Surveillance for Influenza during the 2009 Influenza A (H1N1) Pandemic–United States, April 2009–March 2010

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The emergence in April 2009 and subsequent spread of the 2009 pandemic influenza A (H1N1) virus resulted in the first pandemic of the 21st century. This historic event was associated with unusual patterns of influenza activity in terms of the timing and persons affected in the United States throughout the summer and fall months of 2009 and the winter of 2010. The US Influenza Surveillance System identified 2 distinct waves of pandemic influenza H1N1 activity—the first peaking in June 2009, followed by a second peak in October 2009. All influenza surveillance components showed levels of influenza activity above that typically seen during late summer and early fall. During this period, influenza activity reached its highest level during the week ending 24 October 2009. This report summarizes US influenza surveillance data from 12 April 2009 through 27 March 2010.

The US Influenza Surveillance System, a collaborative effort between the Centers for Disease Control and Prevention (CDC) and its many partners in state, local, tribal, and territorial health departments, public health and clinical laboratories, vital statistics offices, health care providers, clinics, and emergency departments, collects information on influenza virus strains, influenza-associated morbidity and mortality, and the timing and geographic spread of influenza virus strains. This system served as the foundation of surveillance for 2009 pandemic influenza A (H1N1) virus in the United States and was critical in planning interventions to prevent and control pandemic influenza and developing community mitigation strategies, antiviral treatment guidance, and vaccine recommendations. In addition to providing necessary data for public health professionals involved in the response, these surveillance components also provided information to the media and the general public regarding the progress and severity of the pandemic. This report summarizes influenza surveillance data collected from 12 April 2009 through 27 March 2010.

METHODS

The US Influenza Surveillance System collects 5 types of surveillance data: virologic, outpatient influenza-like illness, influenza-associated hospitalizations, influenza- and pneumonia-related deaths, and geographic spread of influenza. The US World Health Organization (WHO) and the National Respiratory and Enteric Virus Surveillance System (NREVSS) collaborating laboratories submit weekly information from 140 laboratories on the total number of respiratory specimens tested for influenza and the number positive by influenza type, subtype, and age group. Outpatient illness surveillance is conducted through the US Outpatient Influenza-Like Illness Surveillance Network (ILINet) in collaboration with state and select local health departments. More
than 3300 enrolled health care providers submit weekly reports of the total number of patients seen for any reason and the number of patients with influenza-like illness (ILI), by age group. For this system, ILI is defined as a temperature of $\geq 37.8^\circ C$ (oral or equivalent) and cough and/or sore throat, in the absence of a known cause other than influenza. Laboratory-confirmed influenza-associated hospitalizations in children and adults are collected through the Emerging Infections Program (EIP), a collaboration between the CDC, state health departments, and academic centers in 10 states. Data collection began during the 2003–2004 influenza season for children and during the 2005–2006 season for adults. This population-based surveillance is conducted in >60 counties that represent 7% of the US population. Hospital charts are reviewed for each case; since spring 2009, data have been reported to the CDC weekly (previously, reporting was biweekly). Mortality data are collected through 2 different systems. The 122 Cities Mortality Reporting System is comprised of 122 cities located throughout the United States that submit weekly reports on the total number of death certificates received and the number of those for which pneumonia or influenza was listed as the underlying or contributing cause of death, by age group. A second system to monitor influenza-related deaths is the Influenza-Associated Pediatric Mortality Surveillance System, which tracks laboratory-confirmed influenza-related deaths among children <18 years of age. Influenza-related pediatric deaths are a nationally notifiable condition; individual case reports are collected and submitted to the CDC by state, local, and territorial health departments. The geographic distribution of influenza activity across the United States is reported weekly by state and territorial epidemiologists. States report influenza activity as no activity, sporadic, local, regional, or widespread. A detailed description of the methods for each system can be found in Appendix 1. The data presented in this report for the period from 12 April 2009 through 27 March 2010 are preliminary and represent reports submitted to the CDC as of 28 April 2010.

