December 20, 2007

Dear Colleagues: 

Influenza is a LEADING public health threat and it is PREVENTABLE. Preventing influenza or minimizing the impact depends on a surveillance system that allows better monitoring of influenza activity and trends in terms of severity, geography, and age distribution in our communities.

I am pleased to present the Nebraska Influenza Epidemiology Report 2004-2007. This report details influenza activity during the past three seasons based on multiple data sources. I hope this report will help the public and health care providers better understand the trend of influenza activity and take appropriate measures to prevent or minimize the spread.

The influenza surveillance system is a collaborative effort involving many partners. I would like to thank physicians, hospital infection control staff, clinical laboratory personnel, and local health department officers for their dedication and commitment in assisting the Nebraska Department of Health and Human Services Division of Public Health (DPH) in tracking influenza and influenza like illness on a weekly basis during influenza seasons.

In collaborating with health care providers and local health departments, DPH will continue to enhance influenza surveillance and monitor influenza infection among Nebraskans.

Sincerely,

Joann Schaefer, MD.
Chief Medical Officer
Director, Division of Public Health
# Table of Contents

Acknowledgement ............................................................................................................ i
Executive Summary .......................................................................................................... iv
Synopsis ............................................................................................................................... 1
Results ................................................................................................................................. 3
Influenza-Like Illness Hospital Admission Survey ............................................................. 3
  2004-2005 Influenza Season ............................................................................................. 3
  2005-2006 Influenza Season ............................................................................................. 5
  2006-2007 Influenza Season ............................................................................................. 7
  Comparison of ILI Hospital Admissions in the Three Influenza Seasons ....................... 9
Discussion ......................................................................................................................... 11
Influenza Clinical Laboratory Surveillance .......................................................................... 12
Influenza-Like Illness Sentinel Provider Surveillance .......................................................... 15
122 Cities Mortality Reporting System ............................................................................... 18
Influenza-associated Pediatric Mortality ............................................................................. 19
State and Territorial Epidemiologist Report ........................................................................ 19
References ......................................................................................................................... 20
Appendix A Start and End Date of Weekly Surveillance ....................................................... 21
Appendix B Local Health Department Weekly Reporting Form ......................................... 22
Appendix C Laboratories Participating in Influenza Surveillance ...................................... 23
Appendix D Nebraska Sentinel Provider Surveillance Network ............................................ 24
Acknowledgement

Influenza surveillance is carried out primarily through the reporting done by Nebraska acute care hospitals, medical laboratories, and participating physicians in the Influenza-Like Illness (ILI) Sentinel Provider Surveillance Network (listed below). We appreciate those health care providers’ dedication and commitment in assisting us in the tracking of influenza activities within their regions and throughout the state of Nebraska.

Superior surveillance data is vital to correctly assess the full spectrum of influenza severity within a given year. It is also critical for assessing and providing comparisons to past and future influenza seasons. State and local health departments (listed below) work diligently in receiving, submitting, analyzing, and disseminating this critical data on a weekly basis. They deserve much appreciation for what they have accomplished. We would like to thank Arturo Coto, the former Disease Surveillance Coordinator at the Department of Health and Human Service (DHHS), who was responsible for the development of the Nebraska Influenza-Like Illness Hospital Admissions Survey in 2004, and the implementation of the survey during the 2004-2005 and 2005-2006 influenza seasons.

A special thanks to Rita Parris, Executive Director of Public Health Association of Nebraska, who assists DHHS in coordinating the ILI survey.

We would like to thank the following DHHS reviewers: Dr. Jackie Miller, Section Chief Administrator, Dr. Tom Safranek, State Epidemiologist, Grey Borden, Bioterrorism Surveillance Coordinator, Dennis Leschinsky, Communicable Disease Surveillance Specialist, and Leah Bucco-White, Public Information Officer.

Appreciation is extended to Aimee Pearce for editing the report.

