State of Wyoming

Department of Health

Wyoming Influenza Summary Report
2014-2015 Season

July 2015

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WYOMING INFLUENZA SUMMARY REPORT, 2014-2015 SEASON
(September 28, 2014 – May 23, 2015)

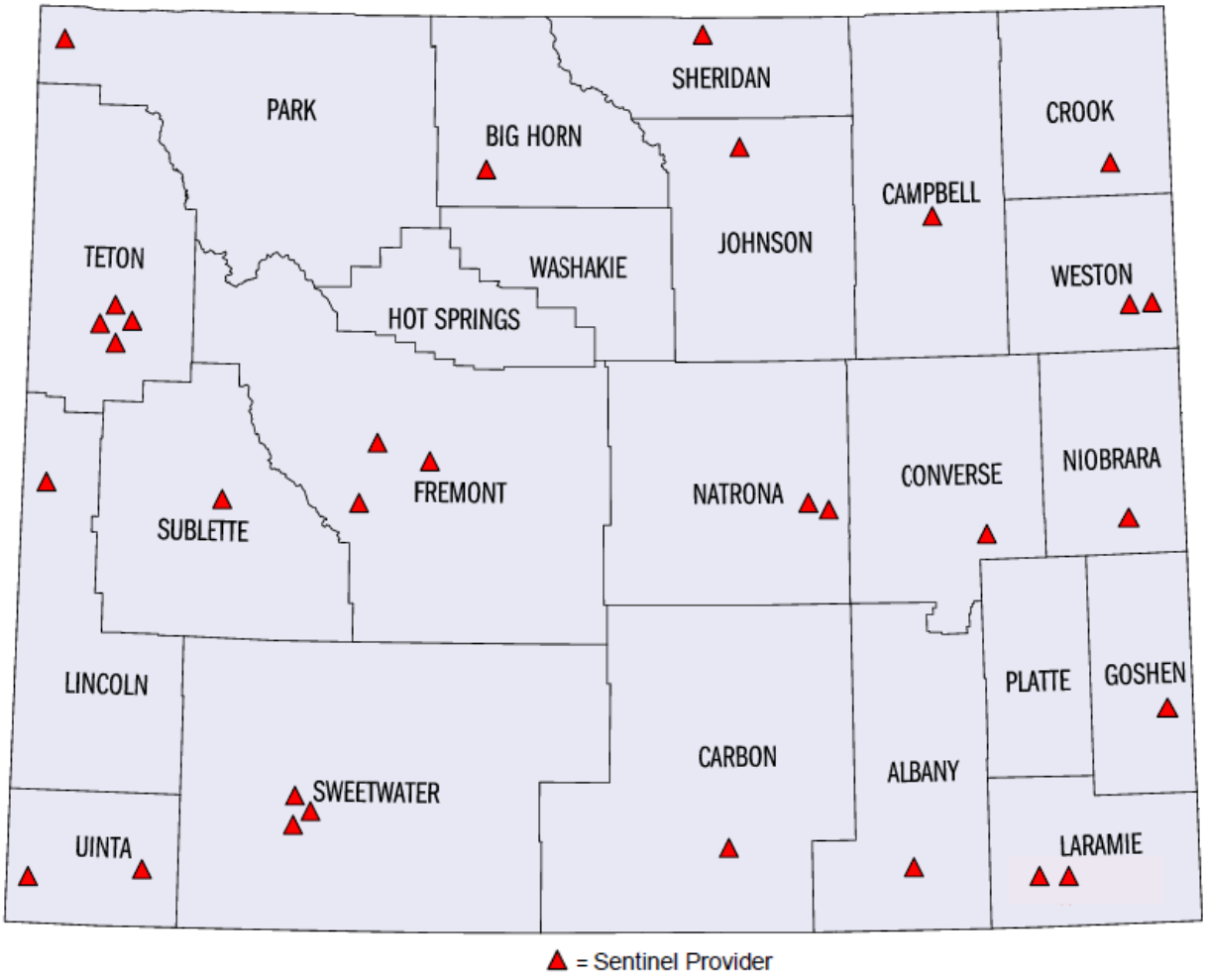
SYNOPSIS

Influenza activity was severe during the 2014-2015 influenza season, as determined by the number of influenza-associated deaths, the number of reported cases of laboratory-diagnosed influenza, and the percentage of visits to outpatient clinics or hospitals for influenza-like illness (ILI) during the influenza season. At the start of the 2014-2015 influenza season, healthcare providers across Wyoming reported low levels of influenza activity. The number of reported cases and the percentage of outpatient visits for influenza-like illness (ILI) significantly increased in December 2014. The number of reported cases in Wyoming peaked during the week ending January 17, 2015 (MMWR Week 02). Activity throughout the state remained elevated until March 2015 when influenza activity decreased gradually. For the remainder of the season, Wyoming experienced decreasing levels of influenza activity. Overall, influenza A (H3N2) viruses were the predominant influenza viruses circulating in Wyoming during the 2014-2015 influenza season. However, Influenza B viruses emerged as the predominant circulating viruses starting February 2015, and continued as the predominant viruses circulating in Wyoming until the end of the influenza season.

SURVEILLANCE AND THE INFLUENZA SENTINEL PROVIDER NETWORK

Influenza is a reportable disease in the State of Wyoming. Each year, the Wyoming Department of Health (WDH) receives reports of rapid influenza diagnostic test (RIDT), direct fluorescent antibody (DFA), indirect fluorescent antibody (IFA), polymerase chain reaction (PCR), and cell culture results from physicians, clinics, hospitals, and laboratories across the state and the nation. The surveillance program relies on these sectors to test and report all positive test results. In addition, Wyoming has a network of influenza sentinel providers located across the state. An influenza sentinel provider, or Influenza-like Illness Surveillance Network (ILINet) provider, conducts surveillance for ILI in collaboration with the WDH and the Centers for Disease Control and Prevention (CDC). ILINet providers submit reports each week, even when they observe no influenza or ILI activity. Additionally, the ILINet providers collect specimens from a small number of patients with ILI. The providers submit the samples to the Wyoming Public Health Laboratory (WPHL) for specialized influenza testing. This information often provides public health officials the earliest identification of circulating influenza virus types, subtypes, and strains during the influenza season. Map 1 indicates the locations of healthcare providers enrolled in the ILINet Provider - Influenza Surveillance Program during the 2014-2015 influenza season.

