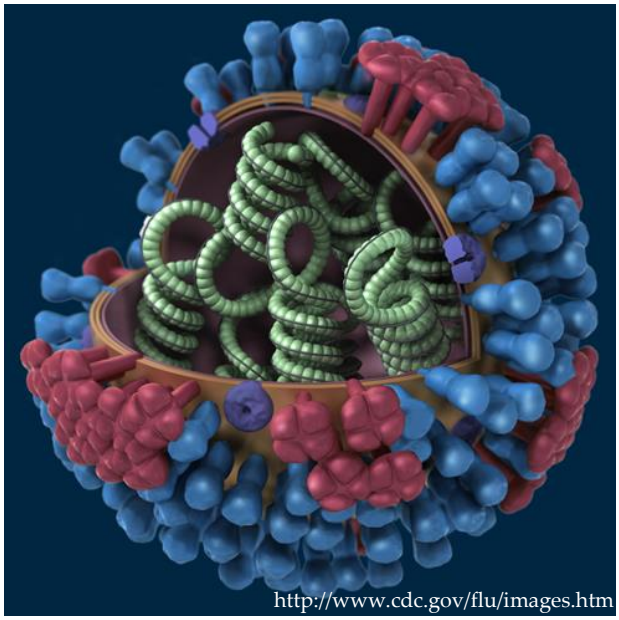
INFLUENZA IN MARYLAND 2013-2014 SEASON REPORT



September 2013 – May 2014

Influenza in Maryland 2013-2014 Season Report

SEPTEMBER 29, 2013 TO MAY 17, 2014

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, and they are described below. Epidemiologists at the Maryland Department of Health and Mental Hygiene (DHMH) analyze the data, and weekly influenza surveillance reports are published from October to May. This is the final report for the 2013-2014 influenza season and it contains a summary of the entire season's observations. It concludes with suggested readings for more information on influenza, influenza epidemiology, and influenza surveillance.

Syndromic Surveillance

Syndromic surveillance is surveillance that looks for cases based on clinical syndromes (combinations of signs and symptoms) rather than laboratory diagnoses. We currently use four systems for syndromic surveillance of influenza. Two of these systems rely on people with symptoms of influenza seeking medical care, while the other two use web technology to track cases of influenza-like illness (ILI) who may not necessarily come into contact with the healthcare system. ILI is a surrogate indicator for influenza during the influenza season in the absence of laboratory testing. 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 in the community.

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** (ILI). 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, so long as the sore throat is not known to be the result of another illness, like strep 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 27 sentinel providers participated in ILINet during the 2013-14 influenza season. For proper coverage of the population under surveillance, a ratio of one sentinel provider per 250,000 residents is recommended. For Maryland, 24 sentinel providers would meet this recommendation.

ESSENCE ILI Surveillance

> **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 the influenza surveillance coordinator in the Office of Infectious Disease Epidemiology and Outbreak Response (OIDEOR). Both the ILINet and ESSENCE systems will detect only people who are sick enough to seek health care, and have access to it.

Non-Healthcare System Internet-Based Influenza Surveillance

> **MRITS was the first flu surveillance system of its kind in the US. It was modeled after a similar system in Australia.**

Two systems are used to count cases of ILI in persons who may not come into contact with the healthcare system. First is the **Maryland Resident Influenza Tracking Survey (MRITS)**, 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.

> **Data from ILINet from previous influenza seasons was used to calibrate the computer algorithm used in Google Flu Trends.**

The other system used to track individuals who may not seek medical care is **Google Flu Trends**. Google analyzes queries made to their web search engine to determine if the user making the query is experiencing ILI. This is done through a computerized algorithm that determines if the search (e.g., "Flu Symptoms"), the time of the search (e.g., February vs. June) and the location of the search (e.g., an area known to have elevated influenza activity) indicate that the user has ILI. The system is hosted by Google, and the data are freely available for download at http://google.org/flutrends.

Laboratory Surveillance

There are many different types of laboratory tests available to detect influenza. The most simple and widely available tests are called rapid influenza diagnostic tests (RIDTs). These tests are done in hospitals, physician offices or urgent care centers. They 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). This season, 39 clinical laboratories in 18 counties and Baltimore City agreed to report the total number of rapid tests performed each week along with the results.

The Maryland DHMH State Laboratories Administration performs complex laboratory tests on respiratory specimens to detect and identify influenza virus. These tests are polymerase chain reaction (PCR) and viral culture. PCR tests do not require a viable (living) virus in the specimen since they detect the viral genetic material (RNA). On the other hand, viral culture requires viable virus in the specimen in order to grow in culture. Both of these tests are similar in their ability to properly detect influenza virus. Both PCR and culture provide the ability to determine the subtype of the influenza virus in the specimen.

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. EIP staff members go to hospitals and review medical charts of people who were hospitalized and had a positive influenza test of any kind. These chart reviews are extensive, and they help to accurately describe severe cases of influenza (those requiring hospitalization) in order to identify underlying conditions and other factors that may exacerbate the symptoms of influenza. All 46 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 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 2013-2014 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. These data help guide the response to the outbreak to control the spread of infection, as well as to prevent future outbreaks. 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.

The different levels are defined as follows:

- **No Activity:** No laboratory-confirmed cases of influenza and no reported increase in the number of cases of ILI.
- **Sporadic:** Small numbers of laboratory-confirmed influenza cases, or a single laboratory-confirmed influenza outbreak has been reported, but there is no increase in cases of ILI.
- **Local:** Outbreaks of influenza or increases in ILI cases and recent laboratory-confirmed influenza in a single region of the state.
- **Regional:** Outbreaks of influenza or increases in ILI and recent laboratory confirmed influenza in at least two but less than half the regions of the state with recent laboratory evidence of influenza in those regions.
- **Widespread:** Outbreaks of influenza or increases in ILI cases and recent laboratory-confirmed influenza in at least half the regions of the state with recent laboratory evidence of influenza in the state.