List of Sentinel Providers, Medical Laboratories, and Local/District Health Departments

Influenza-Like Illness (ILI) Sentinel Provider Surveillance Network

<table>
<thead>
<tr>
<th>Asthma and Allergy Center</th>
<th>Hastings Family Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cherry County Physicians Clinic</td>
<td>Lincoln-Lancaster County Health Department</td>
</tr>
<tr>
<td>Columbus Family Practice</td>
<td>McCook Clinic</td>
</tr>
<tr>
<td>Creighton University Student Health</td>
<td>Midlands Family Medicine</td>
</tr>
<tr>
<td>Family Medical Specialties</td>
<td>Norfolk Family Medicine</td>
</tr>
<tr>
<td>Fillmore County Medical Center</td>
<td>Seward Family Medical Center</td>
</tr>
<tr>
<td>Fred LeRoy Health and Wellness Center</td>
<td>Tecumseh Family Health</td>
</tr>
<tr>
<td>Grand Island Clinic</td>
<td>Prairie Fields Family Medicine</td>
</tr>
<tr>
<td>Harkins Family Medicine</td>
<td></td>
</tr>
</tbody>
</table>
Medical Laboratories

Alegent Health Lab-Douglas
Alegent Health Memorial Hospital
Alegent Health-Midlands Hospital
Annie Jeffrey Memorial County Health Center
Antelope Memorial Hospital
Auburn Family Health Center
Avera St. Anthony's Hospital
Beatrice Community Hospital
Boone County Health Center
Box Butte General Hospital
Brodstone Memorial Hospital
Brown County Hospital
BryanLGH Medical Center
Butler County Health Care Center
Callaway District Hospital
Chadron Community Hospital
Chase County Hospital
Cherry County Hospital
Children's Hospital/Methodist
Columbus Community Hospital
Community Hospital
Community Medical Center/Family Medicine Clinic--Falls City
Community Memorial Hospital
Cozad Community Hospital
Creighton Area Health Services
Creighton University Medical Center
Crete Area Medical Center
Dundy County Hospital
Ehrling Bergquist Hospital
Faith Regional Health Services
Fillmore County Hospital
Franklin County Memorial Hospital
Fremont Area Medical Center
Garden County Health Services
Good Samaritan Hospital
Gordan Memorial Hospital
Gothenburg Memorial Hospital
Great Plains Regional Medical Center
Harlan County Health System
Henderson Health Care Services
Howard County Community Hospital
Jefferson Community Health Center
Kearney Clinic
Kearney County Health Services-Hospital
Kimball Health Services
Legend Buttes Health Services
Litzenberg Memorial County Hospital
Mary Lanning Memorial Hospital
Memorial Community Health Inc
Memorial Community Hospital
Memorial Health Care Systems
Memorial Health Center
Mercy Medical Clinic
Morrill County Community Hospital
Nebraska Medical Center
Niobrara Valley Hospital Corporation
Oakland Memorial Hospital
Ogallala Community Hospital
Pathology Services
Pender Clinic
Perkins County Health Services
Phelps Memorial Health Center
Physician's Laboratory
Plainview Public Hospital
Providence Medical Center
Regional West Lab Chadron Medical Clinic
Regional West Medical Center
Saint Francis Medical Center
Saunders County Hospital
St. Elizabeth Regional Medical Center
St. Francis Memorial Hospital
St. Mary's Community Hospital
Tri Valley Health System (Cambridge Memorial Hospital)
University Health Center (UNL)
Valley County Hospital
Warren Memorial Hospital
Webster County Community Hospital
West Holt Memorial Hospital
York General Hospital
York Medical Clinic
Executive Summary

Influenza is a highly contagious respiratory illness caused by influenza viruses. The virus is spread from person to person primarily through droplets which are released when an infected person coughs or sneezes. Influenza is a LEADING public health threat and is PREVENTABLE. A critical component to the prevention of influenza is surveillance. Different surveillance methods are used to determine the presence of influenza within our communities. It is a challenge to capture data related to all people who are ill with influenza. Public health officials rely on the voluntary reporting done by health care providers, laboratories, vital statistics offices, and local health departments in order to develop a state-wide picture of influenza virus activity, the geographic distribution of influenza viruses, and the clinical impact of the circulating viruses.

Based on multiple information sources, this report describes influenza activity and trends established in Nebraska, during the 2004 to 2007 influenza seasons. The purpose of this report is to assist health care providers and public health officials, at state and local levels, in their understanding of influenza activity and patterns, and to support their efforts in taking appropriate countermeasures to prevent or minimize the spread of influenza. This report also attempts to use multiple data sources to establish baseline monitoring of the general trends of influenza.