MAP 1: NETWORK OF ILINET PROVIDERS BY COUNTY
WYOMING, 2014-2015 INFLUENZA SEASON



Thirty-one healthcare organizations enrolled as ILINet providers during the 2014-2015 influenza season. A major goal of the WDH-Infectious Disease Epidemiology Unit is to recruit and maintain ILINet providers from every county in the state, including multiple municipalities and various types of practices within each county. This season, 20 of Wyoming's 23 counties had ILINet providers enrolled in the program, including ILINet providers at the Wind River Indian Reservation and Yellowstone National Park. Data from the network of ILINet providers are critical for monitoring the impact of influenza. Additionally, public health officials can utilize the data in combination with other influenza surveillance data, to guide prevention and control activities, vaccine strain selection, and patient care. Providers of any specialty (e.g., family practice, internal medicine, pediatrics, infectious diseases) in any type of practice (e.g., private practice, public health clinic, emergency room, university student health center) are eligible to be ILINet providers. The sentinel provider program involves two major components: weekly ILI reporting and laboratory specimen collection.

The first component, weekly ILI reporting, consists of recording and reporting summary data (total number of patient visits for any reason and the number of patient visits for ILI by age group) each week to CDC via the ILINet website. The influenza sentinel provider program, also known as the ILINet provider program, consists of approximately 3,000 healthcare providers in all 50 states and several United States Territories. The program provides public health officials with a source of outpatient illness surveillance during the influenza season. The ILI case definition used for national surveillance is {1} a fever ($\geq$100.0° F or 37.8° C) and {2} a cough and/or sore throat in the absence of a known cause other than influenza. The design of the ILI case definition is to capture patients with influenza-like illnesses; therefore, providers are not capturing only influenza cases. Consequently, some patients will meet the ILI case definition without having the disease of influenza. ILINet providers submitted reports weekly through the ILINet website beginning September 28, 2014 (MMWR Week 40); the reports continue until September 26, 2015 (MMWR Week 39). Some of the ILINet providers discontinued reporting on May 23, 2015 (MMWR Week 20). Historically, the twentieth week of the year marks the end of the influenza season. However, in recent years, CDC requested that ILINet providers continue to report throughout the summer. Year-round influenza surveillance provides a baseline level of influenza activity; this process functions to establish the annual epidemic thresholds of influenza.

The second component, laboratory specimen collection, involves collecting specimens from a small number of patients with ILI each influenza season. Healthcare providers submit specimens to the WPHL for specialized influenza testing. The WPHL performs reverse transcriptase – polymerase chain reaction (RT-PCR). In addition, WPHL forwards a subset of the specimens submitted by ILINet providers to CDC for additional testing. This testing often provides the earliest identification of circulating influenza virus types, subtypes, and strains during the current influenza season. During a typical influenza season, laboratory and epidemiology officials will utilize the ILINet provider program as a major part of influenza surveillance for the WDH. In addition, the WPHL is a World Health Organization (WHO) Collaborating Laboratory. As a WHO Collaborating Laboratory, the WPHL reports the total number of respiratory specimens tested and the number of positive influenza specimens to CDC each week. The participating ILINet providers are offered summaries of state and national influenza data, free subscriptions to CDC's *Morbidity and Mortality Weekly Report*, *Emerging Infectious Diseases Journal*, and viral isolation test kits for free influenza testing at the WPHL. Finally, the most important consideration is the data provided by ILINet providers are critical for protecting the public's health. For more information on the Influenza Sentinel Surveillance Network, or if you are interested in becoming an ILINet provider, please contact the WDH-Infectious Disease Epidemiology Unit at (307) 777-8640.

REPORTED CASES

Wyoming reported 5,152 laboratory-confirmed influenza cases (RIDT, DFA, PCR, or cell culture positive test results) during the 2014-2015 influenza season. Healthcare providers reported the first positive cases for the 2014-2015 influenza season during the week ending October 4, 2014 (MMWR Week 40). Reporting of influenza peaked the week ending January 17, 2015 (MMWR Week 02) when providers reported 438 cases. In comparison, during the 2013-2014 influenza season, reporting of influenza peaked the week ending January 11, 2014 (MMWR Week 02) when providers reported 303 cases. Chart 1 and Table 1 display the number of cases reported by week. The WDH requires healthcare providers and laboratories to report all positive influenza laboratory tests; however, not all providers report these results. Additionally, many ill persons do not seek medical care, and not all healthcare providers test for the disease during a medical visit. Therefore, comparing reported cases of influenza from week-to-week or season-to-season may not be valid, as many factors influence both testing and reporting.

CHART 1: REPORTED CASES OF INFLUENZA (RIDT, DFA, PCR, & LAB CULTURE) WYOMING, (2010-2011 TO 2014-2015)