Maryland consists of five surveillance regions:

- **Central:** Baltimore City along with Anne Arundel, Baltimore, Carroll, Harford, and Howard Counties
- **Eastern Shore:** Caroline, Cecil, Dorchester, Kent, Queen Anne's, Somerset, Talbot, Wicomico, and Worcester Counties
- **National Capital:** Frederick, Montgomery, and Prince George's Counties
- **Southern Maryland:** Calvert, Charles, and St. Mary's Counties
- **Western Maryland:** Allegany, Garrett, and Washington Counties

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. This baseline level is the proportion of visits to sentinel providers when there is no laboratory confirmed influenza, and it is subject to change from one season to the next. Current and historical intensity data can be accessed at http://gis.cdc.gov/grasp/fluview/main.html.

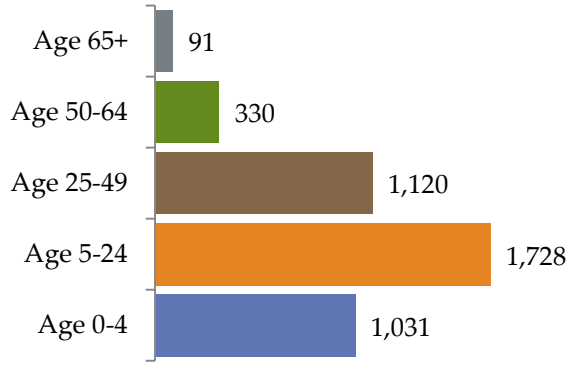
INFLUENZA SURVEILLANCE DATA RESULTS

In the following sections, the data collected during the 2013-2014 influenza season with the systems described above will be displayed. Whenever possible, an analysis of those data will be included. 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.

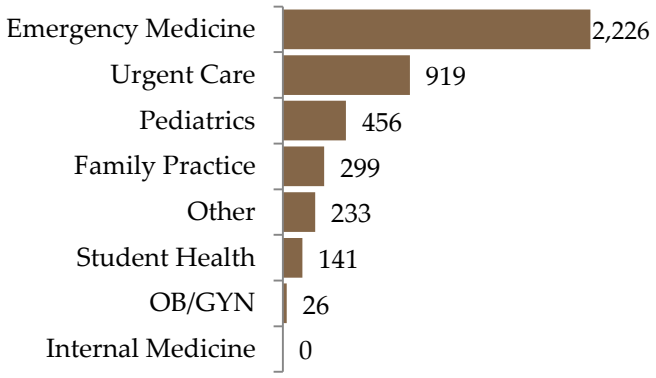
ILINet

During this season, a total of 27 sentinel providers participated in influenza surveillance. Of those, 24 (89%) reported their findings 17 or more weeks during the influenza season – more than half of the time. Ten of the sentinel providers practice medicine in family practices, followed by five in student health settings, four in pediatrics, and one in internal medicine. Two providers practice in emergency medicine settings, two others in urgent care, and two in OB/GYN practices. One provider's practice setting was listed as "other." There are sentinel providers in Baltimore City, as well as in Allegany, Anne Arundel, Baltimore, Calvert, Cecil, Charles, Frederick, Montgomery, Prince George's, Somerset, Washington, Wicomico, and Worcester counties.

Of the 337,136 total visits to all sentinel providers during the season, 4,300 (1.3%) were for ILI. The largest proportion of the ILI visits were in the 5-24 age group, followed by the 25-49 age group and the 0-4 age group. The 50-64 and over 65 age groups together made up only 10% of all ILI visits to sentinel providers.

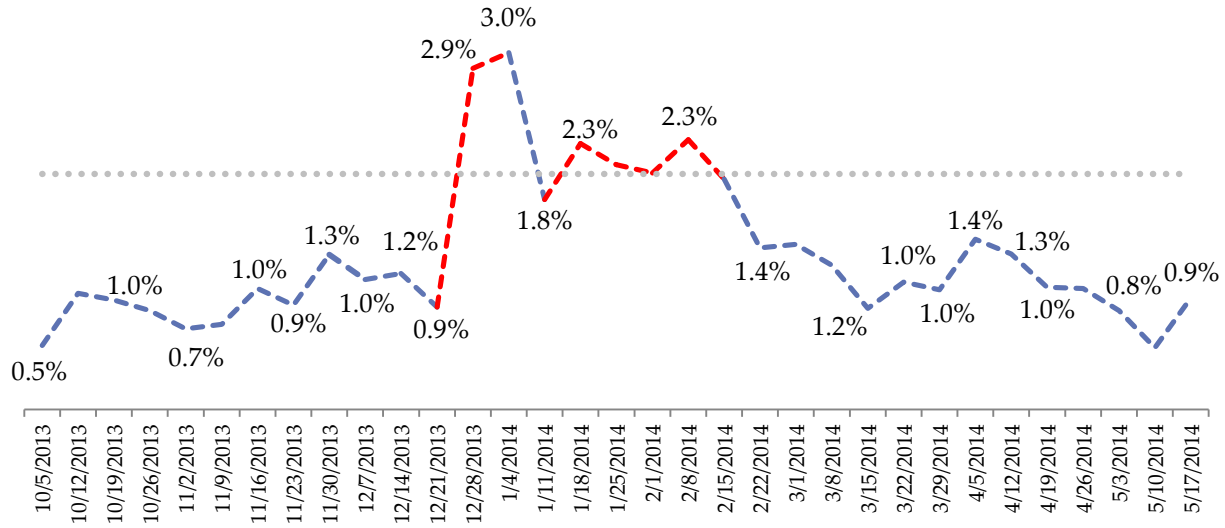


NUMBER OF ILI VISITS TO SENTINEL PROVIDERS BY AGE GROUP



NUMBER OF ILI VISITS TO SENTINEL PROVIDERS BY PRACTICE TYPE

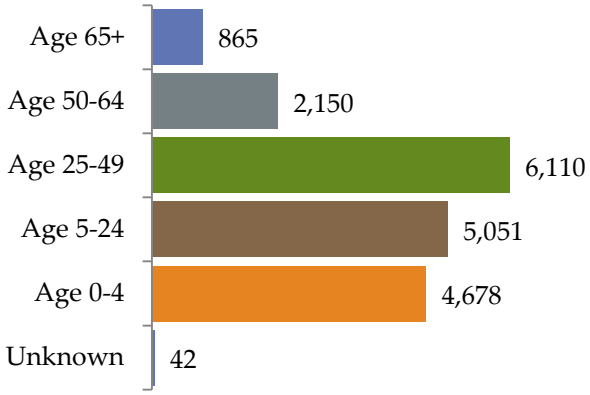
Broken down by week, we can see (below) that the proportion of visits for ILI to sentinel providers began to rise in December 2013, peaked in January 2014, and then progressed on a downward trend from early February to May. The highest proportion of visits for ILI reported was 3.0% during the week ending January 4, 2014. For the 2013-2014 influenza season, the baseline proportion of visits for ILI was 2.0% for Maryland (represented by the horizontal dotted line on the graph below). The first week that rates of ILI visits to sentinel providers were greater than the baseline rate was the week ending December 28. The level dropped slightly below baseline for the week following the peak, but rates were then above that proportion for five continuous weeks between mid-January and mid-February.