From data collected during seasonal influenza season it is indicated that the number of Influenza-Like Illness (ILI) hospital admissions decreased steadily during the three influenza seasons from 2004 to 2007, with the mildest season in 2006-2007. To summarize influenza activity for these surveillance years, influenza typically remained at low levels from the beginning of influenza season in October through late December. Activity increased at the end of December and reached its peak between late January and early March. At the end of the influenza season in April, activity decreased and remained at a low level. Children under the age of 5 are vulnerable to influenza, and are more likely to be hospitalized due to ILI. This is followed by seniors older than 65 years of age, who had the second highest hospitalization rate. The ILI hospital admission rate varied greatly for each area. The highest rate was reported by the Central District Health Department and the lowest rate was reported by the Sarpy/Cass Health Department. The laboratory surveillance results revealed patterns similar to the ILI hospital admission survey. The peaks of the number of laboratory-confirmed influenza virus positivity and ILI hospital admissions appeared around the same time period. The peak levels of laboratory-confirmed influenza virus A were higher than influenza virus B throughout the three influenza seasons.

Limitations of the current influenza surveillance system are evident. Though we are able to monitor influenza activity, the number of hospitalized patients ill with ILI, and the severity and distribution (geographic location and age) of ILI cases in the state during influenza season, we are unable to ascertain how many people have actually become ill with influenza during the influenza season. Data from the ILI hospital admission survey
represents hospitalized patients, which is just the tip of the iceberg. The majority of patients seen by emergency rooms and clinics are only partially reflected in the laboratory and sentinel provider surveillance systems. Future improvements to the ILI hospital admission survey can be made by requiring every hospital to report to DHHS, extending the survey to include ILI emergency room visits, breaking down age groups to more specific and meaningful categories, and developing an online reporting system. Additional recommendations include establishing testing practice guidelines for laboratory surveillance and expanding the sentinel provider surveillance network, to ensure that these systems provide more information on influenza outpatients.
Synopsis

Influenza, an acute contagious respiratory disease, is a major cause of morbidity and mortality in the United States. Every year in this country, 5% to 20% of the population becomes infected with influenza; more than 200,000 people are hospitalized from influenza complications; and approximately 36,000 people die. The clinical severity of infection can range from asymptomatic illness to primary viral pneumonia and death. Certain populations, such as persons over 55, young children, and people with certain health conditions, are at high risk for serious influenza complications (Center for Disease Control and Prevention, 2006a).

Because influenza viruses undergo constant antigenic change, both virologic surveillance and disease surveillance are necessary. The goal of influenza surveillance is to ascertain when and where influenza activity is occurring; to determine what type of influenza virus strains are circulating; to detect shifts in the influenza viruses; to track influenza-related illnesses; and to measure the impact of influenza deaths (Center for Disease Control and Prevention, 2006b). This report summarizes the results of the following five components of the Nebraska Influenza Surveillance System for the past three influenza seasons from 2004 to 2007.

1. Influenza-Like Illness (ILI) Hospital Admission Survey

   This survey evolves from a project that the Nebraska Department of Health and Human Services (DHHS) and the Public Health Association of Nebraska (PHAN) developed to assess the need of influenza vaccine in the state of Nebraska, in October 2004. Influenza-like illness (ILI) in this survey means the admission diagnosis, as noted by the admitting physician in the patient’s chart which includes either ILI or influenza. Eighty-five hospitals, located in 19 local health department regions across Nebraska, participated in the survey. Dakota County was excluded due to no hospital in the jurisdiction. Influenza season in this survey extended from the first week of November to the last week of March in the following year. Each week during influenza season (Appendix A, Start and End Date of Weekly Surveillance), the 85 hospitals reported the number of ILI hospital admissions to their corresponding local health departments (LHDs). LHDs compiled the data and submitted a weekly summary report to DHHS, either by fax or email, the following Monday or Tuesday (Appendix B, Local Health Department Weekly Reporting Form). Upon receipt, the data was reviewed and entered into the state database system. A summary report was then produced and distributed to state and local health department officials on the Thursday of that week.

2. Influenza Clinical Laboratory Surveillance

   Yearly, a survey is distributed to all clinical laboratories in Nebraska inquiring if influenza rapid diagnostic tests are performed in their laboratory. Approximately, seventy-five laboratories are selected to participate in this survey per year (Appendix C, Laboratories participating in influenza surveillance). Each week, during influenza season from October to April (Appendix A, Start and End Date of Weekly Surveillance), the laboratories are asked to submit the number of positive and the total number of influenza tests performed, via an on-line reporting system. This data is automatically tabulated to reflect influenza activity in selected regions, by county, and by LHD jurisdiction. A weekly report is
prepared with tables, maps, and graphs and distributed to public health officials across the state. This information is also available on the DHHS web site for public viewing.

