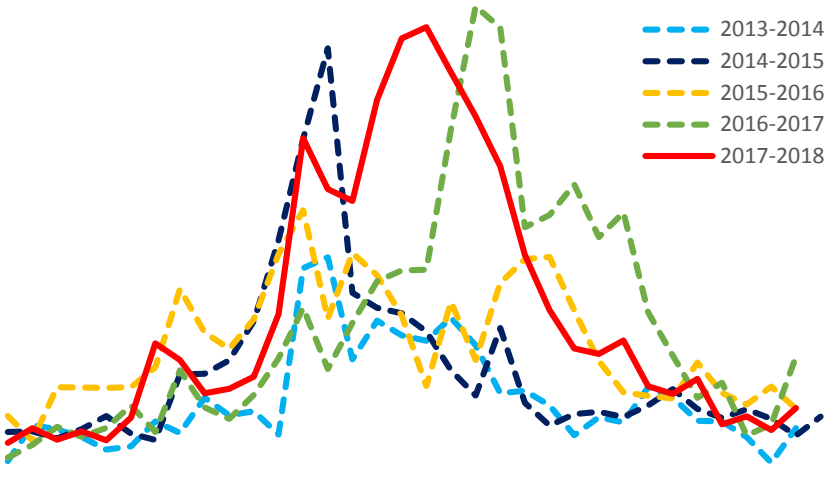
ILI INTENSITY AND GEOGRAPHIC SPREAD BY WEEK

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

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

DISCUSSION

The first influenza virus detected at the MDH lab during this season was an influenza type A (H3N2) virus, which was the predominant strain of the prior influenza season. The A (H3N2) strain went on to become predominate this season too, accounting for 56% of the specimens testing positive at the state lab. The two influenza type B lineages, Yamagata and Victoria, accounted for 22% and 4% of the specimens testing positive at the state lab; the influenza A (H1N1) subtype fell in between at 17%.



ILINET ACTIVITY FOR THE LAST FIVE SEASONS

This influenza season, like the prior one, saw high levels of influenza activity. Generally speaking, influenza type A (H3N2)-predominant seasons tend to be more severe than seasons predominated by type A (H1N1), which is consistent with what was observed here. And again this season, there was a strong statistical correlation (r=0.84) between weekly ILI activity levels and the percentage of positive rapid influenza test results reported by our sentinel laboratories. This correlation suggests that the high levels of ILI activity can likely be attributed to circulating influenza virus and are less likely to be due to other respiratory viruses that co-circulate during influenza season.

The nearby graphic shows influenza activity over the course of the five previous seasons as reported by Maryland ILI Net providers. The breadth of the period of elevated activity this season was wider than most. Peak activity began much earlier and was only slightly less intense than the 2016-2017 season. Both this season and the 2016-2017 season were predominated by A (H3N2) viruses and both showed notably higher activity than the 2015-2016 season when an A (H1N1) virus was the predominate strain.

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 2017-2018 Influenza Season" Centers for Disease Control and Prevention, available at: https://www.cdc.gov/flu/about/season/flu-season-2017-2018.htm
- "Recommendations of the Advisory Committee on Immunization Practices – United States, 2017-18 Influenza Season" Centers for Disease Control and Prevention, available at: https://www.cdc.gov/mmwr/volumes/66/rr/rr6602a1.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
- "Take Action to Prevent the Spread of Flu Between Pigs and People" Centers for Disease Control and Prevention, available at: https://www.cdc.gov/flu/swineflu/variant/preventspreadfactsheet.htm
- "Key Facts About Seasonal Flu Vaccine" Centers for Disease Control and Prevention, available at: https://www.cdc.gov/flu/protect/keyfacts.htm