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

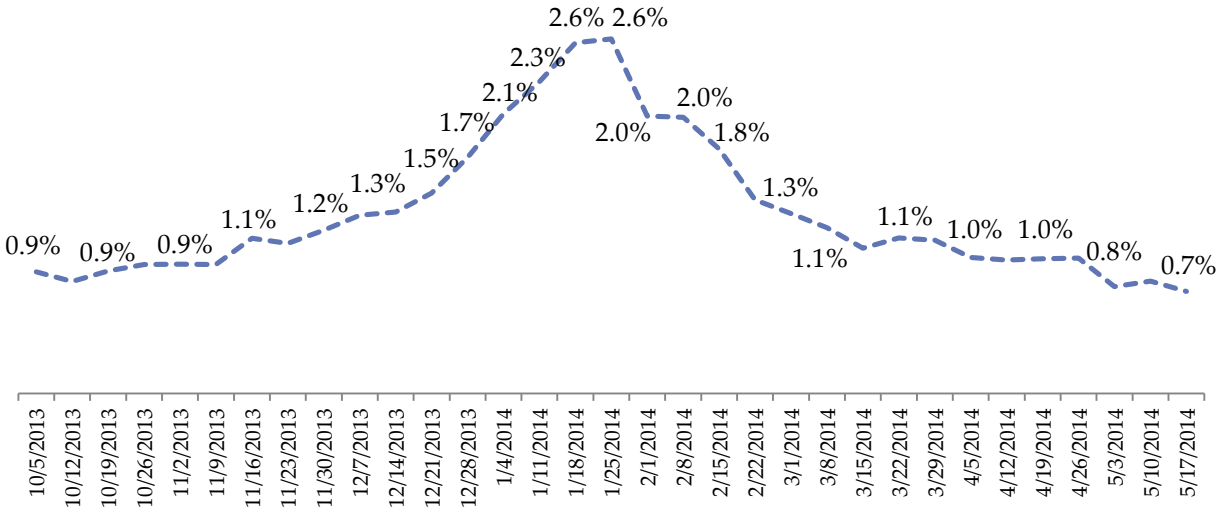
ESSENCE ILI Surveillance

There were a total of 1,432,891 visits to emergency departments reported this season through ESSENCE. Of those, 18,896 (1.3%) were visits for ILI. The largest number of ILI visits was by people in the 25-49 age group, followed by the 5-24 and the 0-4 age groups. Whenever an abnormal or unexpected increase in ILI chief complaints at a hospital was detected, epidemiologists from OPR, OIDEOR, and the local health departments investigated the situation and acted if necessary.



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 from October to mid-December 2013. In the week ending December 21, the rate of increase began accelerating, with ILI peaking at 2.6% for two weeks during mid- to late January. Following this peak, the proportion for emergency room visits for ILI rapidly dropped off, hitting 2.0% for the week ending February 1 and continuing to steadily decline through the end of the season.

