

***REPORT ON:***

***INFLUENZA AND RESPIRATORY VIRUS  
SURVEILLANCE IN WISCONSIN  
2007-08***

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## **I. U.S. INFLUENZA SENTINEL PROVIDER SURVEILLANCE NETWORK WISCONSIN SENTINEL CLINICIAN PROGRAM**

### **Overview**

The U.S. Influenza Sentinel Provider Surveillance Network is a program designed and implemented by the Influenza Division of the Centers for Disease Control and Prevention (CDC). State health officials are given immediate access to national, regional and state-specific influenza data through the CDC Internet web site, allowing for faster and more thorough assessment of influenza activity in each state. Wisconsin participates in the national Sentinel Provider Surveillance Network, through the Sentinel Clinician Program, implemented by the Wisconsin Division of Public Health (DPH). Sentinel clinicians in Wisconsin include physicians, physician assistants and nurse practitioners.

Since 1997, the CDC has used sentinel provider reporting data used to determine national, regional-national and state percentages of influenza-like illness (ILI). The Communicable Disease Epidemiology Section (CDES) uses data received from the CDC to monitor influenza activity in Wisconsin and the East North-Central region of the United States. In 1999, the CDES began using sentinel clinician data to calculate the percentage of ILI in each of the five public health regions of Wisconsin. This data provided clinicians with an accurate sense of ILI activity in their geographic area. In 2002, the CDES began to calculate state and regional baseline and threshold levels of ILI activity, based on data from previous influenza seasons. Baseline and threshold levels assist clinicians and public health officials in the interpretation of ILI activity in their area, by providing an accurate comparison method between public health regions and the state. Percentages below the baseline level were considered as low ILI activity while percentages between baseline and threshold levels were considered moderate ILI activity and percentages above threshold levels were considered high ILI activity.

### **2007-08 Wisconsin Influenza Sentinel Clinician Program**

In 2002, ILI surveillance was conducted on a year-round basis. Sentinel clinicians who reported at least 50% of the weeks during the influenza season were invited to participate in year-round surveillance. During weeks 21-39 (June-September) of 2007, 29 clinicians participated in year-round surveillance.

For the 2007-08 influenza season, the DPH recruited 76 clinicians to participate in influenza sentinel surveillance. Fifty-two (52) clinicians (68%) reported at least 50% of the weeks during influenza season. A breakdown of clinician specialties by public health region follows (Table 1).

Table 1. Wisconsin Sentinel Clinicians by specialty and public health region.

<b>Region</b>	<b>Family Practice</b>	<b>Pediatrics</b>	<b>Student Health</b>	<b>Total</b>
Western	11	2	3	16
Northeastern	12	1	3	16
Northern	6	3	0	9
Southern	13	1	3	17
Southeastern	11	2	5	18
<b>Total</b>	<b>53</b>	<b>9</b>	<b>14</b>	<b>76</b>

**Peak Activity:**

Since 1981 the CDES have monitored peak influenza activity in Wisconsin. Between 1981 and 1997 data from the State and Territorial Epidemiologists Report was used to determine peak influenza-like illness activity. The use of this surveillance method can only be described as a “best guess” as there was no method to positively calculate peak activity from weeks described as “widespread”.

Since 1997, peak activity was determined using influenza-like illness percentage data from Sentinel Clinician data which can be calculated to determine peak activity. Based on historical data, peak influenza activity in Wisconsin and in the Northern, Southern, Southeastern and Western regions of the state usually occurs around week 6, in early February. Peak activity in the Northeastern region usually occurs around week 7, during mid February. The East North-Central region of the United States, that includes Wisconsin, usually occurs around week 6 in early February, while peak activity in the United States occurs during week 5, in late January (Table 2).

Table 2. Eleven-year historic trend of peak influenza activity statewide and in each of the public health regions, as reported by sentinel clinicians, 1997-2008.

REGION	United States	E-N-C U.S.	Wisconsin	Northeastern	Northern	Southern	Southeastern	Western
YEAR	Week	Week	Week	Week	Week	Week	Week	Week
1997-1998	4	4	6	6	ID	5	5	ID
1998-1999	5	6	7	6	ID	5	7	ID
1999-2000	52	52	52	52	52	52	52	51
2000-2001	5	5	6	4	6	5	6	8
2001-2002	7	8	9	10	10	9	8	7
2002-2003	6	6	9	10	10	8	7	9
2003-2004	52	52	51	51	51	52	52	51
2004-2005	7	7	5	9	6	4	6	5
2005-2006	9	10	13	13	8	10	8	13
2006-2007	7	8	8	9	7	8	8	5
2007-2008	7	8	9	9	8	9	9	7
<b>Average</b>	<b>5</b>	<b>6</b>	<b>6</b>	<b>7</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>6</b>

ID = Insufficient Data

Based on the weekly data received from Wisconsin Sentinel Clinicians, influenza activity statewide and in the Northeastern, Southern and Southeastern regions of Wisconsin peaked during week 9 in early March while peak activity in the Northern Region occurred during week 8 in late February and during week 7 in mid February in the Western Region. Peak activity was 1-3 weeks later than historical averages (Figure 1). Peak activity in the East North Central region of the United States occurred during week 8 in late February and during week 7 in mid February in the United States (Figure 2).

Comparison of ILI data by clinician practice identified consistent peak activity during week 9 in early March among Family Practice and Pediatric clinicians, however ILI percentages for pediatricians was 2-3 times higher. The ILI activity for Student Health clinicians was observed in week 5 in early February (Figure 3). A 4-year review of ILI activity in Wisconsin is identified in Figure 4.

Figure 1. Influenza-like illness percentage statewide and in each of the five public health regions, 2007-08. Baseline — Threshold - - - -