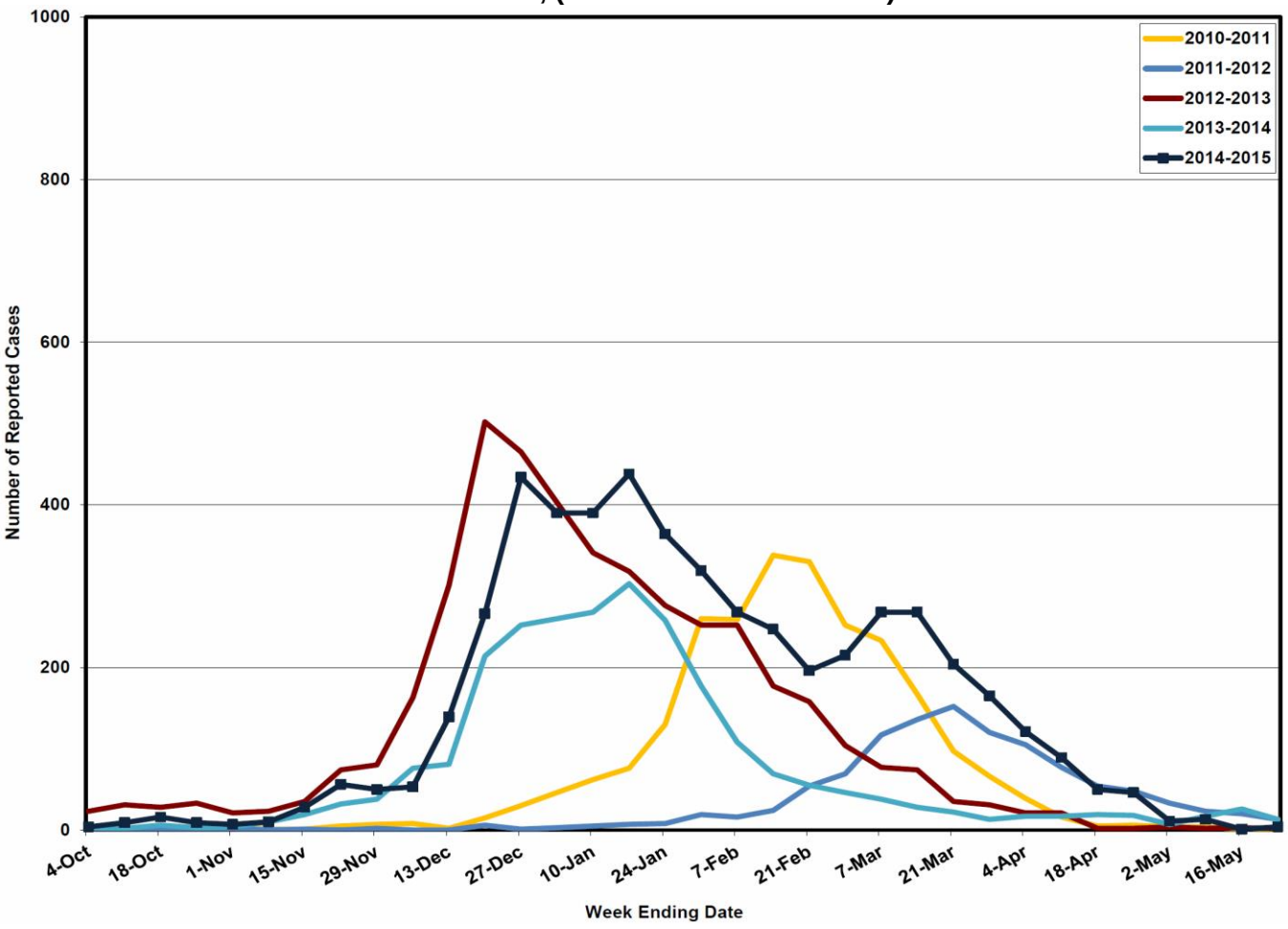


TABLE 1: REPORTED CASES OF INFLUENZA; WYOMING, 2014-2015 INFLUENZA SEASON

Week Ending	Number
04-Oct	4
11-Oct	9
18-Oct	16
25-Oct	9
01-Nov	7
08-Nov	10
15-Nov	28
22-Nov	56
29-Nov	50
06-Dec	53
13-Dec	139
20-Dec	266
27-Dec	434
03-Jan	390
10-Jan	390
17-Jan	438
24-Jan	364
31-Jan	319
07-Feb	268
14-Feb	247
21-Feb	196
28-Feb	215
07-Mar	268
14-Mar	268
21-Mar	204
28-Mar	165
04-Apr	121
11-Apr	89
18-Apr	50
25-Apr	46
02-May	11
09-May	14
16-May	4
23-May	4
Total	5152

County	Number
Albany	185
Big Horn	68
Campbell	885
Carbon	107
Converse	153
Crook	42
Fremont	223
Goshen	109
Hot Springs	45
Johnson	27
Laramie	864
Lincoln	84
Natrona	908
Niobrara	5
Park	115
Platte	81
Sheridan	336
Sublette	105
Sweetwater	337
Teton	165
Uinta	164
Washakie	99
Weston	45
Unknown	0
Total	5152

Age	Number
0-4	986
5-10	1214
11-19	798
20-39	961
40-59	642
60+	551
Unknown	0
Total	5152

Gender	Number
Male	2532
Female	2620
Total	5152

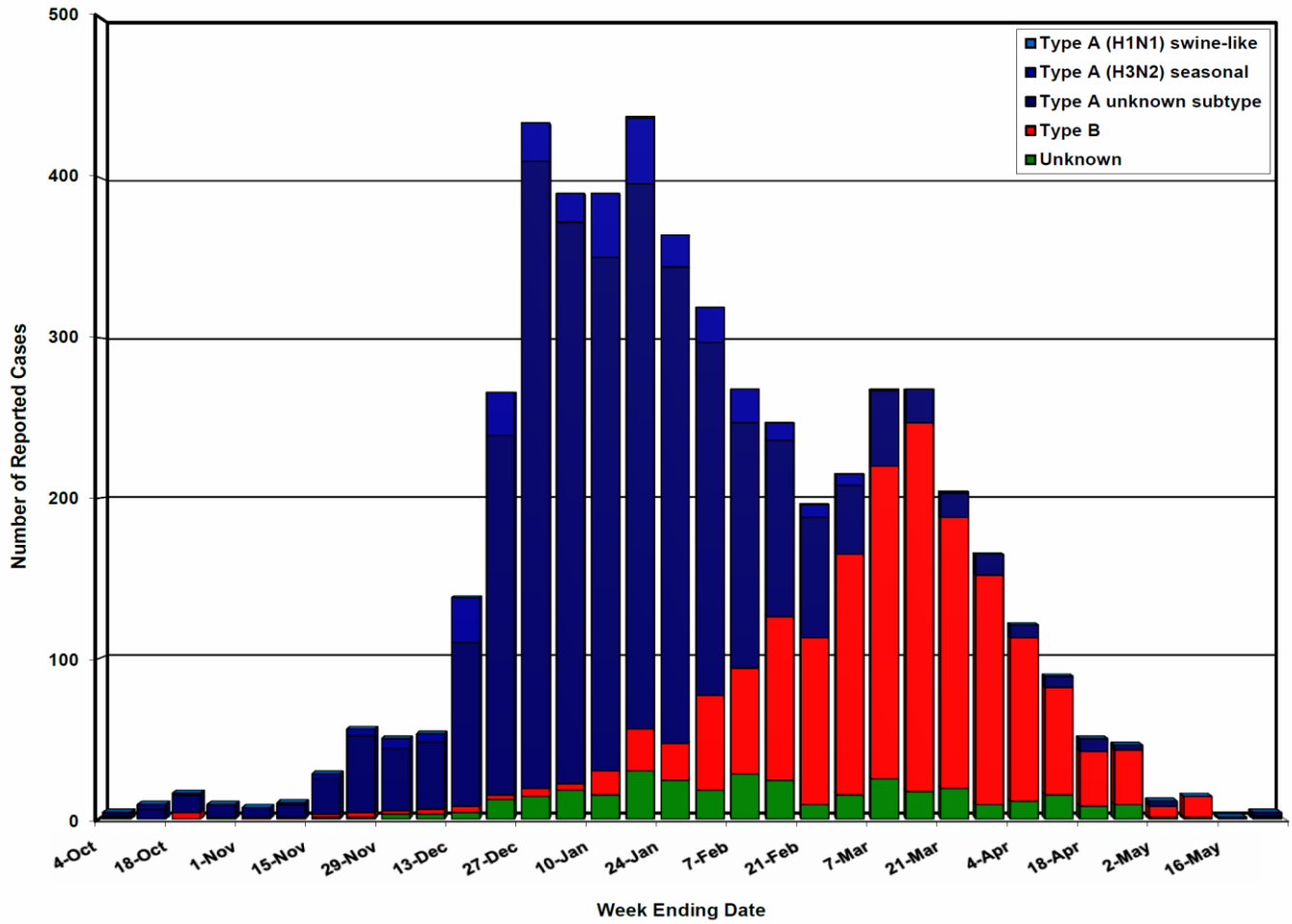
Type	Number
A	3238
B	1576
A & B Dual	1
Unknown	337
Total	5152