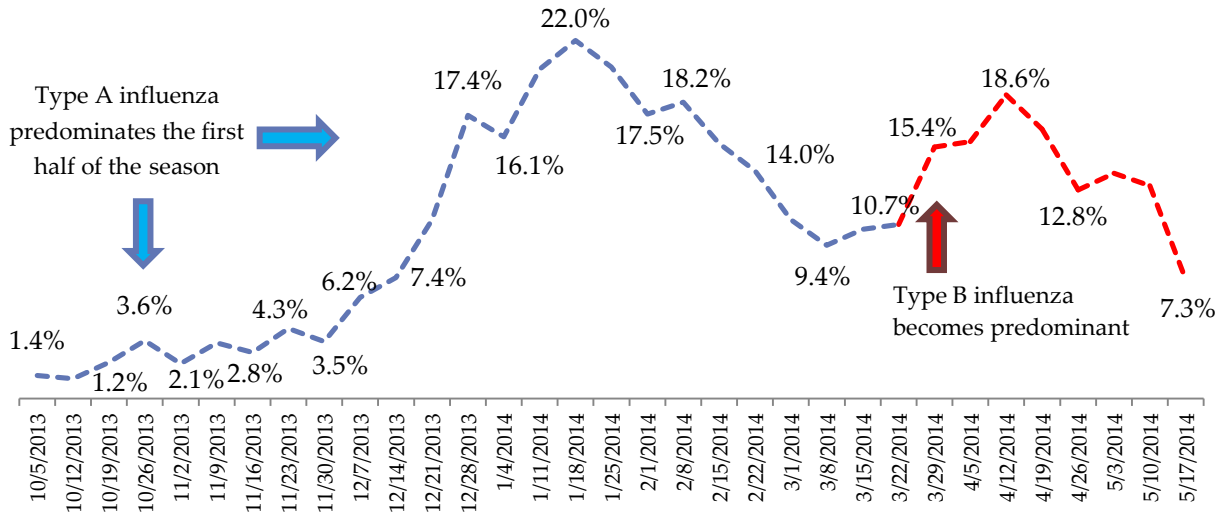


PROPORTION OF VISITS TO EMERGENCY DEPARTMENTS WITH CHIEF COMPLAINT OF ILI BY WEEK

Clinical Laboratory Testing

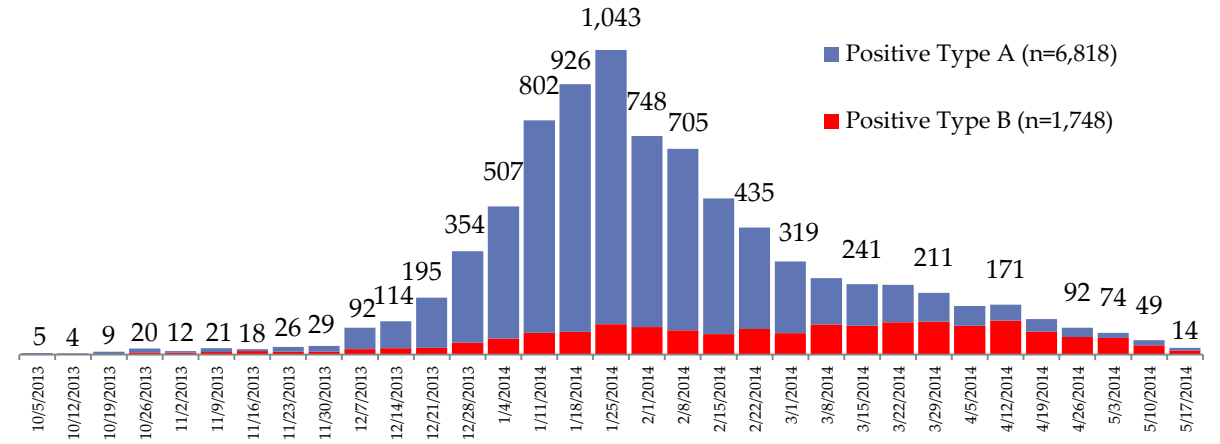
This season, 44 clinical laboratories agreed to report the total number of influenza tests they performed, along with the number of positive tests and the proportion of positives that were type A or type B. Of those 44 laboratories, 37 (84%) reported more than 17 weeks during the 33-week influenza season, and the rest reported at least one week. The results of 59,124 influenza diagnostic tests were reported over the entire 2013-2014 influenza season, with 8,566 (14.5%) specimens testing positive. Of those specimens testing positive 6,818 (79.6%) were influenza type A and 1,748 (20.4%) were type B.

The graph below shows that the proportion of positive tests began to increase rapidly in early December 2013, peaking at 22.0% during the week ending January 18. From that week until mid-March 2014, the proportion of rapid positive tests declined. Then, the proportion increased again with a second, late-season peak of 18.6% in the week ending April 12. Since that week, the proportion steadily declined. This second peak coincided with an increase in influenza type B activity, which was predominant from the week ending March 29 until the end of the season.



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

The following graph shows the number of positive influenza tests reported by week. As in the previous graph showing the proportion of specimens testing positive, the number of specimens testing positive grew slowly from the start of the season until early December when the rate of increase accelerated rapidly, peaking at 1,043 positive specimens for the week ending January 25, 2014. However, unlike the previous graph, there is no second peak later in the season. This is because, while there was an increase in the proportion of specimens testing positive late in the season, the number of specimens being testing was declining at a higher rate, resulting in a drop in the overall number of positive specimens detected.



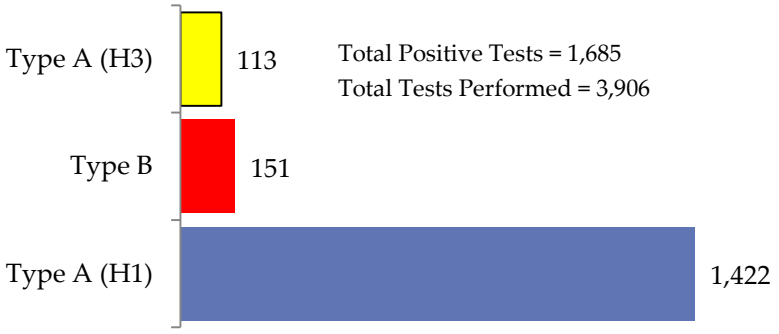
NUMBER OF RAPID POSITIVE INFLUENZA TESTS BY TYPE (A/B) AND WEEK

Influenza Testing at the State Laboratories Administration

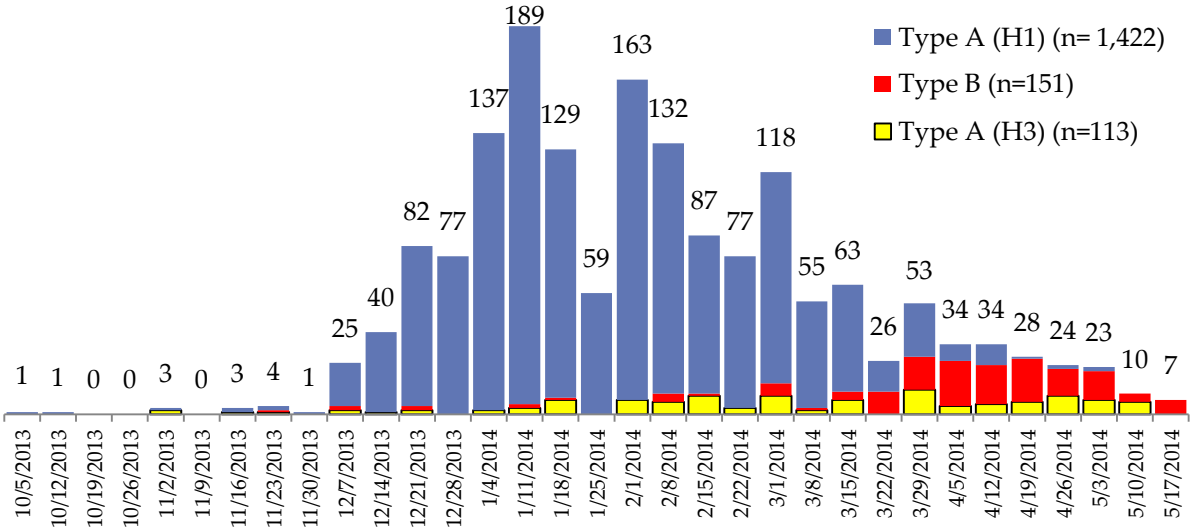
The DHMH State Laboratories Administration performed a total of 3,906 PCR tests for influenza. PCR testing is more reliable than rapid influenza diagnostic testing, which is what many of the clinical laboratories use. Of those specimens tested by the state lab, 1,685 (43.1%) were positive. These specimens came from throughout the state and were submitted by ILINet sentinel providers, sentinel clinical laboratories, hospital laboratories, private practitioners, and by local health departments as part of outbreak investigations.