RESULTS

Virologic Surveillance

The first 2 cases of pandemic influenza H1N1 were confirmed by the Influenza Division laboratory at the CDC (Atlanta, GA) on 15 and 17 April 2009 from specimens collected on 30 March and 1 April [1, 2]. Before and during that week, seasonal influenza activity in the United States had been decreasing; 7.2% of the 4674 specimens tested by the WHO and NREVSS collaborating laboratories during the week ending on 18 April were positive for influenza. One hundred fifty-one (44.9%) of 336 positive samples were positive for influenza A, and 185 (55.1%) were positive for influenza B (Figure 1). The first pandemic influenza H1N1 positive results performed by the WHO collaborating laboratories were reported for the week ending on 25 April 2009 (week 16), when laboratories tested 4219 respiratory specimens and identified 324 (7.7%) influenza-positive
specimens: 14 were the pandemic influenza H1N1 strain, 4 were influenza A strains that could not be subtyped, 113 were influenza B strains, 43 were seasonal influenza A (H1N1) strains, 37 were A (H3N2) strains, 113 were influenza A strains for which subtyping was not performed. For the next week ending on 2 May 2009 (week 17), the number of specimens tested for influenza increased to 36,203, and the number of pandemic influenza H1N1 virus strains reported increased to 1,354, with an additional 195 influenza A strains that were unsubtypable as seasonal influenza H1 or H3. The number of seasonal virus strains detected during week 17 also increased: 702 seasonal influenza A (H1N1), 935 A (H3N2), 526 influenza A of undetermined subtype, and 800 influenza B.

The percentage of specimens testing positive for influenza is a meaningful measure of influenza activity that gives the relative proportion of respiratory disease caused by influenza. The percentage of respiratory specimens testing positive for influenza increased from 7.7% for the week ending on 25 April 2009 (week 16) to 12.5% for the week ending on 2 May 2009 (week 17) and continued to increase each week before peaking at 43.1% during the week ending on 20 June 2009 (week 24), with 4,587 pandemic influenza H1N1 strains reported.

From 21 June through 29 August 2009, 99.8% of all positive influenza results reported were for influenza A, and 98.4% of subtyped influenza A strains were pandemic influenza H1N1. Both the number of pandemic influenza H1N1 strains and the percentage of specimens testing positive for influenza decreased through July and August (week 34). A second sustained increase in the number of influenza strains reported and the percentage of specimens testing positive was first noted for the week ending on 12 September 2009 (week 36) and continued through the week ending on 24 October 2009 (week 42), when 38.1% of all respiratory specimens tested were positive for influenza and 9,734 pandemic influenza H1N1 strains were reported. Since data from the WHO collaborating laboratories and NREVSS laboratories were first combined during the 1997–1998 influenza season, the peak percentage of specimens testing positive for influenza has ranged from 23.2% to 34.7%. The percentage of specimens testing positive for influenza first decreased to <10%, indicating lower levels of viral circulation, for the week ending on 12 December 2009 (week 49) and continued at ~4% positive each week from the middle of December through the end of March (weeks 51–12).

Although pandemic influenza H1N1 strains predominated throughout the summer months, low numbers of seasonal influenza A (H1), A (H3), and influenza B strains were also detected. During the week ending on 2 May 2009 (week 17), >50% of subtyped influenza A strains were seasonal influenza; however, during the week ending on 16 May 2009 (week 19), more than half of all influenza strains were pandemic influenza H1N1. By the week ending on 20 June (week 24), influenza A strains accounted for >99% of all influenza strains identified and >95% of the subtyped influenza A strains were pandemic influenza H1N1. Through the summer, fall, and winter months, pandemic influenza H1N1 was the predominant strain identified. For the weeks ending during 2 January–27 March 2010, influenza B strains accounted for only 1.5% of all influenza strains identified, and of the 3,600 subtyped influenza A strains reported during this time, only 11 (0.3%) were seasonal influenza A (H1) or A (H3) strains.