Subtype (A)	Number
A (H3N2)	292
A (H1N1) 2009	1
A & B Dual	1
A Unknown	2945
Total	3239

LABORATORY DATA

Of the 5,152 reported cases, 3,238 (62.9%) were influenza A viruses, 1,576 (30.6%) were influenza B viruses, 337 (6.5%) were unknown influenza viruses and one case was a dual infection with influenza A and B. Healthcare providers and laboratories confirmed 56 cases by DFA; two cases by cell culture; and 4,446 cases by RIDT only. The WPHL confirmed 314 of these cases by PCR testing. Other laboratories (hospital, medical reference, and public health laboratories) confirmed an additional 334 cases by PCR testing. During the 2014-2015 influenza season, the WPHL tested a total of 669 specimens for influenza viruses and 325 (48.6%) were positive. However, eleven were out-of-state residents not counted in the Wyoming database. The WPHL confirmed the first positive PCR specimen during the week ending October 11, 2014 (MMWR Week 41), and confirmed the last positive specimen during the week ending May 16, 2015 (MMWR Week 19). Among the 325 positive influenza specimens tested at the WPHL, 240 (73.9%) were influenza A (H3N2) viruses; 82 (25.2%) were Influenza B viruses; and three (0.9%) were either unknown influenza A viruses or dual infections with influenza A and B viruses (see chart 2).

CHART 2: REPORTED CASES OF INFLUENZA BY VIRUS TYPE & SUBTYPE WYOMING, 2014 - 2015 INFLUENZA SEASON



On a national level, WHO and the National Respiratory and Enteric Virus Surveillance System collaborating laboratories tested a total of 691,952 specimens for influenza viruses during the 2014-2015 influenza season and 125,462 (18.1%) were positive. Among the 125,462 influenza viruses, 104,822 (83.5%) were influenza A viruses and 20,640 (16.5%) were influenza B viruses. The collaborating laboratories subtyped 52,519 (50.1%) of the 104,822 influenza A viruses: 52,299 (99.6%) were influenza A (H3N2) viruses; 219 (0.4%) were 2009 influenza A (H1N1) viruses; and one variant influenza A (H3N2v) virus. This influenza season, influenza A (H3N2), 2009 influenza A (H1N1), variant influenza A (H3N2v), and influenza B viruses co-circulated in the United States. However, the relative proportion of each type and subtype of influenza virus varied by region and week. Influenza A (H3N2) viruses were the most commonly reported influenza virus type and subtype throughout most of the influenza season. Additionally, influenza A (H3N2) viruses were the overall predominant influenza subtype circulating across the United States. Specifically, influenza A (H3N2) viruses were predominant in Region 8 of the U.S. Department of Health and Human Services (DHHS) during the weeks preceding the influenza peak in Wyoming. The State of Wyoming is located within DHHS Region 8. Although influenza A (H3N2) viruses predominated, 2009 influenza A (H1N1) and influenza B viruses co-circulated across the state.

As of May 23, 2015, CDC antigenically characterized 2,193 influenza viruses collected by United States laboratories since October 1, 2014. CDC characterized all 59 of the 2009 influenza A (H1N1) viruses as A/California/7/2009-like, the 2009 influenza A (H1N1) virus component of the 2014-2015 influenza vaccine for the Northern Hemisphere. Two hundred forty-six (18.6%) of the 1,324 influenza A (H3N2) viruses were characterized as A/Texas/50/2012-like, the influenza A (H3N2) component of the 2014-2015 influenza vaccine for the Northern Hemisphere. The remaining 1,078 (81.4%) of the influenza A (H3N2) viruses tested showed reduced titers with antiserum produced against A/Texas/50/2012-like or belonged to a genetic group that typically shows reduced titers to A/Texas/50/2012. Among viruses that showed reduced titers with antiserum raised against A/Texas/50/2012, most were antigenically similar to A/Switzerland/9715293/2013. The A/Switzerland/9715293/2013 virus is related to but antigenically distinguishable from the A/Texas/50/2012 vaccine virus. Laboratories characterized 582 of the 810 (71.9%) B/Yamagata-lineage viruses as B/Massachusetts/2/2012-like, the recommended influenza B component for the 2014-2015 Northern Hemisphere influenza vaccine. However, eleven viruses showed reduced titers with antiserum produced against B/Massachusetts/2/2012-like. Laboratories identified the remaining 228 (28.1%) influenza B viruses as belonging to B/Victoria-lineage of the viruses as B/Brisbane/60/2008-like. However, five of the B/Victoria-lineage viruses showed reduced titers to B/Brisbane/60/2008.