The number of positive specimens reported each week by the state lab is presented in the graph below. The first PCR-positive specimen was collected on the first day of the influenza surveillance season (September 29, 2013). The number of specimens testing positive remained low through November, with less than 15 detected in the first two months of the season. As with several of the other indicators already discussed, activity saw a substantial increase beginning in early December and peaked during the week ending January 11, 2014, when 189 specimens tested positive for influenza. There was a drop in the number of specimens testing positive at the state lab in mid-January, immediately following the peak; however, this drop coincides with a string of severe weather events when many healthcare providers, clinical laboratories, and local health departments, as well as the state health department, had to close and specimens could not be collected and delivered. It is likely that the drop in the number of positive specimens reported is mostly, if not entirely, due to severe weather rather than a true decrease in influenza activity. Similar to the rapid testing results, the number of type B influenza positive specimens exceeded the number of type A positive specimens beginning in April. Type B influenza remained the predominant strain for the rest of the season.

Of the 1,685 specimens testing positive at the state lab, Type A (H1N1) was the predominant strain, accounting for 1,422 (84.4%) of the positive tests, followed by Type B, with 151 (9.0%) positives. Type A (H3N2), the predominant strain of the severe 2012-2013 influenza season, was the least commonly detected strain, accounting for 113 (6.7%) of the positive tests. (The sum of the specimens by type/subtype is 1,686, rather than 1,685, because one specimen tested positive for two influenza strains.)



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

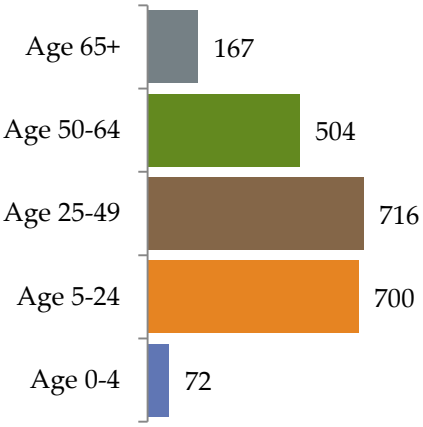


NUMBER OF PCR-POSITIVE TESTS BY INFLUENZA TYPE AND SUBTYPE AND WEEK REPORTED BY THE DHMH LABORATORIES ADMINISTRATION

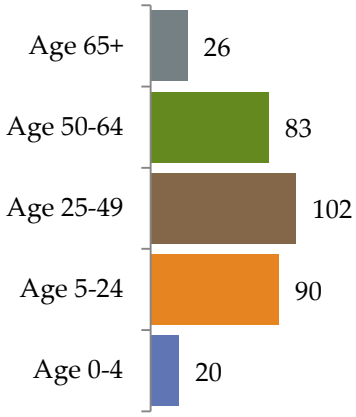
Maryland Resident Influenza Tracking Survey (MRITS)

The number of participants in MRITS increased through the influenza season from 2,028 at the beginning of the season to 2,159 at the end. Over the entire influenza season, DHMH received 19,688 survey responses through MRITS, averaging 597 per week. The median age of MRITS participants was 47 years, with a range of 0 to 88 years. Among respondents, 1.6% experienced ILI symptoms at one point in the season, causing them to miss a cumulative 720 days of work, school, and/or other regular daily activities. Of those participants reporting ILI, the largest number was in the 25-49 age group, followed by the 5-24 and 50-64 age groups. ILI activity reported through

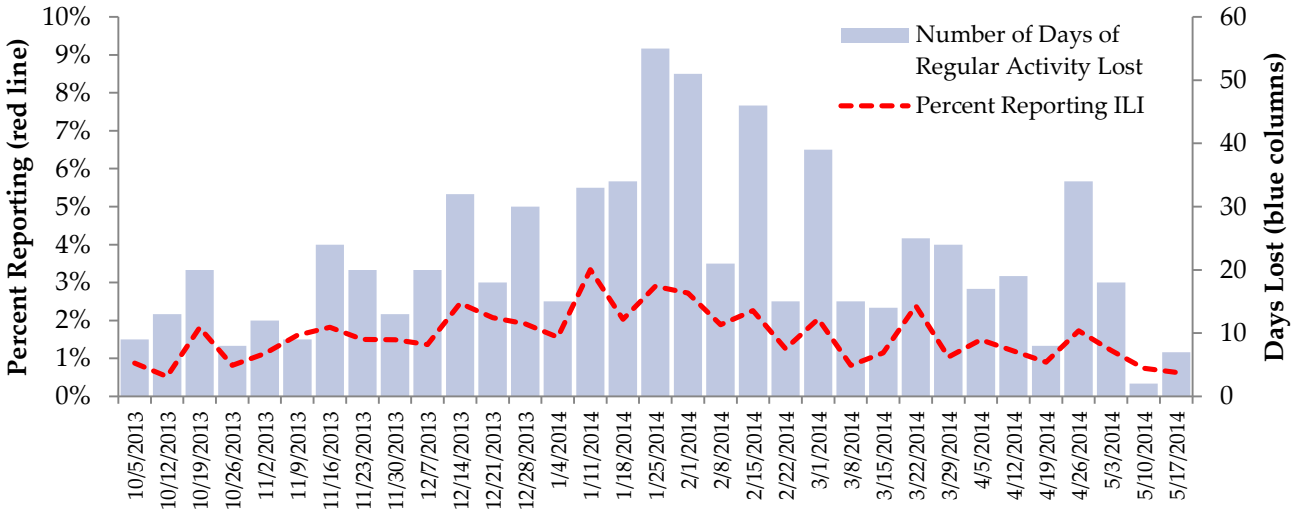
MRITS was highly variable throughout the season, but peaked for the week ending January 11, 2014, when 3.3% of respondents reported ILI symptoms47