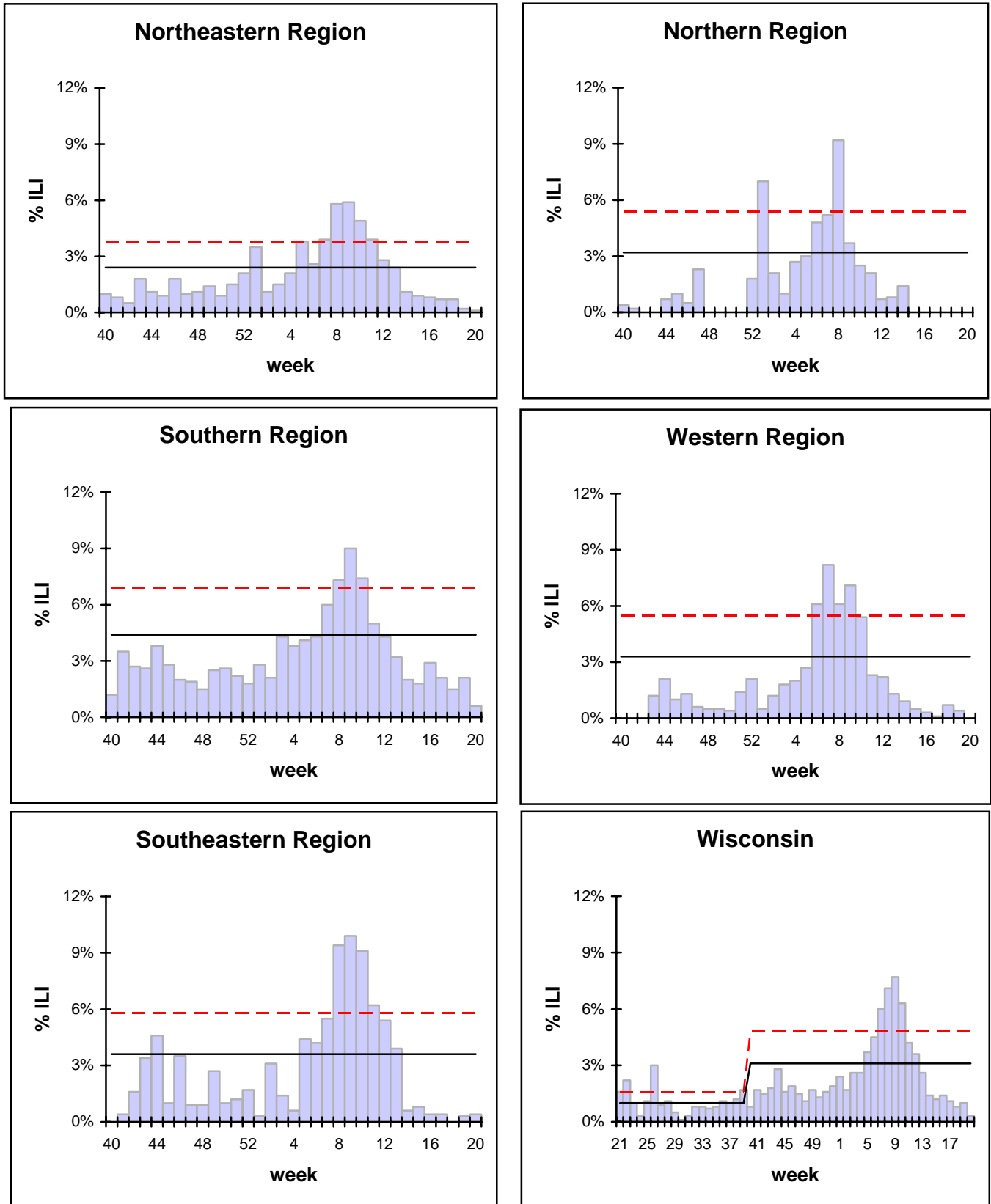


Figure 2. Percentage of patients who present with influenza-like illness, as noted by influenza sentinel clinicians in Wisconsin, the East-North-Central (ENC) region of the United States and the U.S. October-May, 2007-08.