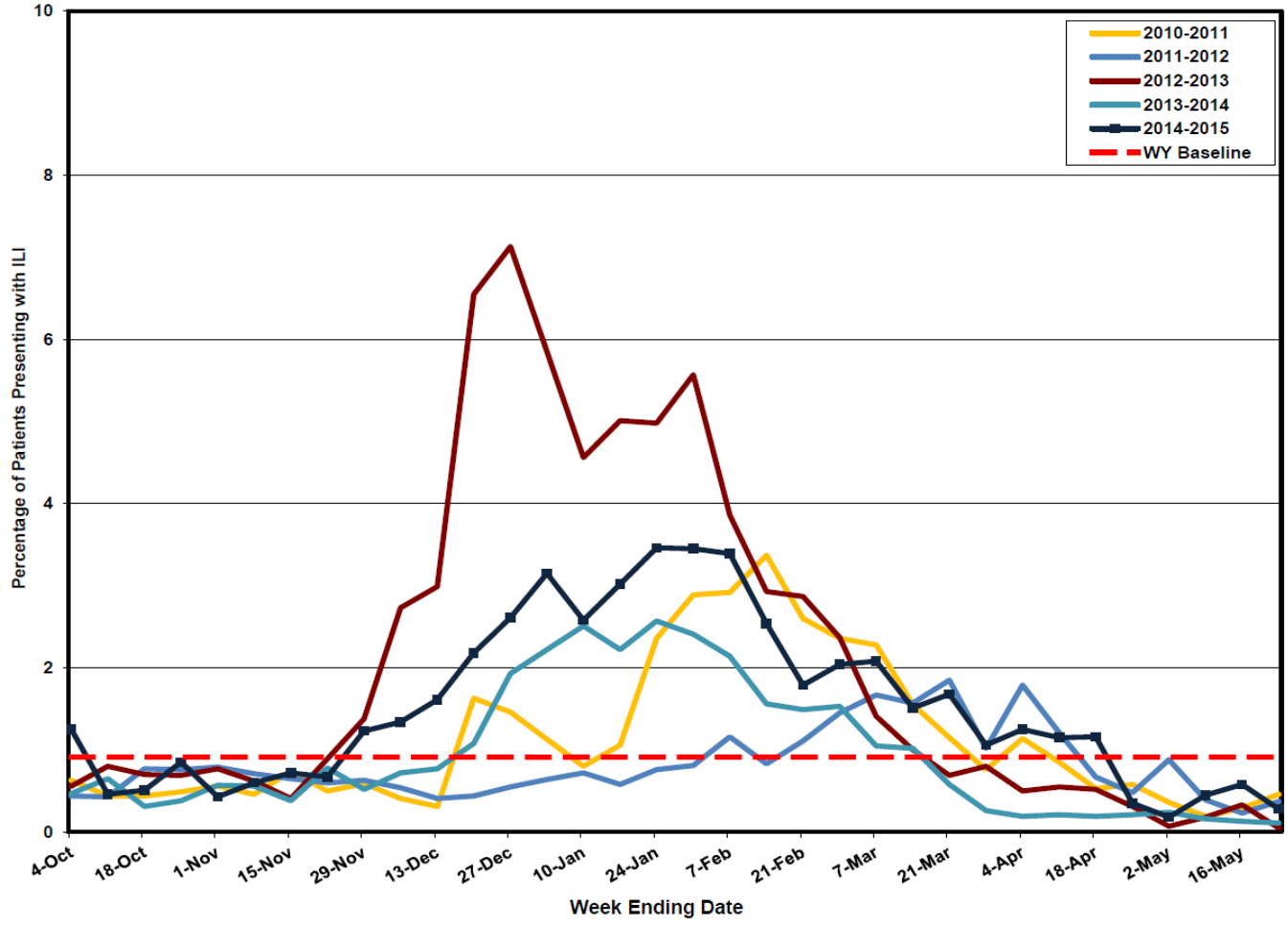
Overall, the 2014-2015 influenza vaccine poorly matched the circulating strains of influenza in the United States. All of the influenza A (H1N1) pandemic viruses and most of the influenza B viruses sent to CDC for further characterization were antigenically similar to their components in the 2014-2015 Northern Hemisphere vaccines. Wyoming experienced limited circulation of the 2009 influenza A (H1N1) pandemic viruses. However, both influenza B lineages widely circulated in the United States and Wyoming. However, the majority of influenza B specimens submitted to CDC for antigenic characterization were B/Victoria-lineage of the viruses as B/Brisbane/60/2008-like. Although the influenza A (H1N1) and influenza B components of the vaccine matched the circulating strains of their corresponding viruses, the majority of the circulating strains of influenza A (H3N2) viruses did not match the vaccine strain. Influenza A (H3N2) viruses were the predominant circulating influenza viruses during the 2014-2015 influenza season. The widespread circulation of drifted influenza A (H3N2) viruses detrimentally impacted the effectiveness of influenza vaccines in the Northern Hemisphere. Less than 20% of the characterized influenza A (H3N2) viruses tested were as A/Texas/50/2012-like, the influenza A (H3N2) component of the 2014-2015 Northern Hemisphere vaccine. Conversely, over 80% of the influenza A (H3N2) viruses tested showed either, reduced titers with antiserum produced against A/Texas/50/2012 or belonged to a genetic group that typically shows reduced titers to A/Texas/50/2012.

Laboratorians at CDC routinely use hemagglutination inhibition assays to antigenically characterize influenza viruses year-round to compare how similar currently circulating influenza viruses are to those included in the influenza vaccine, and to monitor for changes in circulating influenza viruses. However, a portion of early season influenza A (H3N2) viruses did not grow to sufficient hemagglutination titers for antigenic characterization by hemagglutination inhibition. For many of these viruses, CDC performed genetic characterization to infer antigenic properties. The majority of influenza A (H3N2) virus specimens submitted by the WPHL did not grow sufficient hemagglutination titers for antigenic characterization. The remaining specimens from Wyoming with hemagglutination inhibition assays performed by CDC revealed that antiserum raised against the A/Texas/50/2012 vaccine virus had an eight-fold or greater reduction in titer with the viruses submitted by Wyoming compared with the homologous titer of the vaccine virus. Therefore, the majority of the circulating influenza A (H3N2) viruses in Wyoming were drifted influenza A (H3N2) viruses. The emergence and widespread nature of the drifted influenza A (H3N2) viruses during the 2014-2015 influenza season likely reduced the vaccine's ability to protect against those viruses and ultimately resulted in a severe influenza season. In contrast, during the 2013-2014 influenza season, the majority of the influenza A (H3N2) viruses collected around the world were antigenically closely related to the vaccine strain.