AGE DISTRIBUTION OF MRITS RESPONDERS



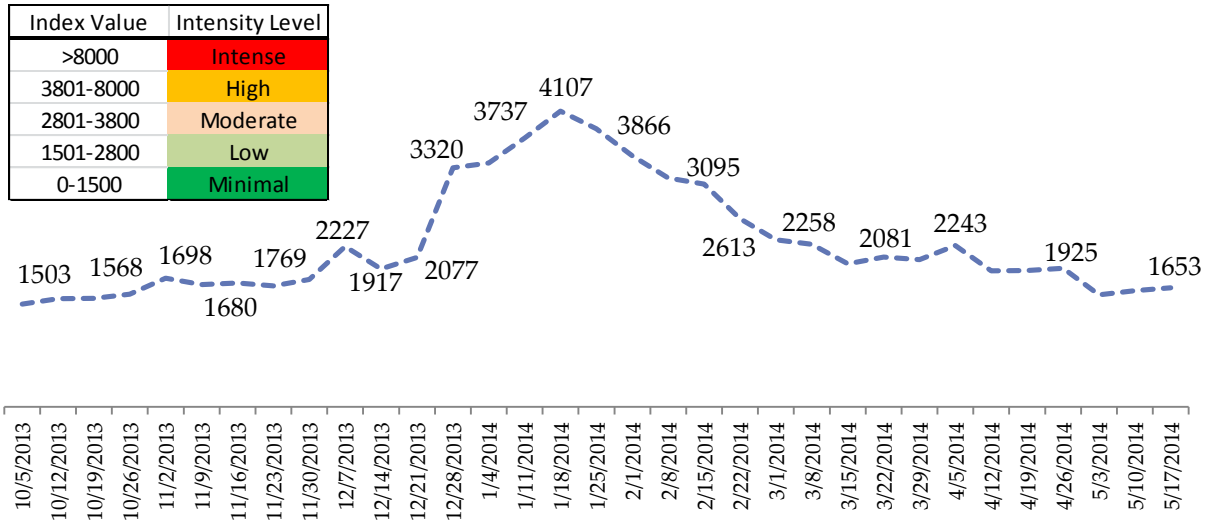
AGE DISTRIBUTION OF MRITS RESPONDERS REPORTING ILI



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

Google Flu Trends

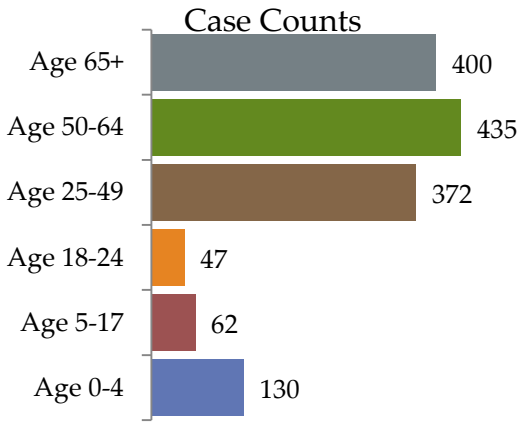
The Google Flu Trends activity index remained steady through mid-December 2013 when an increase in ILI and influenza-related web searches began to be detected. This upward trend continued for the next several weeks, peaking during the week ending January 18, 2014. From then on, the activity decreased steadily, returning to "low" activity by the end of February. To access an interactive tool for visualizing Google Flu data, please visit http://google.org/flutrends. (There are other tools on that site to visualize other syndromes being tracked via Google, including some experimental visualizations.)



GOOGLE FLU ILI ACTIVITY INDEX BY WEEK

Influenza-Associated Hospitalizations

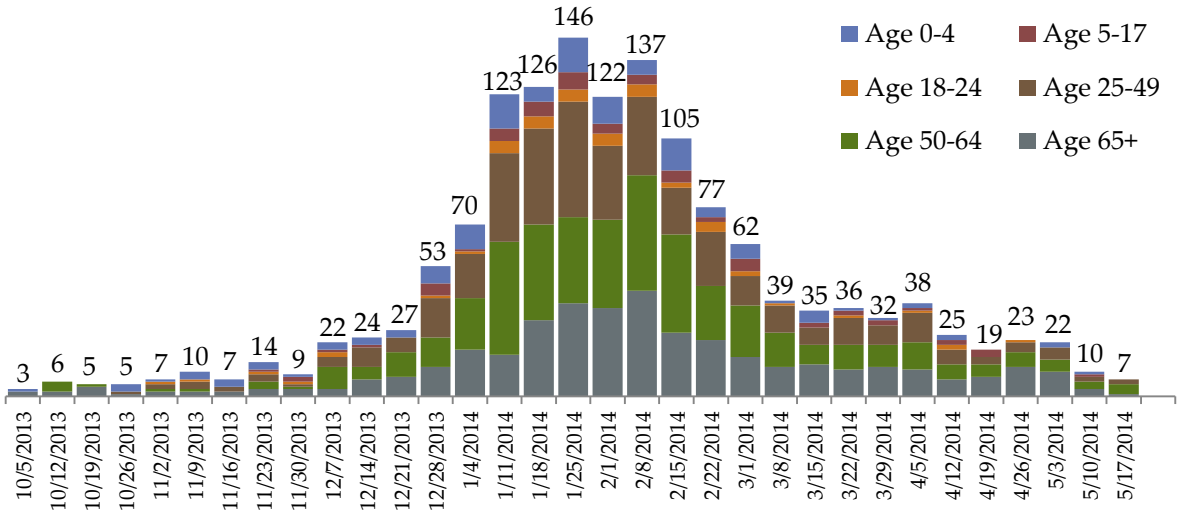
A total of 1,446 influenza-associated hospitalizations were reported to the Emerging Infections Program at DHMH during the season. The 50-64 age group had the greatest proportion of hospitalized cases, accounting for 30% of the reported cases. Last season the 65 and older group was the largest. The 18-24 age group saw the smallest proportion of hospitalizations this season (3%).