Outpatient Illness Surveillance
When the pandemic influenza H1N1 virus was identified during the week ending on 18 April (week 15), the percentage of outpatient visits for ILI that was reported through ILINet was 1.3%, less than the national baseline of 2.3% (Figure 2). However, 2 weeks later, for the week ending on 2 May, the percentage of patient visits for ILI increased to 2.7% and 42 states had detected laboratory-confirmed pandemic influenza H1N1 cases or probable cases of influenza A virus infection that was unsubtypable with use of reagents for seasonal influenza A strains. This was the only week between the weeks ending on 28 March 2009–22 August 2009 (weeks 12 and 33) during which the percentage of ILI exceeded baseline levels nationally. During the week ending on 29 August 2009 (week 34), the percentage of visits for ILI increased to 2.4% and continued to increase until reaching a peak of 7.7% during the week ending on 24 October 2009 (week 42). The national percentage of outpatient visits for ILI remained above baseline levels for 19 consecutive weeks before returning below baseline levels during the week ending on 9 January 2010 (week 1). For the past 6 influenza seasons (2003–2009), the peak percentage of ILI has ranged from 3.1% (2005–2006) to 7.6% (2003–2004), with a median of 4.5%, and exceeded baseline levels for 8 (2008–2009) to 16 (2005–2006) consecutive weeks.

Influenza-Associated Hospitalizations
Rates of laboratory-confirmed influenza-associated hospitalizations are monitored through the Emerging Infections Program (EIP) Network. Persons with laboratory evidence of influenza infection due to any influenza virus type are included. During 15 April 2009–27 March 2010, cumulative influenza hospitalization rates for persons aged <65 years were substantially elevated relative to the end-of-season cumulative rates for the previous 3 seasons, the only prior seasons with comparably collected data. Cumulative influenza-associated hospitalization rates from 15 April through the week ending on 29 August 2009 (week 34) among children aged 0–4 years and 5–17 years were 16.1 and 8.3 cases per 100,000 population, respectively (Figure 3). During this same period, adult hospitalization rates for persons aged 18–49 years, 50–64 years, and ≥65 years were 5.4, 6.1, and 4.9 cases per 100,000 population,
respectively. Cumulative influenza-associated hospitalization rates from 30 August 2009 (week 35) through the week ending on 27 March 2010 (week 12) among children aged 0–4 years and 5–17 years were 63.7 and 25.2 cases per 100,000 population, respectively. Rates among adults aged 18–49 years, 50–64 years, and ≥65 years were 23.3, 30.8, and 26.3 cases per 100,000 population, respectively. For the entire period from 15 April 2009 through 27 March 2010, cumulative influenza-associated hospitalization rates among children aged 0–4 years and 5–17 years were 79.8 and 33.5 cases per 100,000 population, respectively. Rates among adults aged 18–49 years, 50–64 years, and ≥65 years were 28.7, 36.9, and 31.2 cases per 100,000 population, respectively. In comparison, EIP cumulative hospitalization rates among children aged 0–4 years and 5–17 years were 79.8 and 33.5 cases per 100,000 population, respectively. Rates among adults aged 18–49 years, 50–64 years, and ≥65 years were 28.7, 36.9, and 31.2 cases per 100,000 population, respectively. In comparison, EIP cumulative hospitalization rates during the October–April influenza reporting seasons of 2006–2007, 2007–2008, and 2008–2009, were as follows: ages 0–4 years (25.9–42.1 cases per 100,000 population), 5–17 years (3.5–6.4 cases per 100,000 population), 18–49 years (2.5–7.3 cases per 100,000 population), 50–64 years (4.2–14.8 cases per 100,000 population), and ≥65 years (13.5–75.1 cases per 100,000 population).

Although influenza-associated hospitalization rates varied by age group, the weekly numbers of hospitalizations followed similar temporal patterns for each age group. During the first wave of pandemic influenza H1N1 activity, a peak in the number of influenza-associated hospitalizations occurred during the second half of June. The second larger peak in hospitalizations occurred in each age group during the week ending on 24 October 2009 (Figure 3).