OUTPATIENT INFLUENZA-LIKE ILLNESS (ILI) REPORTS FROM WYOMING SENTINEL SITES

The ILINet website is a data repository for healthcare providers to record aggregated data on patients with ILI symptoms. Each week, ILINet providers reported the total number of patients seen and the number of those patients with ILI by age group. Chart 3 illustrates ILI reported by Wyoming ILINet providers. Influenza and ILI morbidity started the influenza season below the baseline level (0 - 0.91%); ILI activity among the network of ILINet providers extensively remained below the baseline until the week ending November 29, 2014 (MMWR Week 48). The peak percentage of patient visits for ILI was 3.46%, which occurred the week ending January 24, 2015 (MMWR Week 03). Conversely, the number of reported cases peaked the previous week, January 17, 2015 (MMWR Week 02). Additionally, ILI activity among the ILINet providers remained above the baseline until the week ending April 25, 2015 (MMWR Week 16). In comparison, during the 2013-2014 influenza season the peak percentage of patient visits for ILI was 2.57%, which occurred the week ending January 18, 2014 (MMWR Week 03).

CHART 3: WEEKLY ILI REPORTING BY ILINET PROVIDERS WYOMING, (2010-2011 TO 2014-2015)



REPORTED INFLUENZA-ASSOCIATED DEATHS

Influenza-associated deaths are reportable conditions in the State of Wyoming. Influenza-associated deaths are defined as deaths occurring in Wyoming residents, in which an influenza infection was the primary cause or a contributing cause of mortality listed on an individual's death certificate. Tracking death certificates is currently the best surveillance system to capture and identify influenza-associated deaths in Wyoming. However, according to CDC, influenza is infrequently listed on death certificates and testing for seasonal influenza infections is usually not done, particularly among the elderly who are at greatest risk of seasonal influenza complications and death. Therefore, public health officials may not identify influenza-associated deaths in many instances; consequently, this surveillance system may underestimate the true impact of influenza-associated deaths in the state.

This season, the WDH-Vital Statistics Services Unit reported twenty-nine influenza-associated deaths (4.96 per 100,000). In contrast, during the 2013-2014 influenza season, the WDH-Vital Statistics Services Unit reported twelve influenza-associated deaths (2.13 per 100,000). The reported deaths during the 2014-2015 influenza season reflect the highest reported number of influenza-associated deaths in recent history. The median age of the twenty-nine influenza-associated deaths was 75 years, with twenty-one (72.4%) of the deaths occurring in individuals 65 years of age or older. The remaining eight (27.6%) influenza-associated deaths occurred in individuals under the age of 65 years, with one of those being a pediatric death (0-18 years). In comparison, during the 2013-2014 influenza season, the median age of influenza-associated deaths was 54 years and 75.0% of the deaths occurred in individuals under the age of 65 years. However, the 2009 influenza A (H1N1) pandemic virus was the predominant circulating influenza virus in Wyoming during the 2013-2014 influenza season. This season, influenza A (H3N2) was the predominant influenza virus circulating during the 2014-2015 influenza season. Consequently, public health officials linked the majority of reported influenza-associated deaths with influenza A (H3N2) virus infections. According to CDC, influenza seasons during which influenza A (H3N2) viruses predominate are typically associated with higher rates of hospitalizations and deaths among the elderly; this may partially explain the disproportionate number of influenza-associated deaths in individuals over the age of 65 years during the 2014-2015 influenza season. Wyoming public health officials linked four influenza-associated deaths with influenza B virus infections. All of the influenza-associated deaths linked to influenza B virus infections occurred after the influenza peak. Twelve (41.4%) influenza-associated deaths, both influenza A and B, occurred after the influenza peak, the week ending January 17, 2015 (MMWR Week 02).

COMPOSITION OF THE 2015-2016 VACCINE

Public health officials select the influenza viruses for seasonal influenza vaccines each year based on information gathered over previous influenza seasons. Researchers study the strains of viruses infecting humans and how they are changing. One hundred forty-one National Influenza Centers (NIC), located in 111 different countries, gather circulating influenza strains and information on disease trends. The four WHO Collaborating Centers for Reference and Research on Influenza analyze the combined data. Based on this information, experts forecast which viruses are likely to circulate during the upcoming influenza season, and WHO recommends specific virus strains to make the vaccine. Each February, the WHO makes the final recommendations for vaccines produced for the Northern Hemisphere. Each country then uses the recommendations made by the WHO to assist with national decisions of what virus strains to include in the influenza vaccine supply for their country. In the United States, an advisory committee convened by the Food and Drug Administration (FDA) makes the final decision about vaccine strains in February. Manufacturers grow vaccine strains based on these recommendations.

Currently, there are primarily three types of influenza viruses circulating in humans: influenza A (H1N1) viruses, influenza A (H3N2) viruses, and influenza B viruses. Each year, vaccine manufacturers use one influenza virus strain from each of the three circulating viruses to produce the trivalent seasonal influenza vaccine. The WHO recommended the vaccine virus strains for the 2015-2016 Northern Hemisphere Trivalent Influenza Vaccine. The FDA - Vaccines and Related Biological Products Advisory Committee (VRBPAC) agreed with the recommendations for the United States influenza vaccine supply. Both agencies recommend that the trivalent vaccine contain A/California/7/2009 (H1N1) pandemic 2009-like virus; an A/Switzerland/9715293/2013 (H3N2)-like virus; and a B/Phuket/3073/2013-like (B/Yamagata lineage) virus. Researchers recommend quadrivalent vaccines contain an additional influenza B virus; thus adding the B/Brisbane/60/2008-like (B/Victoria lineage) virus. The upcoming vaccine formulation represents a change in the influenza A (H3N2) virus and the influenza B (Yamagata lineage) components of the vaccine compared with the composition of the 2014-2015 influenza vaccine. Hemagglutination inhibition tests indicated that the vast majority of A/California/7/2009 (H1N1) pandemic 2009-like viruses remained antigenically homogeneous and closely related to the vaccine virus. Therefore, the A/California/7/2009 (H1N1) pandemic 2009-like virus vaccine component remained unchanged since the original production in 2009. Researchers based the new vaccine recommendations on global influenza virus surveillance data related to antigenic characteristics, serological responses to 2014-2015 seasonal vaccines, and the availability of candidate strains and reagents.