3. **Influenza-Like Illness (ILI) Sentinel Provider Surveillance Network**
   Currently, there are 17 sentinel providers throughout the state of Nebraska who participate in ILI surveillance (Appendix D, Nebraska Sentinel Provider Surveillance Network). Each week (Appendix A, Start and End Date of Weekly Surveillance), the participating providers report to the Centers for Disease Control and Prevention (CDC), via the internet or fax, the total number of patients seen and the number of patients with ILI by age group, within their respective practices. The CDC then uses this data to prepare the U.S. Weekly Influenza Report. DHHS also has access to the individual provider data. This data is reviewed for compliance and outbreak potential. In addition, the State Influenza Coordinator and LHDs perform yearly evaluations on the selected providers.

4. **122 Cities Mortality Reporting System**
   As part of its national influenza surveillance effort, the CDC receives weekly mortality reports from 122 cities and metropolitan areas throughout the United States. These reports summarize the total number of death certificates received in these cities/areas each week, and the number of those for which pneumonia or influenza was listed as the underlying or contributing cause of death by age group. In Nebraska, Lincoln and Omaha are among the participating cities.

5. **Influenza-associated Pediatric Mortality**
   Influenza-associated pediatric mortality is a newly added nationally notifiable condition. Laboratory-confirmed, influenza-associated deaths in children less than 18 years old are reported through the Nationally Notifiable Disease Surveillance System (Center for Disease Control and Prevention, 2006b). DHHS receives such reports from LHDs across the state.

In addition to these five components of Nebraska’s Influenza Surveillance System, Nebraska reports the estimated level of influenza activity across the state to CDC weekly in the State and Territorial Epidemiologists Report. The severity of activity is determined by reviewing all surveillance components, and is based primarily on the number of laboratory-confirmed influenza cases, ILI cases, and occurrence of outbreaks within the state. Other surveillance systems, such as school student absenteeism survey, influenza-associated pediatric hospitalization, influenza vaccine coverage information, and the National Electronic Disease Surveillance System (NEDSS), can also assist in understanding influenza activity by providing information from different aspects. Results from these surveillance systems are not included in this report. However, it is recommended to add these pieces of information in future epidemiology report to generate a more comprehensive picture of influenza activity in Nebraska.
Results

Influenza-Like Illness Hospital Admission Survey

2004-2005 Influenza Season
There were 2,559 ILI cases reported from November 1, 2004 to April 3, 2005. The number of admissions increased rapidly beginning in late January, peaked in late February, and then tapered off for the remainder of the season. More than half (61%) of the cases were reported between January 24 and March 13, 2005. The number of total admissions during each week is presented in Figure 1.1a. Figure 1.1a also represents the number of ILI patients on a ventilator each week. Cumulatively, 41 patients were put on a ventilator due to ILI during the 22 week time period.

Among the 2,559 ILI cases, 26% (n=671) were children under 5 years old, 35% (n=883) were 5-64 years, and 39% (n=1,005) were seniors over 65 years (Figure 1.1b). The number of ILI admissions for children under 5 years old peaked in the month of February. The number of ILI admissions for the other two age groups demonstrates a similar pattern, however their peak occurred four weeks later than the <5-year olds. The highest numbers of ILI weekly admissions for the three age groups were 91(<5), 89(5-64), and 121(65 and over).

The ILI admission rates, during the 22 week period in each health department coverage area, are shown in Figure 1.1c. The Central District Health Department Region, Douglas County, and the Four Corners Health Department Region had the highest rates at 404, 330, and 155 per 100,000 population, respectively. Sarpy/Cass Health Department Region had the lowest rate at 6 per 100,000 population. But keep in mind the admission rates are based on population size of each health department region. In some cases, patients may seek health care in a hospital out of there residential region. For example, residents of Sarpy/Cass Health Department Region may be treated at a hospital in Douglas County. In these cases, the admission rate of Sarpy/Cass Health Department Region may be underestimated; on the other hand, the admission rate of Douglas County may be overestimated.
Fig. 1.1a Number of ILI Admissions and ILI Patients on Ventilator State Total by Week of Admission, Nebraska, 2004-2005 n=2,559

Fig. 1.1b Number of ILI Admissions by Age-Group and Week of Admission Nebraska, 2004-2005 n=2,559
2005-2006 Influenza Season
From October 31, 2005 to April 2, 2006, 2,024 total ILI hospital admissions were reported, which was approximately 535 cases (20%) fewer than the previous year. The number of admissions rose steadily until the third week in February 2006. During that week, it reached a peak with 182 ILI cases. Thereafter, from the 9th to 13th week, a steady decline in admissions occurred. Weekly, the highest number of patients on a ventilator was seven, which occurred during the first week of December 2005. There were a total of 19 patients on a ventilator during the entire influenza season. The number of weekly admissions and number of patients on a ventilator are presented in Figure 1.2a.