**Pneumonia- and Influenza-Related Mortality**

During 12 April 2009–27 March 2010, the percentage of deaths from pneumonia and influenza in the 122 Cities Mortality Reporting System was at or exceeded the epidemic threshold for 13 consecutive weeks during the weeks ending on 3 October—26 December 2009 and for 3 consecutive weeks during the weeks ending on 16–30 January—2010 (Figure 4). The percentage of deaths from pneumonia and influenza peaked twice: once at 8.1% during the week ending on 21 November 2009 and again at 8.2% during the week ending on 23 January 2010.

From 12 April 2009 through 27 March 2010, 24% of deaths from pneumonia and influenza were among persons <65 years of age and 76% were among persons ≥65 years of age. Of all deaths from pneumonia and influenza, 97.8% had pneumonia listed as the underlying or contributing cause of death and 2.2% had influenza listed as the contributing or underlying cause of death. Of the deaths from pneumonia, 22.2% were among persons <65 years of age. Of the deaths from influenza, 82.8% were among persons <65 years of age. During the previous 5 years, 81% of deaths from pneumonia and influenza occurred among the persons aged ≥65 years; >99% of these were from pneumonia. However, only 26% (compared with 82.5% during

![Figure 2](https://academic.oup.com/cid/article-abstract/52/suppl_1/S27/498565/1271486655) by guest on 10 January 2019

(2009–2010) of deaths from influenza were among persons <65 years of age.

Influenza-Associated Pediatric Deaths
During 26 April 2009–27 March 2010, 338 pediatric deaths associated with laboratory-confirmed influenza occurred and were reported to the CDC. Two hundred eighty-two (83%) of these cases were associated with laboratory-confirmed pandemic influenza H1N1 virus. Fifty-three pediatric deaths were associated with an influenza A virus infection for which the subtype was undetermined, but most were likely attributable to the pandemic influenza H1N1 strain, based on the predominance of this strain among those circulating at the time that the deaths occurred. Two deaths were associated with a seasonal influenza A (H1) virus infection in May 2009, and 1 death occurring in October 2009 was associated with influenza B virus infection. Two hundred seventy-three pediatric deaths (81%) reported to the CDC occurred during 30 August 2009–27 March 2010. During the summer months, a peak in the number of influenza-associated pediatric deaths occurred during the weeks ending on 13 and 20 June 2009 (weeks 23 and 24), when 8 deaths were reported each week. The number of pediatric deaths began to increase a second time during the week ending on 29 August 2009 (week 34) and peaked during the week ending on 24 October 2009 (week 42), when 34 deaths occurred. During the 5 influenza seasons from the 2004–2005 season through 25 April 2009, a mean of 65 influenza-associated deaths (range, 46–88 deaths) were reported each season.

State-Specific Activity Levels
From the week ending on 25 April 2009 (week 17), when the pandemic influenza H1N1 strain was identified by an increasing number of states, through the week ending on 5 September 2009 (week 35), the geographic spread of influenza was reported as widespread—by 2–12 states each week. For the week ending on 12 September 2009 (week 36), 21 states reported widespread influenza activity, and this number quickly increased to a peak of 48 states reporting widespread influenza activity during the weeks ending on 24 and 31 October 2009 (weeks 42 and 43). All 50 states reported either widespread or regional influenza activity for 4 consecutive weeks (weeks 42–45). Beginning on week 46, the geographic spread of influenza began to decrease, and by the week ending on 9 January 2010 (week 1), no states reported widespread influenza activity. During the week ending on 27 March 2010 (week 12), no states reported widespread influenza activity and 3 states reported regional influenza activity.

DISCUSSION
In the United States, influenza surveillance systems routinely used to monitor seasonal influenza activity were successfully
used to track and characterize the 2009 influenza A (H1N1) pandemic, showing patterns of influenza activity that differed dramatically from those of seasonal influenza by occurring primarily outside the period when influenza virus typically circulates widely, and predominantly affecting younger age groups. Although influenza activity during April–November 2009 was at higher than expected levels for that time of year, for the population as a whole, influenza activity did not greatly exceed that seen during the winter during moderate-to-severe influenza A (H3N2) seasons. However, unlike a typical influenza season, the impact of the 2009 pandemic, particularly for severe disease, was shifted to the younger age groups [3]. A much higher percentage of influenza-associated deaths reported through the 122 Cities Mortality Reporting System occurred among persons <65 years of age, and the number of influenza-associated pediatric deaths reported was more than double that reported during the severe 2003–2004 H3N2 season that led to making influenza-associated pediatric death a notifiable condition [4].