VACCINE EFFECTIVENESS

Vaccine effectiveness depends on how closely related, or matched, the viruses in the vaccine are to the influenza viruses circulating that season and on how well a vaccinated person responds to the vaccine in terms of producing protective antibody. In years when the vaccine strains and the virus strains are well-matched, public health officials measure substantial benefits from vaccination in terms of preventing influenza illness. According to CDC, even during years when the vaccine match is very good, the benefits of vaccination will vary across the population, depending on characteristics of the person being vaccinated and even, potentially, which vaccine was used. In the United States, public health officials recommend annual vaccinations against influenza for all persons aged 6 months and older. Since the 2004-2005 influenza season, CDC has conducted studies to estimate how well the seasonal influenza vaccine protects against influenza-associated medical visits. Researchers conducted an early season estimate on the 2014-2015 influenza season to evaluate the effectiveness of the influenza vaccine for preventing laboratory confirmed influenza infections. Although the current data is limited, researchers will publish future studies to examine the effectiveness of the 2014-2015 influenza vaccine.

In February 2015, CDC presented interim vaccine effectiveness estimates for the 2014-2015 influenza season during the Advisory Committee on Immunization Practices (ACIP) meeting. The estimates represent U.S. Influenza Vaccine Effectiveness Network enrollees from the 2014-2015 influenza season; however, the information only represents early season estimates and as a result, interim estimates. The early estimates of influenza vaccine effectiveness were possible because of the widespread nature and the early circulation of influenza viruses during the 2014-2015 season. The vast majority of states were reporting widespread influenza activity by the start of 2015. Researchers based the interim vaccine effectiveness estimates on patients enrolled through January 30, 2015. The early estimates of vaccine effectiveness indicate that seasonal influenza vaccines provided limited protection against influenza viruses circulating during the first half of the influenza season. Overall, the estimated vaccine effectiveness against influenza A and influenza B was 19% (95% confidence interval [CI]: 7% to 29%). According to CDC, the interim vaccine effectiveness estimate is relatively low in comparison to previous seasons when circulating viruses and vaccine viruses are well-matched. Consequently, this illustrates the fact that the majority of circulating influenza A (H3N2) viruses during the 2014-2015 influenza season were antigenically and genetically different from the influenza A (H3N2) vaccine component of the 2014-2015 Northern Hemisphere seasonal influenza vaccines. The low vaccine effectiveness estimates highlights the importance of continued influenza prevention and aggressive treatment measures.

The CDC continued to recommend influenza vaccinations because, although limited, it helped to prevent infections with the circulating influenza viruses and prevented infections with influenza viruses that circulated later in the season. The fact that over 80% of circulating influenza A (H3N2) viruses analyzed at CDC drifted from the influenza A (H3N2) vaccine virus recommended for the vaccine, highlights the reduced protection against influenza A (H3N2) viruses during the 2014-2015 season. Antigenic drift emerges when small changes in the genes of influenza viruses occur as the virus replicates; this process usually occurs over time. These small genetic changes usually produce viruses that are closely related; their close location on the influenza phylogenetic tree illustrates this occurrence. The viruses that are closely related, usually share the same antigenic properties. Therefore, an immune system exposed to a similar virus will usually recognize it and respond. This process is a form of cross-protection. However, the genetic changes can accumulate over time and result in viruses that are antigenically different, or further away on the influenza phylogenetic tree. When this happens, the body's immune system may not recognize drifted viruses. This was the case during the 2014-2015 influenza season.

The level of antigenic match influences vaccine effectiveness. Public health officials observed decreased vaccine effectiveness in previous influenza seasons during which predominant circulating influenza viruses have antigenically drifted. However, randomized studies of influenza vaccines have reported variable vaccine efficacy during seasons when antigenically drifted viruses predominated. Since the start of the 2014-2015 influenza season, drifted influenza A (H3N2) viruses accounted for the majority of antigenically characterized influenza A (H3N2) isolates relative to the influenza A (H3N2) vaccine component. Early season viral characterization data indicated that the majority of influenza A (H3N2) viruses collected and analyzed across the United States was antigenically different or drifted from the H3N2 vaccine virus. Most of the drifted influenza A (H3N2) viruses were A/Switzerland/9715293/2013 viruses. Public health officials first identified the drifted influenza A (H3N2) viruses in small proportions of surveillance specimens in March 2014. This occurred after the WHO and FDA recommended the strains for inclusion in the 2014-2015 Northern Hemisphere influenza vaccine in February 2014. At that time, public health partners only submitted a very small number of these viruses among the thousands of specimens that had been collected and tested, but these viruses have become more predominant over time. Public health detected the antigenically drifted viruses with increasing frequency from July to September 2014. Eventually, the drifted virus had become common among influenza A (H3N2) viruses circulating in the United States and abroad. By the end of the influenza season, over 80% of influenza A (H3N2) viruses isolated in the United States since October 1, 2014, were antigenically or genetically different from the influenza A (H3N2) vaccine virus component.

HEALTH ADVISORY AND UPDATE

The Health Alert Network (HAN) is CDC's primary method of sharing cleared information about urgent public health incidents with public health partners. The HAN collaborates with federal, state, territorial, and city/county partners to develop protocols and stakeholder relationships that will ensure a robust interoperable platform for the rapid distribution of public health information. There are several different HAN message types: *Health Alert, Health Advisory, Health Update, and Info Service*. CDC released two influenza related HAN notices during the 2014-2015 influenza season, a *Health Advisory* and a *Health Update*. A *Health Advisory* provides important information for a specific incident or situation; contains recommendations or actionable items to be performed by public health officials, laboratorians, and/or clinicians; and it may not require immediate action. Conversely, a *Health Update* provides updated information regarding an incident or situation and it is unlikely to require immediate action.

The first HAN, (HAN 00374), was an official CDC *Health Advisory* released on December 3, 2014: *CDC Health Advisory Regarding the Potential for Circulation of Drifted Influenza A (H3N2) Viruses*. CDC issued the HAN to alert healthcare providers and public health officials of the detection of drifted influenza A (H3N2) viruses. Viral characterization data indicated the majority of influenza A (H3N2) viruses collected and analyzed in the United States were antigenically different from the influenza A (H3N2) vaccine virus. The HAN encouraged clinicians to continue vaccinating patients who did not receive the vaccine for the 2014-2015 influenza season and to reemphasize the importance of the use of neuraminidase inhibitor antiviral medications when indicated for treatment and prevention of influenza, as an adjunct to vaccination. The HAN also reinforced special considerations for institutional settings; specifically CDC recommended a three-pronged approach: influenza vaccinations, the use of neuraminidase inhibitor medications when indicated for treatment or prevention, and the use of other preventive health practices to help decrease the spread of influenza. CDC released the second HAN, (HAN 00375), an official CDC *Health Update* on January 9, 2015: *CDC Health Update Regarding Treatment of Patients with Influenza with Antiviral Medication*. The second HAN was a follow-up to the first HAN, (HAN 00374), released on December 3, 2014. When CDC issued the second HAN, most states, including Wyoming, reported widespread influenza activity. The second HAN provided three objectives: a summary of influenza antiviral drug treatment recommendations, update clinicians about approved treatment drugs and supply for the influenza season, and background information for patients regarding anti-influenza treatment. Both the Health Advisory and the Health Update are available at the following link: http://emergency.cdc.gov/han/index.asp.