INFLUENZA-ASSOCIATED HOSPITALIZATIONS BY AGE GROUP

The number of reported hospitalizations began to rise steadily starting the week ending December 7, 2013. Between the week ending December 21, 2013, and the week ending January 11, 2014, the number of cases reported each week rose by nearly 100 cases, from 27 to 123. The number of

hospitalizations then continued to increase, peaking at 146 hospitalizations during the week ending January 25, 2014. The number of reported hospitalizations remained elevated for the two weeks following the peak, but then began to drop precipitously in the week ending February 15, dropping down into the 30s by early March. From that point on, cases continued to slowly but steadily decline. The graph below shows the number of cases reported each week by age group.



NUMBER OF INFLUENZA-ASSOCIATED HOSPITALIZATIONS BY AGE GROUP AND WEEK

Respiratory Outbreaks in Institutional Settings

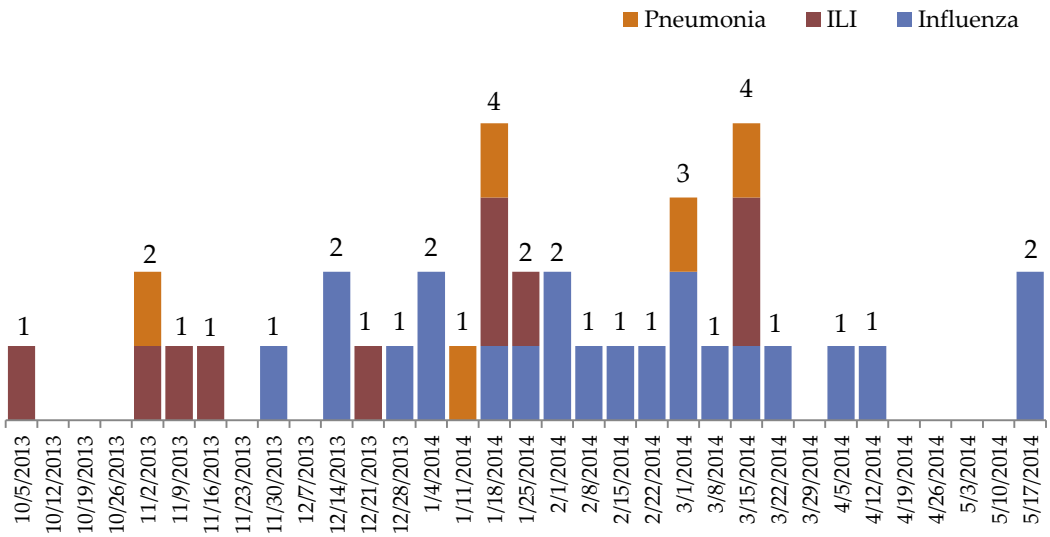
During this season, most of the 37 reported outbreaks of influenza, ILI, and pneumonia occurred in nursing homes (20, 54%), followed by assisted living facilities (11, 30%), rehabilitation centers (3, 8%), and elementary/high schools (3, 8%).

Type of Setting	Influenza Outbreaks	ILI Outbreaks	Pneumonia Outbreaks	Total Outbreaks
Nursing Homes	15	4	1	20
Assisted Living Facilities	3	5	3	11
Rehab Centers	3			3
Elementary/High Schools	1	1	1	3
Total Outbreaks	22	10	5	37

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

In contrast to several recent influenza seasons, reports of respiratory outbreaks remained relatively low throughout the season with little variance from week-to-week. There was a 15-week span (the

weeks ending January 18 through March 22) in which at least one outbreak was reported each week. The largest number of outbreaks reported in any single week was four, occurring in the weeks ending January 18 and March 15.



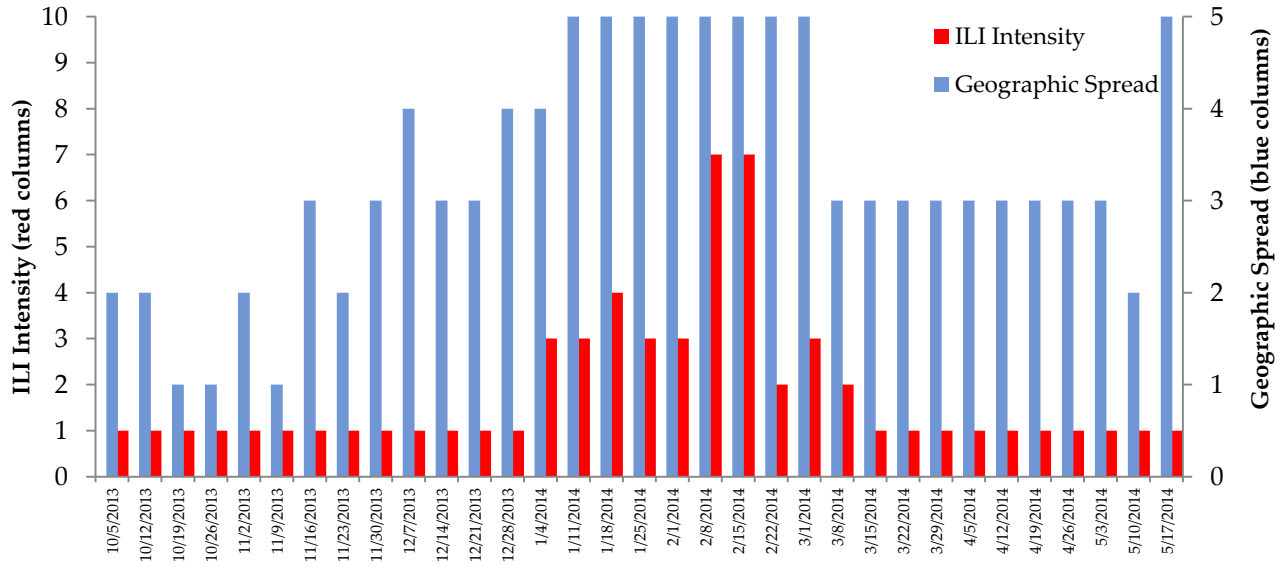
NUMBER OF RESPIRATORY OUTBREAKS BY TYPE

Geographic Spread and Intensity

The geographic spread and ILI intensity levels for the 2013-2014 influenza season can be seen in the chart below.