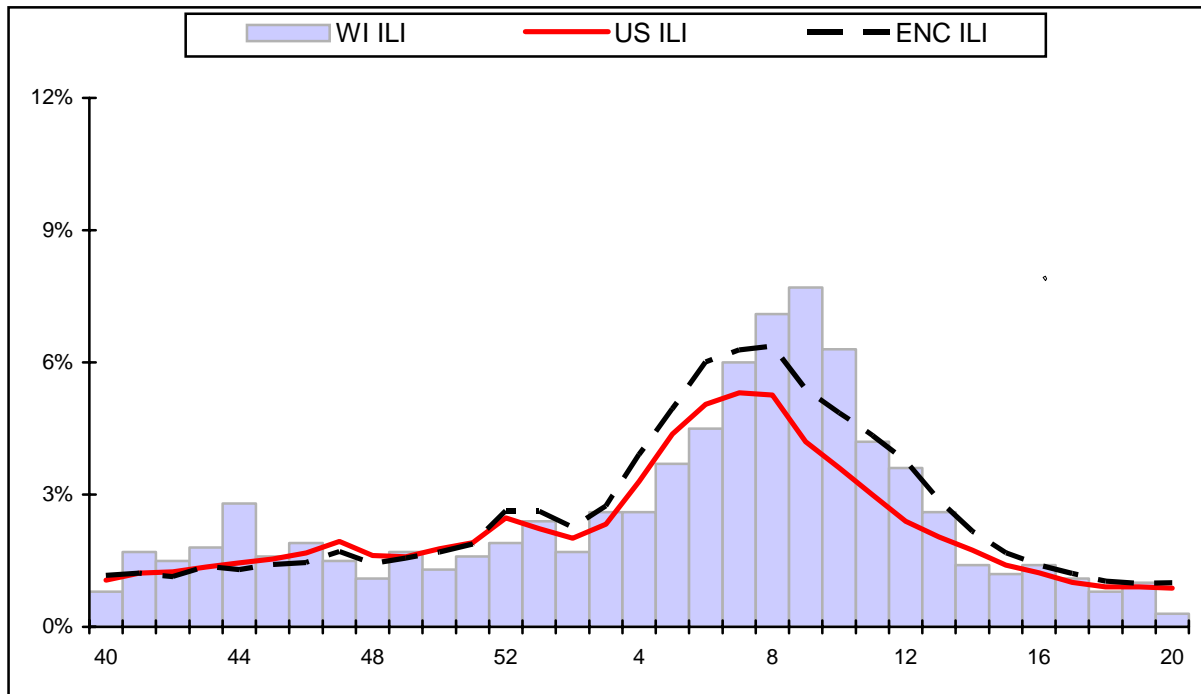
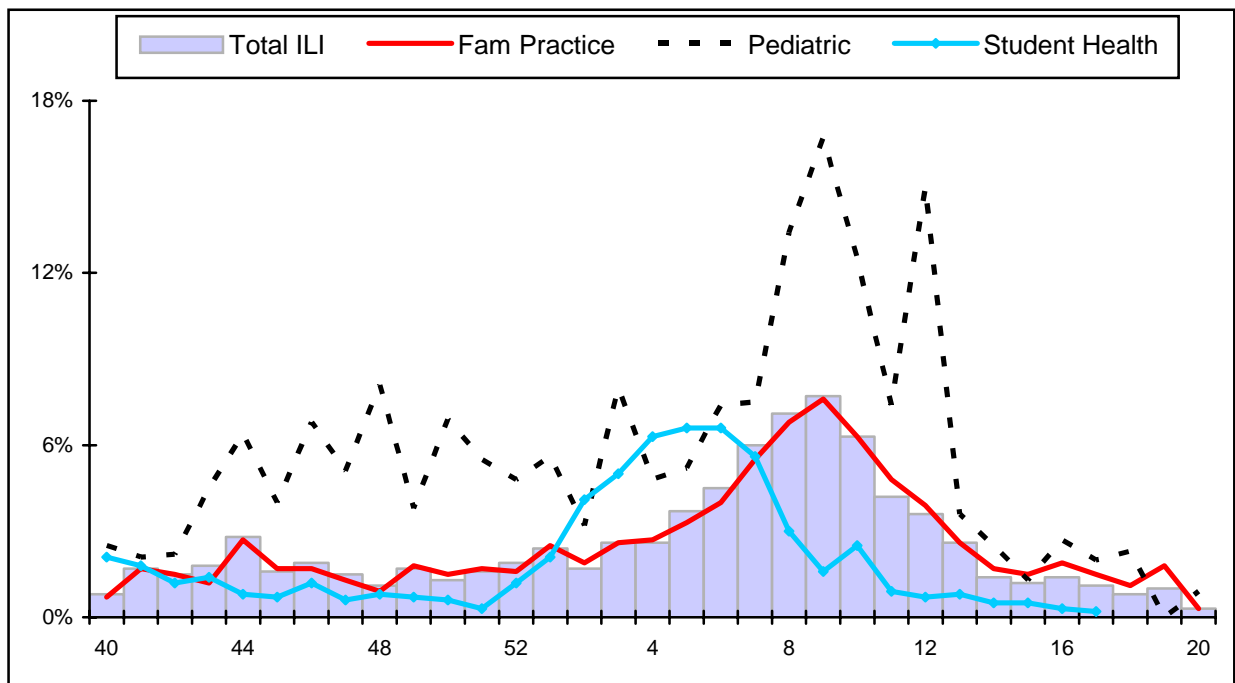
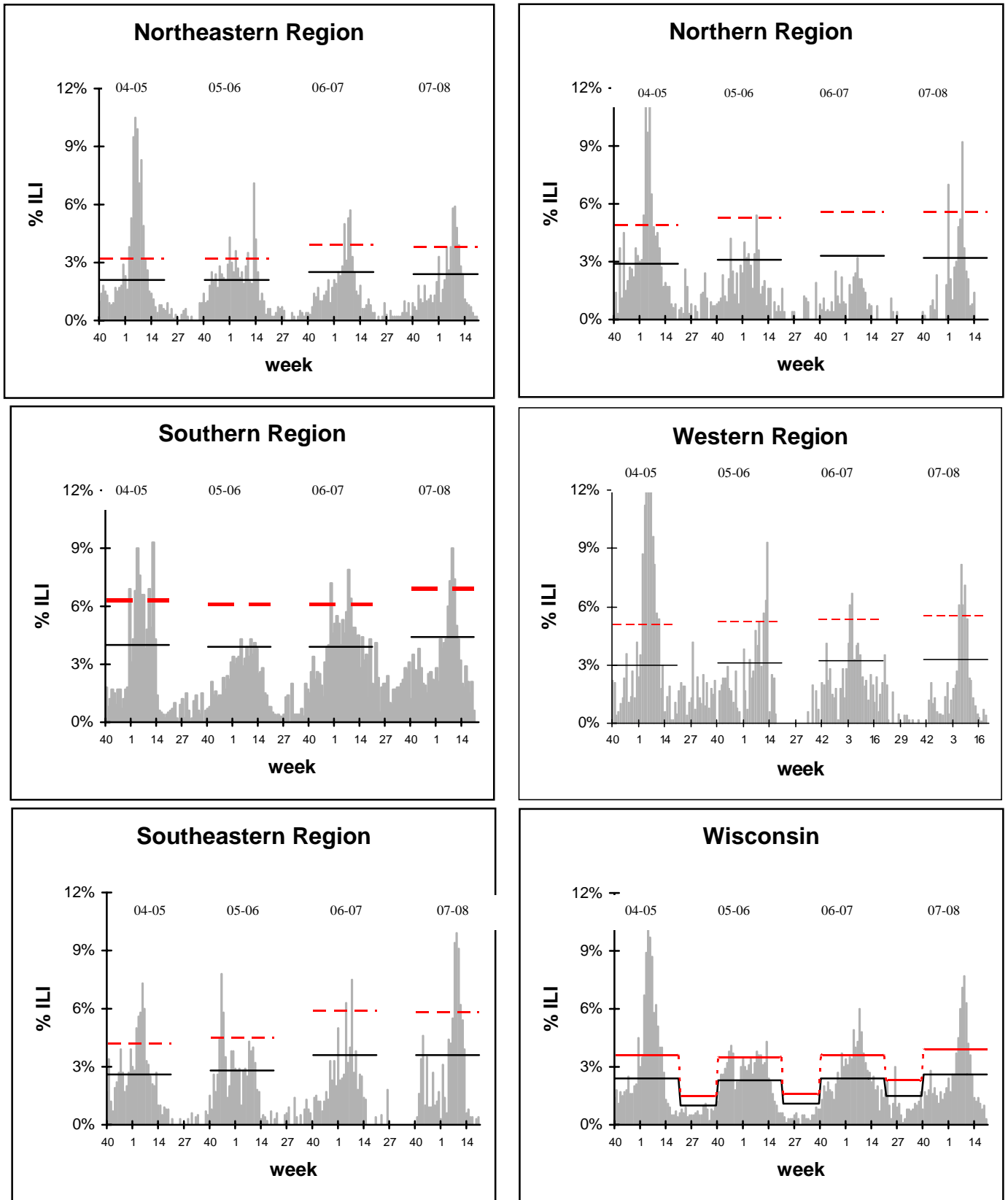


Figure 3. Percentage of patients who present with influenza-like illness, as noted by influenza sentinel clinicians in Wisconsin, by practice type, and the United States, October-May, 2007-08.