Figure 1.2b shows the numbers of ILI admissions for the <5, 5-64, and 65+ year old age groups. Total ILI admissions for the three age groups were 462 (23%), 712 (35%), and 850 (42%), respectively. The trend of ILI admissions for these three age groups followed a similar pattern as that of the state total. The peak numbers of the <5, 5-64, and 65+ year old age groups were 45, 58, and 90, respectively.

The ILI admission rates during the 22 week period, in each LHD region, are shown in Figure 1.2c. The Central District Health Department Region, the Panhandle Health Department Region, and the Southwest Health Department Region had the highest rates at 401, 241, and 216 per 100,000 population, respectively. The Sarpy/Cass Health Department Region had the lowest rate at 5 per 100,000 population.
Fig 1.2a Number of ILI Admissions and Patients on Ventilator State Total by Week of Admission, Nebraska, 2005-2006 n=2,023

Fig. 1.2b Number of ILI Admissions by Age-Group and Week of Admission Nebraska, 2005-2006 n = 2,023
2006-2007 Influenza Season

The numbers of ILI hospital admissions and patients on a ventilator, in each week of admission, are presented in Figure 1.3a. There were 1,486 total admissions reported from October 29, 2006 to April 1, 2007, which was a 41.9% reduction compared to the 2004-2005 influenza season, and a 26.5% reduction compared to the 2005-2006 influenza season. The number of ILI hospital admissions fluctuated during the 22 week time period. Only one obvious peak (148) appeared in the second week of February. Thirteen ILI patients were put on a ventilator during the five months, and the weekly numbers ranged from 0 to 3. The data illustrated that this influenza season was the mildest one among the three seasons.

Figure 1.3b shows the numbers of ILI admissions for the three age groups, <5, 5-64, and 65+ year olds. Nineteen percent of the state’s total admissions (n=286) were less than 5 years old. Another 35% came from seniors who are over 65 years old (n=525). The 5-64 year old age group occupied nearly half of the state total (46%), with 675 admissions recorded. The ILI admissions in the <5 year old group experienced a steep rise in the third week of January; reaching a peak during the second week of February (42), and then tapered off. Small fluctuations were found in the 5-64 and 65+ year old age groups. Both of these two age groups peaked during the second week of February, consistent with the <5 year olds.

The Central District Health Department Region, the North Central Health Department Region, and the East Central Health Department Region had the highest ILI admission rates at 377, 201, and 155 per 100,000 population, respectively. Sarpy/Cass Health Department Region had the lowest rate at 2 per 100,000 population. The ILI admission rate for each health department coverage area during the 2006-2007 influenza season is shown in Figure 1.3c.
Fig. 1.3a Number of ILI Admissions and Patients on Ventilator StateTotal by Week of Admission, Nebraska, 2006-2007  n=1,486

Fig. 1.3b Number of ILI Admissions by Age Group and Week of Admission Nebraska, 2006-2007  n=1,486
Comparison of ILI Hospital Admissions in the Three Influenza Seasons

Total and weekly ILI admissions for the three influenza seasons are presented in Figure 1.4a and 1.4b. The number of ILI admissions decreased steadily during the three years. The 2006-2007 influenza season was the mildest. With little variation, peak activities in ILI for the three influenza seasons occurred from February through early March. The peak activity level was 269 for 2004-2005, 182 for 2005-2006, and 148 for 2006-2007.
The ILI admission rates for each of the three age groups, <5, 5-64, and 65+, during the three influenza seasons are presented in Figure 1.4c. Children under 5 years old were most likely to be hospitalized due to ILI. This age group held the highest admission rate for all the three influenza seasons. Seniors over 65 years old were also vulnerable to infection. This group had a lower ILI hospital admission rate than young children. The admission rates for 5-64-year olds were much lower than those for the other two age groups.
Discussion

Several characteristics make this study worthwhile for health professionals. First of all, because all acute care hospitals throughout the state of Nebraska submitted reports to DHHS, data collected in this survey is relatively more representative than laboratory-confirmed and sentinel-provider surveillance. Secondly, reporting criteria in this survey has remained consistent throughout the years. Whether a patient should be reported or not was determined solely by the physician’s admission diagnosis. Thirdly, the survey collects a broad range of information, including patient’s age, hospital location, ventilator use, bed occupancy of the hospital, and whether there is a personnel shortage in the hospital due to ILI. In addition to providing valuable information on the ILI epidemic, this survey helps to initiate quick response procedures in the event that there is an actual influenza outbreak; to determine severity of influenza reflected by ILI cases that utilize ventilators; and to decide the impact of influenza on the availability of health care personnel and bed availability. The survey results are also essential to describe influenza activities in a given county or health department region, and to provide the information necessary for local health officials to take appropriate preventive measures.