During April 2009–March 2010, influenza activity was highest during the week ending on 24 October 2009, decreased during November and December, and continued at lower levels than typically seen during winter months through the week ending on 27 March 2010 (week 12). During 22 of the past 27 influenza seasons, activity has peaked in January or later. During the 5 seasons with earlier peaks in influenza activity, the peak occurred in December during 4 years and in late November during the 2003–2004 influenza season.

From April 2009 through February 2010, pandemic influenza H1N1 virus produced 2 distinct waves of illness. During the 2009 spring wave, ILI levels increased above baseline for only 1 week. This elevation occurred just as the virus began to circulate widely and receive extensive media coverage and may be attributable in part to increased visits among patients with ILI, some due to seasonal influenza viruses, who would otherwise have recovered at home without seeking medical attention. Although ILI levels during the remainder of the summer were somewhat higher than levels typically seen at that time, they remained below the national baseline. However, it should be noted that the baseline used for ILINet was developed to detect increases in ILI occurring during fall and winter months when other respiratory viruses typically cocirculate with influenza and, therefore, may not be appropriate or sensitive enough for use during summer months.

In contrast to the low levels of ILI, the number and percentage of specimens testing positive for influenza during the summer months exceeded that seen in any season during the past 12 years for which comparable data are available. This discordance of results between the 2 surveillance components may be attributable to several factors. Public health capacity for influenza A subtype testing is limited, and the CDC recommended that testing be performed primarily on hospitalized patients and samples collected by ILINet providers [5]. Additional testing also was likely performed to support outbreak investigations. This triaging of specimens, in combination with the fact that

Figure 4. Percentage of all deaths due to pneumonia and influenza (P&I), by surveillance week and year, 122 Cities Mortality Reporting System, United States, 2005–2010. The epidemic threshold is 1.645 standard deviations above the seasonal baseline. The seasonal baseline is projected using a robust regression procedure that applies a periodic regression model to the observed percentage of deaths from P&I during the preceding 5 years.
activity was occurring during the summer months when no other respiratory virus strains were circulating widely [6], likely led to the elevated percentage of specimens testing positive for influenza, compared with previous years.

During late August 2009, ILI levels began to increase first in the Southeast United States, but increases in other areas of the country soon followed. By mid-September all areas of the country had exceeded their region-specific baselines, except the Northeast, where increases in ILI levels began in early October. In contrast to the spring wave, the ILI peak of 7.7% during the week ending on 24 October 2009 (week 42) occurred during the same week as the peak percentage (38.1%) of respiratory specimens testing positive for influenza from the WHO and NREVSS collaborating laboratory network, indicating that the increase in ILI levels seen in outpatient medical settings was attributable in large part to the widespread circulation of pandemic influenza H1N1 virus. The peak in the percentage of ILI visits during the fall wave of the pandemic was earlier and slightly higher than ILI peaks in any previous influenza season since the current ILINet system was initiated in 1997. Before the emergence and widespread circulation of the pandemic influenza H1N1 virus, both the earliest and highest percentage of outpatient visits for ILI was 7.6%, which occurred during the week ending on 27 December 2003 during the 2003–2004 influenza season. The peak percentages of ILI during these 2 outbreaks are not dramatically different; however, during the 2003–2004 influenza A (H3N2) season, the increase in ILI levels was seen in all age groups, in contrast to the 2009 pandemic, during which the older population was largely spared. Although the clinical definition of ILI is not highly specific for influenza, when evaluated and analyzed in combination with virologic surveillance data, it provides an excellent indicator of influenza activity in the United States.