**Influenza-like illness Historic Data, Wisconsin, 2004-2008**

Figure 4. Influenza-like illness percentage statewide and in each of the five public health regions, 2004-08. Baseline \_\_\_\_\_ Threshold - - - - -



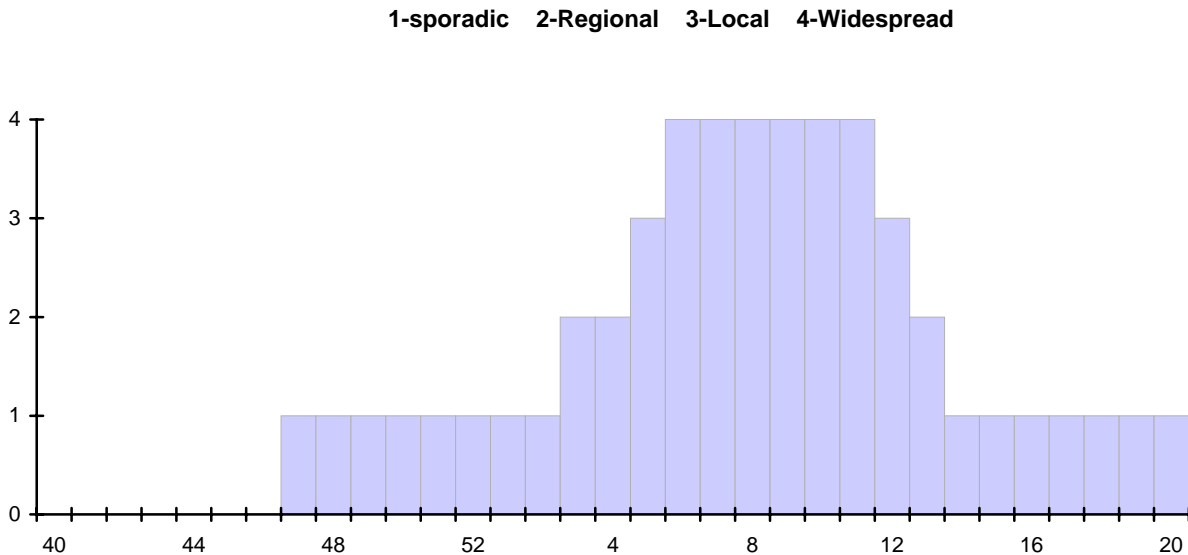
## II. INFLUENZA MORBIDITY AS ASSESSED BY STATE AND TERRITORIAL EPIDEMIOLOGISTS

### Overview

Each week during the influenza season, designees of each of the 50 state and territorial epidemiologists report the influenza activity in their state to the CDC via the National Electronic Telecommunication System for Surveillance (NETSS) or other means of communication. Influenza activity is categorized into four levels of ascending activity as shown below:

Activity Level	ILI activity*/Outbreaks		Laboratory data
No activity	Low	And	No lab confirmed cases <sup>†</sup>
Sporadic	Not increased	And	Isolated lab-confirmed cases
	OR		
Local	Increased ILI in 1 region**; ILI activity in other regions is not increased	And	Recent (within the past 3 weeks) lab evidence of influenza in region with increased ILI
	OR		
Regional (doesn't apply to states with ≤4 regions)	2 or more institutional outbreaks (ILI or lab confirmed) in 1 region; ILI activity in other regions is not increased	And	Recent (within the past 3 weeks) lab evidence of influenza in region with the outbreaks; virus activity is no greater than sporadic in other regions
	OR		
Regional (doesn't apply to states with ≤4 regions)	Increased ILI in ≥2 but less than half of the regions	And	Recent (within the past 3 weeks) lab confirmed influenza in the affected regions
	OR		
Regional (doesn't apply to states with ≤4 regions)	Institutional outbreaks (ILI or lab confirmed) in ≥2 and less than half of the regions	And	Recent (within the past 3 weeks) lab confirmed influenza in the affected regions
	OR		
Widespread	Increased ILI and/or institutional outbreaks (ILI or lab confirmed) in at least half of the regions	And	Recent (within the past 3 weeks) lab confirmed influenza in the state.

Figure 5. Influenza activity in Wisconsin during the 2007-08 influenza season, (October –May)



### III. PNEUMONIA AND INFLUENZA (P&I) MORTALITY

#### Overview

Each week, the vital statistics offices in Milwaukee and 121 other cities in the United States (122 total) report to the CDC the total number of death certificates filed and the number of those for which pneumonia was identified as the underlying cause of death or for which influenza was mentioned in any position.

#### P&I Mortality During the 2007-08 Influenza Seasons

The P&I mortality epidemic threshold is a national percentage determined by the CDC, based on data compiled during the previous five year period. The percentage of deaths in the United States attributed to pneumonia and influenza (P&I) exceeded the epidemic threshold for 19 consecutive weeks (weeks 2 through 20) during 2007-08 influenza season.

Figure 6. Pneumonia and influenza (P&I) deaths, United States, May-October 2007-08

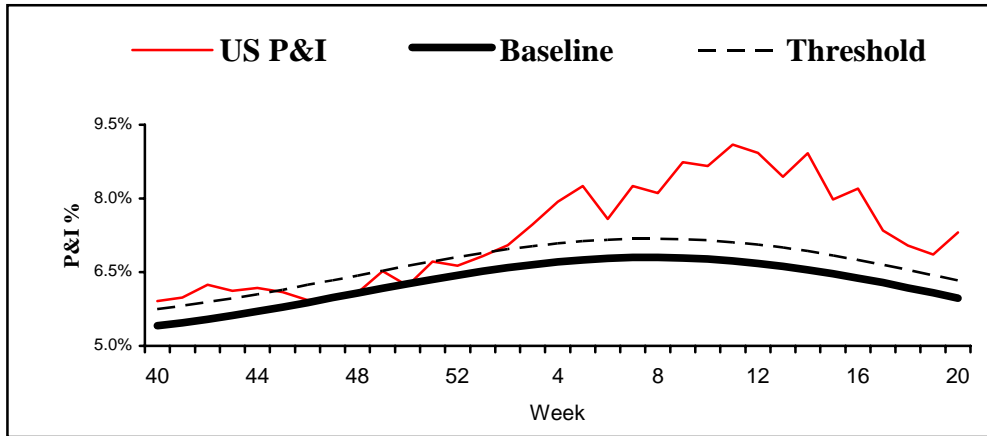
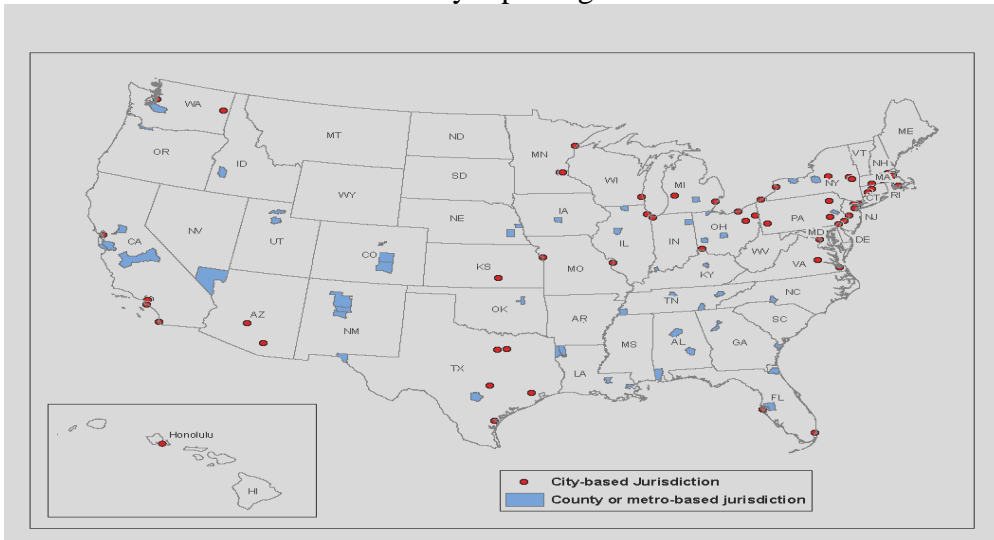


Figure 7. Location of 122 cities mortality reporting in the U.S.