Meanwhile, limitations existed in this survey. Due to the fact that this is a hospital admission survey, only hospitalized ILI patients were reported, reflecting the most severe cases which required intensive care. Most ILI patients receive treatment at an emergency room and/or clinic or do not seek medical treatment at a medical facility. Thus the hospital admission survey only captures the tip of the iceberg of ILI patients.

In the United States, epidemics of influenza typically occur during the winter months (Thompson, Shay, Weintraub, Brammer, Cox, et al., 2003). The ILI Hospital Admission survey was conducted during a 22-week time period, spanning from November to March. The results indicated that ILI peak activities in Nebraska usually took place sometime between late January and early March. However, the potential for non-seasonal influenza still exists. The influenza virus can appear outside the typical November to March influenza window. Hence it is necessary to maintain year-round vigilance of the epidemic.

Rates of influenza virus infection are highest among children (Monto & Kiolmehr, 1975). The risks of complication, hospitalization, and/or death from influenza are higher among persons aged ≥65 years, young children, and persons of any age with certain underlying health conditions (Smith, Bresee, Shay, Uyeki, Cox, et al., 2006). Findings from three years of surveillance are consistent with the above results. However, our survey did not breakdown the age group 5-64 years old, thus there was no way to differentiate older children, adolescents, young adults, working force, and others.

Another limitation of this survey lies in the data collection process. As described in previous sections, health workers at the county health departments collected data from hospitals, and then reported to DHHS either by email or fax. At DHHS, designated personnel reentered the data into the state database. This process is time-consuming and increases the potential for data entry errors.

Based on the above discussion, the following suggestions were made for future improvements:

- All hospitals in Nebraska should be encouraged to directly report ILI admissions to DHHS during influenza seasons, so that the results of the survey are more accurate;
In order to reflect a more comprehensive picture of the ILI epidemic, patients visiting emergency rooms due to ILI should be included in this survey whenever possible;

- Provide a more specific breakdown of the age groups in order to generate more meaningful results. For example, the age group 5-64 can be broken in to 5-24 and 25-64 in order to differentiate school students and the workforce;

- Develop and utilize an online reporting system to improve accuracy and efficiency. DHHS is currently constructing such a system, and is expecting infection control personnel at participating hospitals to report ILI activities online during the 2007-2008 influenza season.

**Influenza Clinical Laboratory Surveillance**

Laboratory surveillance results were compared to the ILI hospital admission survey data. Figures 2.1, 2.2, and 2.3 show comparisons for the 2004-2005, 2005-2006, and 2006-2007 influenza seasons respectively. Generally, the occurrence of the influenza B virus is lower than the influenza A virus. The peaks of the number of ILI hospital admissions and laboratory-confirmed influenza virus positivity appeared around the same time period. The peak level of the number of laboratory-confirmed influenza A was higher than both influenza B and ILI hospital admissions.

During the 2004-2005 influenza season, influenza B reached a peak level during the 5th week of 2005, (n=66). Influenza A and the respiratory syncytial virus (RSV) peaked in the 7th week in 2005 (n=360 and 94, respectively). One week later was the peak of ILI hospital admissions (n=269).

![Fig. 2.1 Comparison of ILI Hospital Admissions Survey and Laboratory Surveillance Nebraska, 2004-2005](image-url)
During the 2005-2006 influenza season, the peak activity of RSV appeared during the 5th week of 2006 (n=405). The peak of the influenza B virus appeared during the 8th week, lowered to 37 cases, compared with the previous influenza season. At the same time, ILI hospital admissions also reached the highest number (n=182). The Influenza A virus had its highest activity level one week later (n=232).

During the 2006-2007 influenza season, peak activity of influenza A came one week earlier than the others, during the 6th week in 2007. The highest activity level was n=343. The highest peaks for both influenza B (n=166) and ILI hospital admissions (n=148) were seen during the 7th week of 2007.
Generally, the influenza activity reflected by laboratory surveillance throughout the three years is similar to the results reflected in the ILI hospital admission survey. The data that is presented in this report is in conjunction with the results from the ILI hospital admission survey.