The geographic spread level was at "no activity" or "sporadic" activity most of the first eight weeks of the season. It began to raise steadily beginning in late November, reaching "widespread" activity the week ending January 4, 2014, and it remained there until early March. Geographic spread then dropped down to "local" activity for most of the rest of the season.

The ILI intensity level was at 1 ("minimal") for the first 13 weeks of the 2013-2-14 influenza season. It climbed to 4 ("low") the week ending January 18 and peaked at 7 ("moderate") in mid-February, before returning to "minimal" levels for the remainder of the season.



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.

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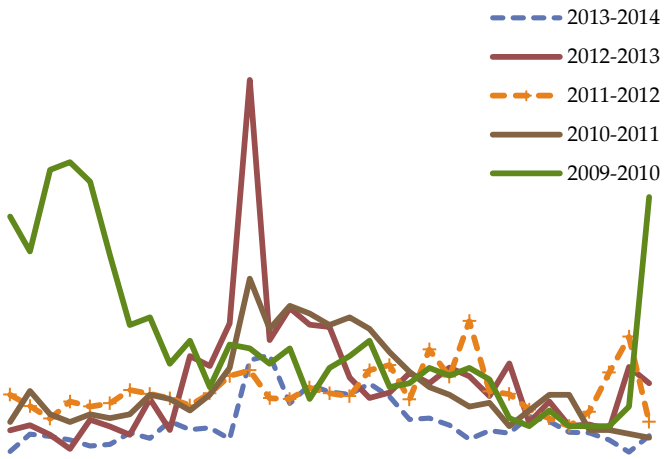
DISCUSSION

Compared to recent influenza seasons, including the 2009 pandemic, the 2013-2014 influenza season saw moderate activity, being less intense than the 2009 pandemic or 2012-2013 influenza seasons, but more active than the 2011-2012 season. By most indicators, the period of elevated activity began in mid-December 2013, and lasted until early February 2014. The peak number of PCR-positive influenza tests performed at the DHMH laboratory was the week ending January 11, while the peak number of tests reported by the clinical laboratories was for the week ending



ILINET ACTIVITY FOR THE LAST FIVE SEASONS

January 25. Meanwhile, reports from ILI-Net, ESSENCE, and MRITS (three of our measures for ILI) showed numbers peak the weeks ending January 11, January 18-25, and January 11, respectively. The peak number of influenza-associated hospitalizations was reported during the week ending January 25. There was a tie for the peak number of outbreaks reported (4), the first occurrence was for the week ending January 18; the second was in the week ending March 15.

With respect to the circulating strains of influenza, type A (H1N1) was the first strain detected this season, appearing in October 2013. Type A (H3N2) and type B were first detected in November. Type A (H1N1) influenza would be the predominant strain for most of the season until early April 2014, when type B influenza became predominant. Looking at rapid influenza testing, we can see that there was a bi-modal (two peaks) distribution of positive rapid testing, with the first peak attributable to type A and the second peak to type B influenza, which is a common pattern seen in previous influenza seasons.

We observed in our surveillance that most of the visits to sentinel providers and emergency departments for ILI were by older children and young to middle-aged adults, which is a pattern commonly seen during seasons in which 2009 H1N1 plays a substantial role. However, looking at the data for hospitalizations, a majority of the people hospitalized with influenza were in the older age groups (50-64 and ≥65). This is a trend we commonly see, regardless of which strain is predominant, as older persons commonly have co-morbidities that put them at greater risk for severe illness. Likewise, most of the outbreaks reported during this season were in nursing homes and assisted living facilities.

Although the predominant strain of the 2013-2014 influenza season (2009 H1N1) was the same virus that caused the 2009-2010 influenza pandemic, the trends observed this influenza season vary substantially from those seen during the pandemic season. In general, our indicators had earlier peaks and higher peak activity during 2009-2010 influenza season. But the 2009-2010 season was very different in that a novel (never before seen) virus was introduced into Maryland in the springtime, followed by its reoccurrence as the predominant virus during the regular influenza season starting in the fall of 2009. While many factors can impact when influenza activity will peak and how severe the season will be, the single greatest difference between seasons is that, overall, Maryland residents were far more susceptible to the virus in 2009. The 2009 novel H1N1 virus was a product of antigenic shift (a reassortment of human, swine, and avian influenza viruses). Prior to 2009, the virus had not circulated in humans, so there was no immunity built up in the population from past infections or vaccinations; as a result, the virus spread widely and rapidly throughout the state, infecting many people who would not normally contract influenza. In August 2010, the World Health Organization declared the end of the global influenza pandemic, but the virus has circulated every season since then as a seasonal influenza virus.

Surveillance for influenza and other respiratory conditions is year-round, not just in Maryland but around the world. We work with our colleagues at all levels to monitor everything from single cases of disease to clusters and outbreaks, whether they are happening in Maryland or elsewhere.

ADDITIONAL READINGS

- "What You Should Know for the 2014-2015 Influenza Season" Centers for Disease Control and Prevention, available at: http://www.cdc.gov/flu/about/season/flu-season-2014-2015.htm
- "CDC Resources for Pandemic Flu" Centers for Disease Control and Prevention, available at: http://www.cdc.gov/flu/pandemic-resources/index.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
- Blanton, et al. (2012). Neurologic Conditions Among Pediatric Deaths Associated With the 2009 Pandemic Influenza. *Pediatrics,* 130(3), pp. 390-396, available at: http://pediatrics.aappublications.org/content/130/3/390.long
- Lombardo, et. al. (2004). ESSENCE II and the Framework for Evaluating Syndromic Surveillance Systems. *Morbidity and Mortality Weekly Report*, 53, pp. 159-165, available at: http://www.cdc.gov/Mmwr/preview/mmwrhtml/su5301a30.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
- "Influenza Seasonal Flu Activity and Surveillance" Centers for Disease Control and Prevention, available at: http://www.cdc.gov/flu/weekly/fluactivitysurv.htm
- "H7N9 Situation and CDC Response" Centers for Disease Control and Prevention, available at: http://www.cdc.gov/flu/spotlights/h7n9-cdc-response.htm
  "Novel Coronavirus" Centers for Disease Control and Prevention, available at: http://www.cdc.gov/coronavirus/ncv/