## **IV. INFLUENZA LABORATORY SURVEILLANCE**

### **U.S. World Health Organization (WHO) Collaborating Laboratory Reports**

Approximately 80 WHO collaborating virology laboratories and approximately 50 laboratories from the National Respiratory and Enteric Virus Surveillance System (NREVSS) located throughout the United States, report the total number of respiratory specimens tested and the number positive for influenza by type and subtype each week to the CDC. A subset of the influenza viruses isolated by each participating laboratory was sent to the CDC for antigenic characterization. As participants in the WHO/NREVSS collaborating laboratory system, the Wisconsin State Laboratory of Hygiene (WSLH) and the Milwaukee Public Health Laboratory (MPHL) send a subset of their confirmed influenza isolates to the CDC for antigenic characterization.

Analysis of WHO/NREVSS laboratory data suggests that influenza activity in the United States peaked early February (week 6) during the 2007-2008 season.

### **Wisconsin Virology Laboratory Surveillance**

In 1994, the WSLH developed the Clinician Education Network (CEN), since referred to as the Sentinel Submitter Network (SSN), to identify viral respiratory illness in Wisconsin. SSN physicians submit clinical specimens to the WSLH for influenza and other viral testing at their discretion throughout the year, especially before the beginning of influenza season and when unusual viral activity is suspected.

Participants of the Wisconsin Laboratory Information Network (LIN), which includes 11 virology laboratories from throughout Wisconsin, provide a weekly summary to the WSLH of the total number of respiratory specimens tested and the number that tested positive for influenza. Data used by the CDES suggests influenza activity in the Wisconsin peaked in mid February (week 7) during the 2007-2008 season.

In addition to the weekly summary, participants of the LIN, periodically sent influenza isolates to the WSLH for subtyping. The MPHL performs subtyping of influenza isolates tested at their laboratory. In the United States and Wisconsin, during the 2007-2008 influenza season type A/H3 was the predominant influenza virus followed by type B.

Figure 8. Percentage of tests positive for influenza, rapid tests and culture, Wisconsin and the U.S., October-May, 2007-08.

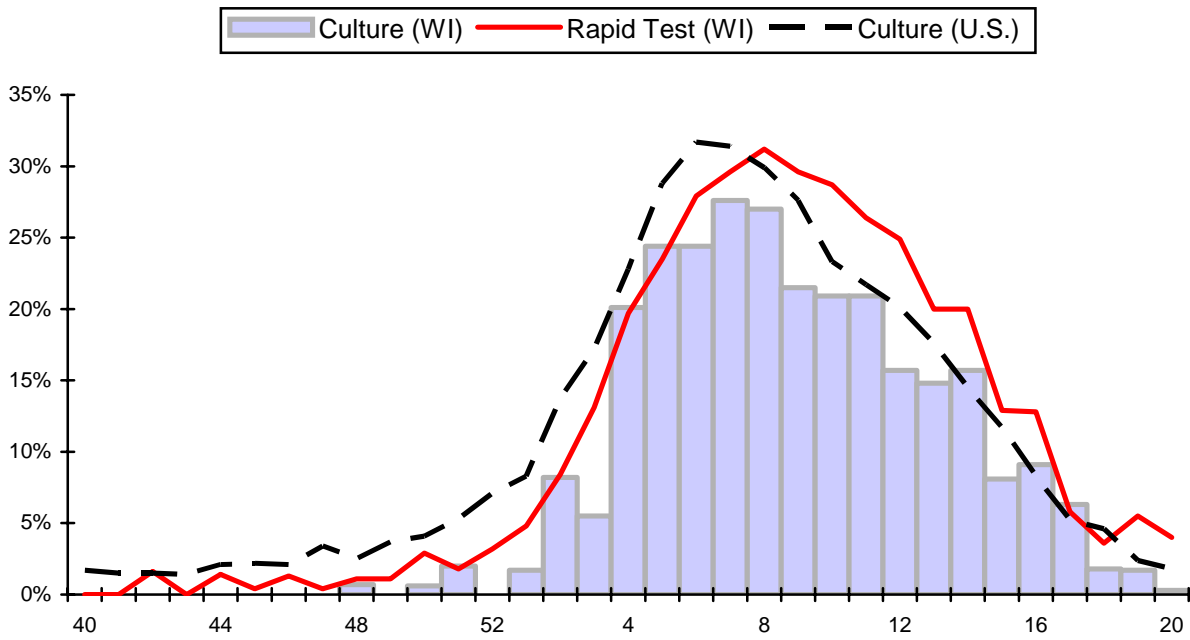
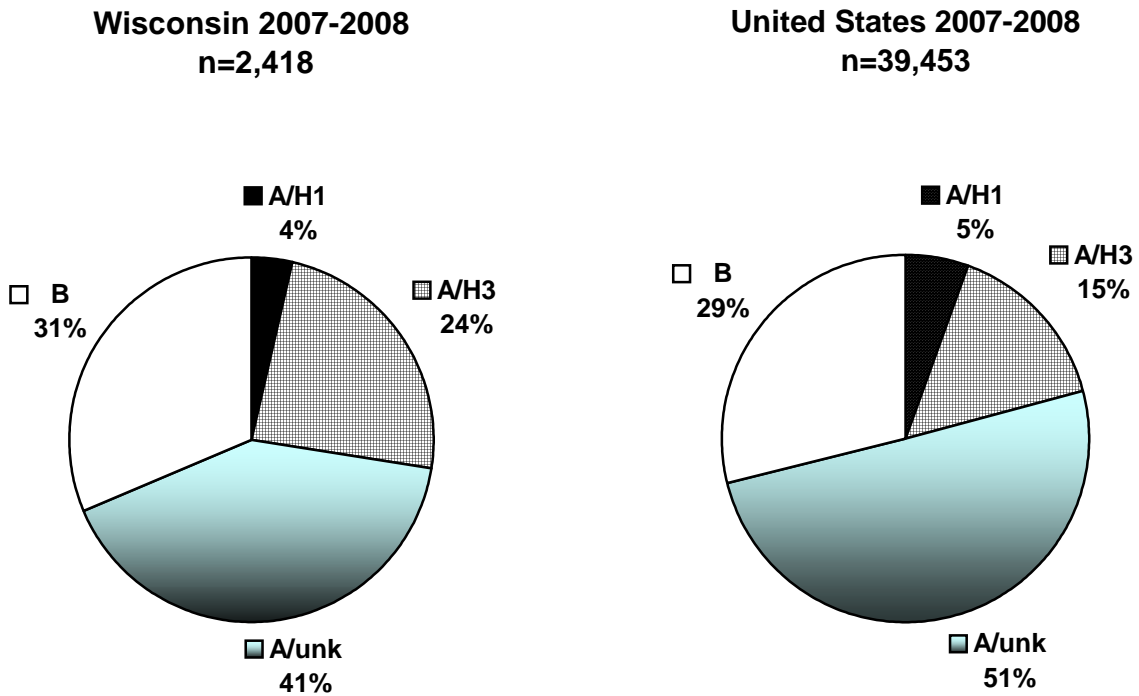