Figure 2.4 compares three years of influenza A activity. The average activity level during the 2005-2006 influenza season was about one third lower than the other two years. Also, the peak during the 2005-2006 influenza season occurred 2 weeks later than that of the 2004-2005 influenza season, and 3 weeks later than that of the 2006-2007 influenza season.

Figure 2.5 compares three years of influenza B activity. The 2006-2007 influenza season had an extraordinarily high level of activity compared with the other two influenza seasons. The peak during the 2006-2007 influenza season was 2.5 times higher than that of the 2004-2005 influenza season, and 4.5 times higher that that of the 2005-2006 influenza season. The peak activity for the three influenza seasons was seen within a 3 week time period from the end of January to February.
Figure 2.6 compares three years of RSV activity. Although influenza A and B activity was mild during the 2005-2006 influenza season, RSV activity during this year was more severe than the other two influenza seasons. The number of laboratory-detected positive RSV cases during the 2005-2006 influenza season was about 4 times higher than the 2004-2005 and 2006-2007 influenza seasons. The peak time for the 2005-2006 influenza season was 2 weeks earlier than the 2004-2005 influenza season, and 3 weeks earlier than 2006-2007 influenza season.

Influenza A viruses are divided into subtypes based on proteins on the surface of the virus, hemagglutinin (H) and neuraminidase (N). Since 1977, influenza A (H1N1) viruses, influenza A (H3N2) viruses, and influenza B viruses have circulated globally. In 2001, influenza A (H1N2) viruses emerged, after genetic re-assortment between human A (H1N1) and A (H3N2) viruses (Smith, Bresee, Shay, Uyeki, Cox, et al., 2006).

Keep in mind, when interpreting the results of the laboratory surveillance, that this process captured only a portion of the actual influenza cases. Whether a sample is sent to a laboratory or not depends on the clinic’s and/or physician’s decision. There are no specific standards to regulate the testing practice. Hence it is recommended that certain guidelines be established, in an effort to make laboratory testing practices more consistent.

**Influenza-Like Illness Sentinel Provider Surveillance**

Figure 3.1, 3.2, and 3.3 represent weekly numbers of ILI visits, and the percentage of the total number of visits reported by sentinel providers throughout the last three years. The colored bars in the three figures represent the number of ILI visits in each of the four age groups, 0-4, 5-24, 25-64, and over 64. Overall, the age groups 5-24 and 25-64 attributed to most of the ILI visits. During 2004-2005, 41% of the reported ILI visits were patients 25-64 years old, and 37% were 5-24 years old. During 2005-2006 and 2006-2007, the percentage of ILI visits of 5-24 years old (44% and 41%) was about 10% higher than 25-64 year olds (34% and 31%). The age group 0-4 contributed
approximately 20% of the total ILI visits for each year, while the oldest age group >64 contributed no more than 10% each year.

The trend of weekly ILI visits closely followed the percent of ILI visits. Due to the fact that the number of sentinel providers who send reports to the CDC is not consistent, the percent is more informative than the actual number of ILI visits. Peak times for ILI, based on the sentinel provider data, were during the 6th week of 2005, the 7th week of 2006, and the 5th week of 2007.

**Fig. 3.1 Influenza-like Illnesses Visits Reported by Sentinel Providers by Age Group, Nebraska, 2004-2005**

**Fig. 3.2 Influenza-like Illnesses Visits Reported by Sentinel Providers by Age Group, Nebraska, 2005-2006**
Figure 3.4 compares the percentages of ILI visits among total patient visits during the last 3 years. The 2005-2006 influenza season had the lowest average percent of ILI visits. The other two influenza seasons had a similar overall percentage. The peak during the 2006-2007 influenza season was slightly higher, with a lower starting point than the 2004-2005 influenza season. These results did not completely replicate the ILI hospital admission survey.

Sentinel Provider Surveillance has the same limitation as Laboratory Surveillance. It does not reflect all influenza outpatient cases but does reflect ILI activity in a certain area. There are 17 providers located in 16 jurisdictions (two providers in Douglas County) participating in this surveillance system. The network should be expanded to include a provider from each jurisdiction.
(n=20) to ensure that this system provides more accurate information to signify influenza activity in Nebraska.