ANTIVIRAL AGENTS FOR INFLUENZA

The FDA approved and recommended three antiviral drugs for use against influenza: oseltamivir, zanamivir, and peramivir. Table 2 presents an overview of the indications, administration, and use of antiviral medications. Oseltamivir, zanamivir, and peramivir are a class of medication known as neuraminidase inhibitors and are active against both influenza A and B viruses. Antiviral resistance to the neuraminidase inhibitors among circulating influenza viruses is currently low. Additionally, antiviral resistance can emerge during or even after treatment of certain patients with influenza, specifically patients that are immunosuppressed. Clinical trials and observational data show that early antiviral treatment can shorten the duration of fever and illness symptoms, may reduce the risk of complications from influenza, and shorten the duration of hospitalization. Clinical benefit is greatest with early administration of antiviral treatment, especially within 48 hours of influenza illness onset. For additional information on antiviral medications during the 2014-2015 influenza season, please visit: http://www.cdc.gov/flu/professionals/antivirals/summary-clinicians.htm.

TABLE 2: RECOMMENDED DOSAGE & SCHEDULE OF INFLUENZA ANTIVIRAL MEDICATIONS FOR TREATMENT OR CHEMOPROPHYLAXIS, 2014-2015 INFLUENZA SEASON

Antiviral Agent	Activity Against	Use	FDA Approved For	Not Recommended for Use in	Adverse Events
Oseltamivir (Tamiflu®)	**Influenza A and B**	**Treatment**	Any age	Not Applicable	**Adverse events:** nausea, vomiting. Post-marketing reports of serious skin reactions and sporadic, transient neuropsychiatric events (self-injury or delirium; mainly reported among Japanese adolescents and adults).
		Chemoprophylaxis	3 months and older	Not Applicable	
Zanamivir (Relenza®)	**Influenza A and B**	**Treatment**	7 years and older	People with underlying respiratory disease (e.g., asthma or COPD)	**Allergic reactions:** oropharyngeal or facial edema. **Adverse events:** diarrhea, nausea, sinusitis, nasal signs and symptoms, bronchitis, cough, headache, dizziness, and ear, nose and throat infections.
		Chemoprophylaxis	5 years and older	People with underlying respiratory disease (e.g., asthma or COPD)	
Peramivir (Rapivab®)	**Influenza A and B**	**Treatment**	18 years and older	Not Applicable	**Adverse events:** diarrhea. Post-marketing reports of serious skin reactions and sporadic, transient neuropsychiatric events (self-injury or delirium; mainly reported among Japanese adolescents and adults).
		Chemoprophylaxis	Not Applicable	Not Applicable	

AVIAN INFLUENZA A VIRUSES IN HUMANS

Influenza A viruses have been identified in various animals species around the world. Typically, certain subtypes of influenza A viruses are specific to certain species. However, avian species are the exception; birds are hosts to all known subtypes of influenza A viruses. Currently, influenza A H3N2 and H1N1 viruses are the main subtypes of influenza A viruses circulating in humans. Occasionally, public health officials receive reports of sporadic human infections with avian influenza A viruses. The reported illnesses in humans associated with avian influenza A virus infections have ranged from mild to severe. The symptoms are usually similar to infections with human influenza viruses. Therefore, it is difficult for healthcare providers to diagnose avian influenza infections by clinical signs and symptoms alone. Laboratory testing is necessary to confirm suspected cases of avian influenza virus infections. Public health officials continue to monitor and track cases of avian influenza A viruses due to the unpredictable nature of viruses. Specifically, avian influenza A viruses have the potential to change and possibly even gain the ability to spread easily from person-to-person. As avian influenza A viruses continue to evolve in unpredictable ways, it is important for public health officials to monitor the epidemiology of circulating viruses in order to understand the risk of avian influenza in human populations.

During the 2014-2015 influenza season, the WHO reported new human infections with highly pathogenic avian influenza A (H5N6) viruses. The virus is highly contagious among birds, and can be deadly to them, especially domestic poultry. The viruses were reported in poultry in Asia during the 2013-2014 influenza season. Genomic analysis by Chinese researchers showed that H5N6 viruses circulating in poultry were reassortants, and derived their genes from H5 and H6 subtype viruses found in poultry in China. Highly pathogenic avian influenza A (H5N6) viruses in humans are rare and typically do not spread easily from person-to-person. Only two reported human cases occurred during the 2014-2015 influenza season; China reported both cases. Also during the 2014-2015 influenza season, the WHO reported new human infections with avian influenza A (H7N9) viruses. China reported the first human infections with the novel avian influenza A viruses during the 2012-2013 influenza season. Public health officials identified the new avian influenza virus as avian influenza A (H7N9) virus. Additionally, researchers detected the virus in birds within China. Available evidence indicated that most people contracted the disease after exposure to birds or environments contaminated with bird flu viruses. Clinically, some of the cases had mild illness; however, most patients had severe respiratory illness. The human cases of H7N9 infections were predominately isolated to Asia; however, public health officials detected the avian influenza A (H7N9) virus in North America after two individuals travel through China before arriving in Canada.

REPORTING REMINDER

All of the following are reportable to the WDH-Infectious Disease Epidemiology Unit: laboratory confirmed cases of influenza and influenza-associated deaths. Furthermore, state statutes require attending healthcare providers, clinics, hospitals, and laboratories performing influenza diagnostic testing to report cases of influenza. Healthcare providers can fax reports to the WDH secure fax line at (307) 777-5573. In addition, WDH requests that hospitals submit respiratory specimens to the WPHL on all hospitalized patients with ILI or clinical suspicion of influenza regardless of the laboratory results. Typically, influenza cases that require hospitalization are severe influenza cases. In an effort to understand the epidemiology of circulating influenza strains in the community, WDH requests respiratory specimen for testing at the state's public health laboratory. Influenza and other infectious diseases listed on the reportable disease list are located at the following link: http://health.wyo.gov/phsd/epiid/reporting.html.