Figure 9. Influenza type and subtype, Wisconsin and the U.S., October-May, 2007-08.



## V. INFLUENZA ANTIVIRAL RESISTANCE IN WISCONSIN

### Overview

Surveillance of circulating isolates of influenza A(H3N2) in the United States during the 2005-2006 influenza season showed predominant resistance to the adamantanes. This prompted the Centers for Disease Control and Prevention (CDC) to issue interim recommendations against the use of adamantanes (amantadine and rimantadine) until surveillance has shown susceptibility to be re-established among circulating influenza A isolates. In cooperation with CDC and the Wisconsin Division of Public Health, the Wisconsin State Laboratory of Hygiene (WSLH) has acquired a new surveillance technology (pyrosequencing) to rapidly test for genetic mutations in influenza A isolates that can indicate adamantane and/or neuraminidase inhibitor (oseltamivir) antiviral resistance.

### Adamantane Antiviral Drugs

Resistance to the adamantanes continues to be high (99.8%) among influenza A (H3N2) viruses and has been detected among A/(H1N1) but at a lower level (9.8%). The adamantanes are not effective against influenza B viruses. Preliminary adamantane a susceptibility surveillance results from a representative sample of the 2006-07 and 2007-08 influenza seasons in Wisconsin, New York (State) and the CDC are listed below.

Season/ State	Influenza A Subtype					
	H1N1			H3N2		
	Tested	Resistant	% Resistant	Tested	Resistant	% Resistant
<b>2006-07</b>						
New York (State)	37	0	0%	42	38	90.5%
Wisconsin	107	0	0%	39	29	74.4%
CDC	UD	UD	UD	UD	UD	UD
Total	144	0	0%	81	67	82.7%
<b>2007-08</b>						
New York (State)	44	0	0%	101	101	100%
Wisconsin	42	1	2.4%	44	44	100%
CDC	883	94	10.6%	426	425	99.8%
Total	969	95	9.8%	571	570	99.8%

### Neuraminidase Inhibitor Antiviral Drugs

Resistance to oseltamivir has been identified only among A/H1N1 viruses (11.3%) . All tested viruses have retained their sensitivity to zanamivir. Preliminary a neuraminidase inhibitor susceptibility surveillance results from a representative sample of the 2006-07 and the 2007-08 influenza season in Wisconsin, New York (State) and the CDC are listed below

Season/ State	Influenza A Subtype								
	H1N1			H3N2			B		
	Tested	Resistant	% Resistant	Tested	Resistant	% Resistant	Tested	Resistant	% Resistant
<b>2006-07</b>									
New York (State)	18	0	0%	17	0	0%	19	0	0%
Wisconsin	ND	ND	ND	ND	ND	ND	ND	ND	ND
CDC	UD	UD	UD	UD	UD	UD	UD	UD	UD
Total	18	0	0%	17	0	0%	19	0	0%
<b>2007-08</b>									
New York (State)	45	5	11.1%	92	0	0%	45	0	0%
Wisconsin	46	8	17.4%	ND	ND	ND	ND	ND	ND
CDC	971	107	10.9%	362	0	0%	305	0	0%
Total	1,062	120	11.3%	454	0	0%	350	0	0%

UD = Unpublished Data ND = Not Done

## VI. SURVEILLANCE FOR OTHER RESPIRATORY VIRUSES IN WISCONSIN, 2007-08

### Surveillance Methods

In the United States, respiratory virus activity is monitored by the CDC through the NREVSS, a voluntary, laboratory-based system that consists of approximately 50 laboratories nationwide. NREVSS laboratories report the total number of tests and the number of positive tests for each respiratory virus on a weekly basis.

Many respiratory virus infections are not reportable in Wisconsin. The CDES performs surveillance by monitoring the percentage of respiratory specimens positive for the each virus, as voluntarily reported on a weekly basis by participants of the Wisconsin LIN.

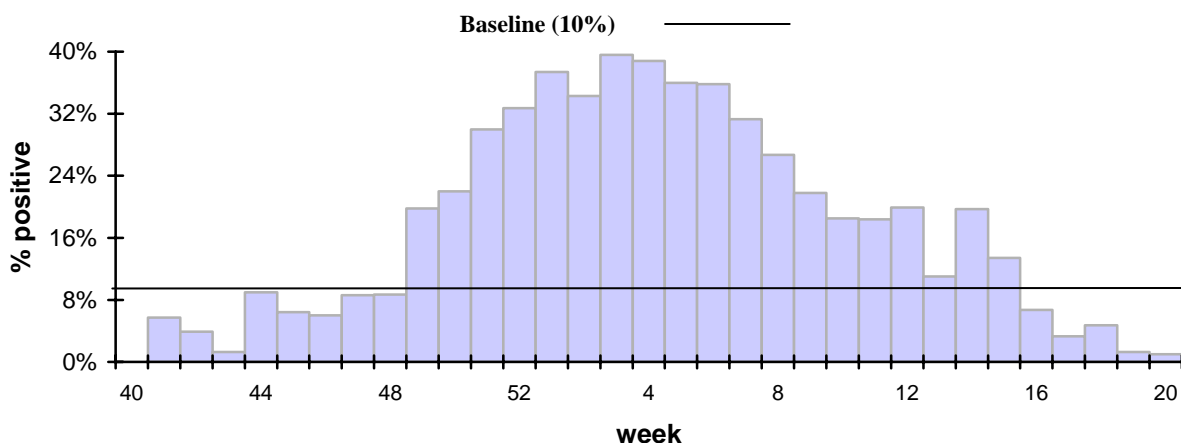
### Respiratory Syncytial Virus (RSV)

Respiratory syncytial virus (RSV) is the most common cause of bronchiolitis and pneumonia among infants and children under 1 year of age. Illness begins most frequently with fever, runny nose, cough, and sometimes wheezing. Most children recover from illness in 8 to 15 days. Most children hospitalized for RSV infection are under 6 months of age. RSV causes repeated infections throughout life, usually associated with moderate-to-severe cold-like symptoms; however, severe lower respiratory tract disease may occur at any age, especially among the elderly or those with compromised cardiac, pulmonary, or immune systems.