122 Cities Mortality Reporting System

Two cities in Nebraska, Lincoln and Omaha, are currently participating in the 122 Cities Mortality Reporting System. The percent of all deaths attributed to pneumonia and influenza (P&I) in these two cities since 2004 is shown in Figure 4.1. The highest percent was seen during week 3 of 2004, week 9 of 2005, week 16 of 2006, and week 11 of 2007.

Except for 2006, the peak times for the mortality report appeared around the same time period as the peak times for the ILI Hospital Admission Survey and the Influenza Sentinel Provider Surveillance. In the ILI Hospital Admission Survey, the peak number of ILI admissions appeared during week 8 of 2005, week 8 of 2006, and week 7 of 2007; in the Sentinel Provider Surveillance, the peaks of percent of ILI visits appeared during week 6 of 2005, week 7 of 2006, and week 5 of 2007. Figure 4.2 compares the three surveillance systems.
Influenza-associated Pediatric Mortality

One influenza-associated pediatric death was reported by Lancaster County Health Department during the 7th week of 2007. The deceased was an 11-year old female, infected by influenza A and treated in the ICU. The onset of illness occurred 4 days before her death. The patient did not receive an influenza vaccine before the illness.

State and Territorial Epidemiologist Report

Nebraska Influenza Surveillance is a cooperative network that involves multiple systems. In order to provide a general picture of influenza activity, data from all of these systems needs to be considered collectively. As one of the products of the collaborative surveillance, DHHS reports the estimated level of influenza activity to the CDC each week between the 40th week of the year and the 20th week of the following year. Influenza activity is reported as no activity, sporadic, local, regional, or widespread. These 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 an increase in ILI cases, and recent laboratory-confirmed influenza in at least two but less than half of the regions throughout the state.
- Widespread: Outbreaks of influenza or an increase in ILI cases, and recent laboratory-confirmed influenza in at least half of the regions throughout the state. (Center for Disease Control and Prevention, 2006b).
Figure 6.1 shows weekly influenza activity in Nebraska reported to CDC in the last three years. Widespread activity was reported during the 5th to 7th week in 2005, and the 6th to 8th week in 2007. Regional activity was reported during 5 weeks in 2005, 10 weeks in 2006, and 3 weeks in 2007. The duration of regional and local activity during the 2005-2006 influenza season was longer than the other influenza seasons, however there was no widespread activity during this year.

Fig. 6.1 State Epidemiologist Reported Influenza Activity Nebraska, 2004-2007

Source: CDC influenza website [http://www.cdc.gov/flu/weekly/fluactivity.htm](http://www.cdc.gov/flu/weekly/fluactivity.htm)

References

Centers for Disease Control and Prevention. (2006a). *Key Facts about Influenza and Influenza Vaccine*. CDC: Atlanta, GA.

Centers for Disease Control and Prevention. (2006b). *Overview of Influenza Surveillance in the United States*. CDC: Atlanta, GA.


## Appendix A Start and End Date of Weekly Surveillance

|----------|------------------------|----------------------|-----------------------|---------------------|----------------------|---------------------|

* For the ILI hospital admission survey in 2004-2005 flu season, the starting and end dates were one day later than the date listed in this table.
Appendix B Local Health Department Weekly Reporting Form


Report for the week of:
Health Department's Name:
Reporting Person's Name:
Phone Number:
Date of Report:

<table>
<thead>
<tr>
<th>Name of facility</th>
<th>Number ILI admissions</th>
<th>Facility</th>
<th>Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>This week</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 5</td>
<td>5 to 64</td>
<td>65 +</td>
<td>Total</td>
</tr>
<tr>
<td>Total in hospital this week</td>
<td>% bed occupancy</td>
<td>No. ILI patients on ventilator</td>
<td>Shortage due to ILI?</td>
</tr>
</tbody>
</table>

By Tuesdays noon, please e-mail or fax this report to: ming.qu@hhss.ne.gov; fax: 402-471-1371
Please add comments / explanations here:
Appendix C Laboratories Participating in Influenza Surveillance

Influenza Surveillance Labs by Region 2007

Legend
- Douglas County
- Lancaster County
- Northcentral Region
- Northeast Region
- Panhandle Region
- Southeast Region
- Southwest Region

80 Labs Statewide

Source: Dept of Health & Human Services
Appendix D Nebraska Sentinel Provider Surveillance Network

Influenza-like-Illness
Sentinel Provider Surveillance, NE, 2006-07

Legend
- Local Health Dept. Boundaries
- Sentinel Provider Participation

Source: Department of Health and Human Services
The Department of Health and Human Services is committed to affirmative action/equal employment opportunity and does not discriminate in delivering benefits or services.