Influenza-associated hospitalization rates continued to trend upward in all age groups during the spring, summer, and fall months, substantially above historical rates from the same period during previous seasons. Use of more sensitive tests and increased testing for influenza that occurred during the pandemic may account for some of the elevation in rates of influenza-associated hospitalizations, compared with earlier seasons; however, it is unlikely that this would account for the large increases seen, particularly among children. From September 2009 through March 2010, cumulative hospitalization rates were highest among children aged 0–4 years. Severe outcomes among children occurred throughout the 2009 influenza A (H1N1) pandemic. A total of 338 influenza-associated pediatric deaths occurred and were reported from 26 April 2009 through 27 March 2010. In comparison, a mean of 65 seasonal influenza-associated pediatric deaths were reported during the previous 5 seasons. The majority of influenza-associated pediatric deaths reported to the CDC occurred during August–November 2009, corresponding to increased levels of virologic and ILI activity.

During the 2009–2010 influenza season, mortality associated with pneumonia and influenza peaked in late November 2009 and again in late January 2010. During the past 10 seasons, pneumonia- and influenza-related mortality peaks occurred from January through April and ranged from 7.8% during the 2008–2009 season to 11.2% during the 1999–2000 season. Although persons ⩾65 years of age frequently have the highest death rates during seasonal influenza epidemics [7], the percentage of deaths from pneumonia and influenza during the 2009–2010 pandemic did not reach historically high levels, largely because of the lower impact of the pandemic influenza H1N1 virus on the older population. During seasonal influenza epidemics, ~90% of the estimated annual number of underlying pneumonia- and influenza-related deaths due to influenza is among persons aged ⩾65 years [8]. However, during this season, >80% of laboratory-confirmed deaths due to pandemic influenza H1N1 virus were in persons aged <65 years. Cross-reactive antibodies to the pandemic virus were detected more frequently in persons >60 years of age than in younger adults, and children had no evidence of pre-existing immunity, which may, in part, account for the shift in severe disease to younger ages [9]. However, increased mortality in younger age groups also is among the most striking characteristics of all 3 of the 20th century influenza pandemics [10].

During the 2009 influenza H1N1 pandemic, the US Influenza Surveillance System served as the foundation for monitoring the progression of influenza activity. Although the unusual timing of activity presented challenges in data interpretation, the system was able to detect early cases of pandemic influenza H1N1 virus infection, track spread of the virus throughout the country, demonstrate differences in impact among age groups, and provide data against which comparisons to seasonal influenza could be made. Although influenza activity as of late March 2010 was decreasing, sporadic cases due to pandemic influenza H1N1 virus, seasonal strains, or both, are likely to occur throughout the summer. During the 3 influenza pandemics of the 20th century (in 1918, 1957, and 1968), multiple waves of influenza activity were observed [10].

Although the influenza surveillance system performed well overall, limitations were identified. Areas for improvement include data timeliness and geographic and demographic coverage, tighter standardization of some surveillance methods, more-efficient data collection methods, more-refined analytic methods, and better use of existing electronic data sources. Lessons learned from the first 2 waves of pandemic influenza H1N1 activity will be used to improve the US Influenza Surveillance System and to enhance the ability of the CDC to monitor changes in the geographic spread, type, and severity of circulating influenza strains in an accurate and timely manner.
APPENDIX 1

The U.S. Influenza Surveillance System collects five types of surveillance data: virologic, outpatient influenza-like illness, influenza-associated hospitalizations, influenza and pneumonia-related deaths, and geographic spread of influenza.

1. Viral Surveillance — About 80 U.S. World Health Organization (WHO) collaborating laboratories and 60 National Respiratory and Enteric Virus Surveillance System (NREVSS), located throughout the United States participate in virologic surveillance for influenza. All state public health laboratories participate as WHO collaborating laboratories along with some county public health laboratories and some large tertiary care or academic medical centers. Most NREVSS laboratories participating in influenza surveillance are hospital laboratories. The WHO and NREVSS collaborating laboratories report the total number of respiratory specimens tested and the number positive for influenza types A and B each week to CDC. Acceptable testing methods include viral culture, RT-PCR, and antigen detection as long as the test used can identify both influenza A and B and distinguish between the two. Most of the U.S. WHO collaborating laboratories also report the influenza A subtype (H1 or H3) of the viruses they have isolated and the ages of the persons from whom the specimens were collected. The majority of NREVSS laboratories do not report the influenza A subtype. Reports from both sources are combined and the weekly total number of positive influenza tests, by virus type/subtype, and the percent of specimens testing positive for influenza are presented in the influenza A viruses and accelerate the implementation of effective public health responses.