The incubation period of RSV is 2-8 days, (4-6 days most common). RSV is spread from respiratory secretions through close contact with infected persons or contact with contaminated surfaces or objects. Infection can occur when infectious material contacts mucous membranes of the eyes, mouth, or nose, and possibly through the inhalation of droplets generated by a sneeze or cough. In temperate climates, RSV infections usually occur during annual community outbreaks, often lasting 4 to 6 months, during the late fall, winter, or early spring months.

The NREVSS considers RSV activity to be widespread when at least half of the participating laboratories detect any RSV for at least two consecutive weeks and greater than 10% of all specimens tested by antigen detection for RSV are positive. In Wisconsin, RSV activity was above the baseline of 10% for 19 consecutive weeks (weeks 49-15) and peaked in late January (week 3) of 2008.

Figure 10. The percentage of rapid tests positive for RSV in Wisconsin, October–May, 2007-08.



## **Human Parainfluenza Virus (HPIV)**

Human parainfluenza viruses (HPIVs) are second to Respiratory Syncytial virus (RSV) as a common cause of lower respiratory tract disease in young children. Similar to RSV, HPIVs can cause repeated infections throughout life, usually manifested by an upper respiratory tract illness (a cold and/or sore throat). HPIVs can also cause serious lower respiratory tract disease with repeat infection (pneumonia, bronchitis, and bronchiolitis), especially among the elderly, and among patients with compromised immune systems. There are four types of HPIVs (1-4), each having unique seasonality.

The incubation period for HPIVs is generally from 1 to 7 days. HPIVs are spread from respiratory secretions through close contact with infected persons or contact with contaminated surfaces or objects. Infection can occur when infectious material contacts mucous membranes of the eyes, mouth, or nose, and possibly through the inhalation of droplets generated by a sneeze or cough. HPIVs can remain infectious in aerosols for over an hour. HPIVs are ubiquitous and infect most people during childhood

### ***HPIV-1***

The most distinctive clinical feature of HPIV-1 and HPIV-2 is croup. HPIV-1 is the leading cause of croup in children. In Wisconsin, increased infections with PI-1 have been noted to peak on a biennial basis from mid to late autumn, usually during odd number years. Increased activity from HPIV-1 was identified in 2007. Normal activity from HPIV-1 is expected in 2008. Note increase in weeks 42-51 in Figure 11)

### ***HPIV-2***

Like HPIV-1, The most distinctive clinical feature of HPIV-2 is croup although HPIV-2 is less frequently detected. The incidence of HPIV-2 in Wisconsin can peak anytime from late spring to late autumn.

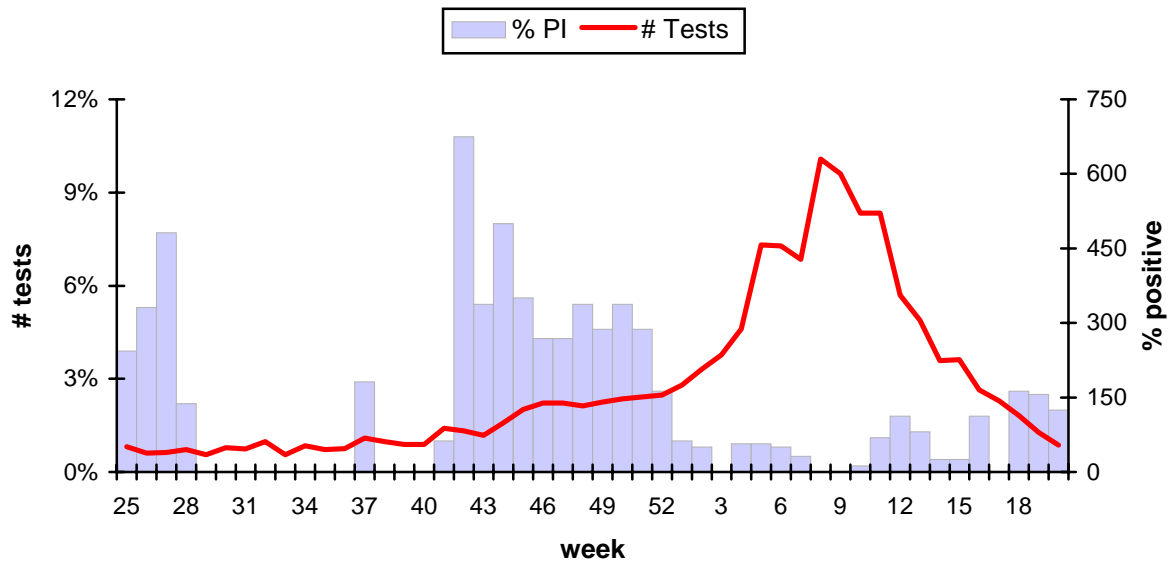
### ***HPIV-3***

HPIV-3 is more often associated with bronchiolitis and pneumonia. Although the incidence of HPIV-3 occurs year round, it usually peaks on an annual basis from late spring to early summer (Note increase in weeks 25-27 in Figure 11)

### ***HPIV-4***

HPIV-4 is infrequently detected, possibly because it is less likely to cause severe disease. HPIV-4 is infrequently isolated and the seasonal characteristics of the virus cannot be determined.

Figure 11. Positive HPIV Tests, Wisconsin, June 2007-October, 2008



### **Adenovirus**

Adenoviruses commonly cause respiratory illness; however, depending on the serotype, they may also cause various other illnesses, such as gastroenteritis, conjunctivitis, cystitis, and rash illness. Symptoms of respiratory illness caused by adenovirus infection range from the common cold syndrome to pneumonia, croup, and bronchitis. Patients with compromised immune systems are especially susceptible to severe complications of adenovirus infection. It tends to affect young children and persons with an altered immune system, but may affect persons of any age.

The incubation period of respiratory tract infections from adenoviruses ranges from 2-14 days. Although epidemiologic characteristics of the adenoviruses vary by type, all are transmitted by direct contact, fecal-oral transmission, and occasionally waterborne transmission. Outbreaks of adenovirus-associated respiratory disease have been more common in the late winter, spring, and early summer; however, adenovirus infections can occur throughout the year.

#### ***Adenovirus -14 (Ad14)***

A report in the November 16, 2007, issue of the Morbidity and Mortality Weekly Report (MMWR) noted an unusual number of recent cases of severe pneumonia and deaths caused by adenovirus serotype 14 (Ad14) infection among civilian and military communities. Ad14 is one of the 51 serotypes of adenoviruses.