2. Outpatient Illness Surveillance — Information on patient visits to health care providers for influenza-like illness is collected through the US Outpatient Influenza-like Illness Surveillance Network (ILI.Net). The Outpatient Influenza-like Illness Surveillance Network (ILI.Net) consists of more than 3,000 healthcare providers in all 50 states, the District of Columbia and the U.S. Virgin Islands reporting over 25 million patient visits each year. Each week, approximately 1,800 outpatient care sites around the country report data to CDC on the total number of patients seen and the number of those patients with influenza-like illness (ILI) by age group. For this system, ILI is defined as fever (temperature of 100°F [37.8°C] or greater) and a cough and/or a sore throat in the absence of a known cause other than influenza. Sites with electronic records use an equivalent definition as determined by the state public health authorities. The percentage of patient visits to healthcare providers for ILI reported each week is weighted on the basis of state population. This percentage is compared each week with the national baseline. The national and regional baselines are the mean percentages of visits for ILI during noninfluenza weeks for the previous three seasons plus two standard deviations. A noninfluenza week is a week during which < 10% of specimens tested positive for influenza. National and regional baselines of patient visits for ILI are weighted on the basis of state population. Use of the national baseline for regional data is not appropriate.

3. Mortality Surveillance — Rapid tracking of influenza-associated deaths is done through two systems.

122 Cities Mortality Reporting System — Each week, the vital statistics offices of 122 cities report the total number of death certificates received and the number of those for which pneumonia or influenza was listed as the underlying or contributing cause of death by age group. The percentage of all deaths due to pneumonia and influenza (P&I) are compared with a seasonal baseline and epidemic threshold value calculated for each week. The seasonal baseline of P&I deaths is calculated using a periodic regression model that incorporates a robust regression procedure applied to data from the previous five years. An increase of 1.645 standard deviations above the seasonal baseline of P&I deaths is considered the epidemic threshold, i.e., the point at which the observed proportion of deaths attributed to pneumonia or influenza was significantly higher than would be expected at that time of the year in the absence of substantial influenza-related mortality.

Surveillance for Influenza-associated Pediatric Mortality — Influenza-associated deaths in children (persons less than 18 years) was added as nationally notifiable condition in 2004. Laboratory-confirmed influenza-associated deaths in children are reported through the Influenza-Associated Pediatric Mortality Surveillance System.

4. Hospitalization Surveillance — Laboratory confirmed influenza infections in children and adults are monitored through the Emerging Infections Program (EIP). The EIP Influenza Project conducts surveillance for laboratory-confirmed influenza related hospitalizations in children (persons less than 18 years) and adults in 60 counties covering 12 metropolitan areas of 10 states (San Francisco CA, Denver CO, New Haven CT, Atlanta GA, Baltimore MD, Minneapolis/St. Paul MN, Albuquerque NM, Las Cruces, NM, Albany NY, Rochester NY, Portland OR, and Nashville TN). Cases are identified by reviewing hospital laboratory and admission databases and infection control logs for children and adults with a documented positive influenza test (viral culture, direct/indirect fluorescent antibody assay (DFA/IFA), reverse transcription-polymerase chain
reaction (RT-PCR), or a commercial rapid antigen test) conducted as a part of routine patient care. EIP estimated hospitalization rates are reported every week during the influenza season.

5. Summary of the Geographic Spread of Influenza —State health departments report the estimated level of spread of influenza activity in their states each week through the State and Territorial Epidemiologists Reports. States report influenza activity as no activity, sporadic, local, regional, or widespread. These levels are defined as follows 1) No Activity: No laboratory-confirmed cases of influenza and no reported increase in the number of cases of ILI. 2) 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. 3) Local: Outbreaks of influenza or increases in ILI cases and recent laboratory-confirmed influenza in a single region of the state. 4) 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. 5) 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.

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