The MMWR report was based on investigations done by state and city health authorities, the U.S. Air Force, and CDC. The study showed that Ad14 is a rarely reported but emerging serotype of adenovirus that can cause severe and sometimes fatal respiratory disease in people of all ages, including healthy young adults. However, Ad 14 infections are uncommon. Most infections from Ad14 are not serious, and severe or fatal outcomes from Ad14 are rare.

The Wisconsin State Lab of Hygiene can identify Ad14, a type B adenovirus, through RT-PCR and genetic sequencing. As of 8/25/08 no cases of Ad-14 had been identified in Wisconsin

### **Rhinovirus**

Rhinovirus is the most common cause of acute respiratory infections including the “common cold”, pharyngitis, otitis media, and, less commonly bronchiolitis and pneumonia. Nasal discharge, usually clear and watery at the onset of illness often becomes purulent and viscous after a few days and may persist for 10-14 days. Fatigue, headache and low-grade fevers are common with rhinovirus infection.

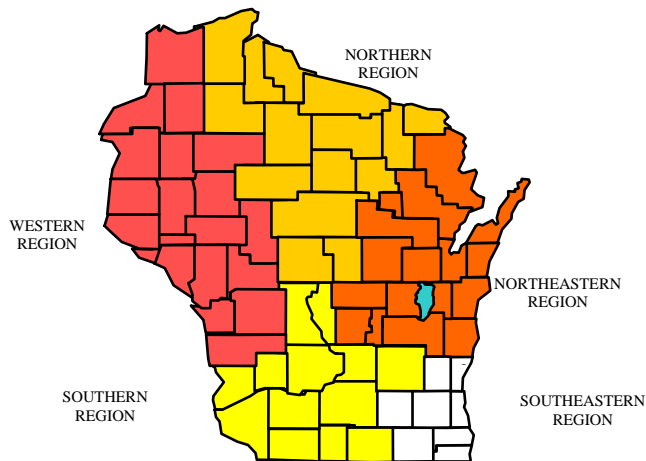
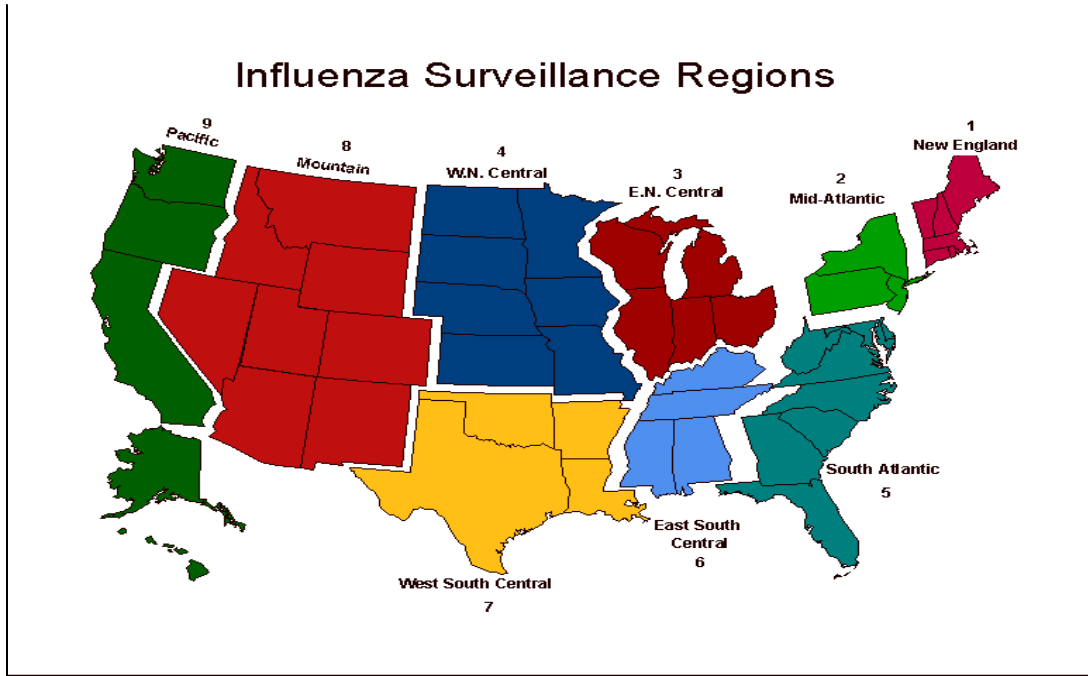
The incubation period of rhinovirus usually is 2-3 days, but occasional can be as long as 7 days. Rhinovirus is spread by person-to-person contact with self-inoculation by contaminated secretions on hands. Like adenovirus, rhinovirus is endemic throughout the year. When discernible peaks were identified in Wisconsin, they occur in late spring and earlier summer.

### **Human Metapneumovirus (hMPV)**

Human metapneumovirus infection ranges from a mild upper respiratory infection to bronchiolitis to severe pneumonia. It affects all age groups but is most common in children. In Wisconsin, two outbreaks of hMPV in long term care facilities occurred late in the 2007-08 influenza season. Common symptoms of hMPV include fever, cough and coryza. Variable symptoms include wheezing, otitis media, conjunctivitis, pharyngitis and laryngitis.

The incubation period for hMPV is unknown, but thought to be 5-6 days. Occurrence of hMPV overlaps with influenza and RSV activity.

# Appendix A. United States and Wisconsin Influenza Surveillance Regions



Southern Region

Adams  
Columbia  
Crawford  
Dane  
Dodge  
Grant  
Green  
Iowa  
Juneau  
Lafayette  
Richland  
Rock  
Sauk

Southeastern Region

Jefferson  
Kenosha  
Milwaukee  
Ozaukee  
Racine  
Walworth  
Washington  
Waukesha

Northeastern Region

Brown  
Calumet  
Door  
Fond du Lac  
Green Lake  
Kewaunee  
Manitowoc  
Marinette  
Marquette  
Menominee  
Oconto  
Outagamie  
Shawano  
Sheboygan  
Waupaca  
Waushara  
Winnebago

Western Region

Barron  
Buffalo  
Burnett  
Chippewa  
Clark  
Douglas  
Dunn  
Eau Claire  
Jackson  
La Crosse  
Monroe  
Pepin  
Pierce  
Polk  
Rusk  
St. Croix  
Trempealeau  
Vernon  
Washburn

Northern Region

Ashland  
Bayfield  
Florence  
Forest  
Iron  
Langlade  
Lincoln  
Marathon  
Oneida  
Portage  
Price  
Sawyer  
Taylor  
Vilas  
Wood

