Summary Report of 2006/2007 Influenza Season

Report produced: 11th January 2008

Summary

The 2006/2007-influenza season was the seventh year of influenza surveillance using computerised sentinel general practices in Ireland. The Health Protection Surveillance Centre (HPSC) is working in collaboration with the National Virus Reference Laboratory (NVRL), the Irish College of General Practitioners (ICGP) and the Departments of Public Health on this surveillance project.

Influenza activity was moderate in Ireland for most of the 2006/2007 season, with the peak of activity occurring during week 7 2006. Influenza A (H3) was the dominant type/subtype circulating this season. Influenza activity mainly affected the 15-64 year age group.

The most significant global event during the 2006/2007-influenza season was the continuing global spread of poultry outbreaks of avian influenza A (H5N1) associated with sporadic cases/clusters of human infection and a significant proportion of human deaths. [1]

Background to influenza surveillance in Ireland

Clinical Data

During the 2006/2007 season, 48 general practices were recruited to report electronically, on a weekly basis, the number of patients with influenza-like illness (ILI). ILI is defined as the sudden onset of symptoms with a temperature of 38°C or more, with two or more of the following: headache, sore throat, dry cough and myalgia. Cases were those attending for the first time with these symptoms. In total, the 48 sentinel general practices comprise 101.5 general practitioners and represent 4.0% of the national population. Practices were located in all HSE-Areas with the number of sentinel practices in each HSE-Area largely based on the population of the HSE-Area (table 1).

Table 1. Number of sentinel GPs by HSE-Area, percentage of total practice population and percentage of population in each HSE-Area, 2006/2007 season

HSE-Area	No. Practices	No. Practitioners	Patient population	% Patient population (n=171,659)	2006 census*	% Census population (n=4,239,848)	% Patient population (n=4,239,848)
HSE-E	14	28	40,479	23.6	1,499,705	35.4	2.7
HSE-M	1	2	2,950	1.7	251,664	5.9	1.2
HSE-MW	4	6	9,712	5.7	361,028	8.5	2.7
HSE-NE	5	15	27,000	15.7	394,098	9.3	6.9
HSE-NW	4	9	13,946	8.1	237,108	5.6	5.9
HSE-SE	7	19.5	43,038	25.1	460,838	10.9	9.3
HSE-S	9	17	27,084	15.8	621,130	14.6	4.4
HSE-W	4	5	7,450	4.3	414,277	9.8	1.8
Total	**48**	**101.5**	**171,659**	**100**	**4,239,848**	**100**	**4.0**

* Source: CSO 2006 population census

Virological Data

Sentinel GPs were requested to send a combined nasal and throat swab on at least one patient per week where a clinical diagnosis of ILI was made. Swabs were sent to the NVRL for testing for influenza using real-time PCR and results were reported to HPSC. The NVRL also reported the results of respiratory specimens (predominantly paediatric), referred mainly from hospitals, on a weekly basis.

Other Indicators of Influenza Activity

The Departments of Public Health reported an influenza activity index (no report, no activity, sporadic, localised, regional or widespread activity) every week, to HPSC. The activity index is analogous to that used by the European Influenza Surveillance Scheme (EISS) and the WHO global influenza surveillance system.[2, 3] The index is based on sentinel GP ILI consultation rates, laboratory-confirmed cases of influenza, and influenza/ILI outbreaks.

Each Department of Public Health also established one sentinel hospital in each HSE-Area, reporting total hospital admissions, accident and emergency admissions and respiratory admissions data on a weekly basis. Sentinel primary and secondary schools were also located in each HSE-Area in close proximity to the sentinel GPs, reporting absenteeism data on a weekly basis. Data from sentinel hospitals and schools were used as a crude indicator of influenza activity.

The Departments of Public Health also notified all cases of influenza and all influenza/ILI outbreaks to HPSC on a weekly basis (following the amendments to the infectious disease regulations (SI No. 707 of 2003)). An enhanced dataset on all hospitalised influenza cases aged between 0 and 14 years of age was also reported to HPSC by the Departments of Public Health. Influenza notifications, ILI/influenza outbreaks and the enhanced influenza dataset are all included in the computerised infectious disease reporting system (CIDR).

From January 2005, HPSC was notified of all registered deaths on a weekly basis from the General Registrar's Office, including influenza and pneumonia deaths.

Weekly Report and EISS

HPSC produce a weekly influenza report, which is posted on the HPSC website www.hpsc.ie each Thursday. Results of clinical and virological data are reported, along with a map of influenza activity and a summary of influenza activity worldwide. HPSC also report the clinical and virological dataset to the European Influenza Surveillance Scheme (EISS) every Thursday.

Results

It should be noted that influenza notifications and enhanced influenza data for the 2006/2007 season are provisional.

Clinical Data

Influenza activity in Ireland peaked slightly earlier in the 2006/2007 season, compared to the 2005/2006 season. Activity was moderate for most of the 2006/2007 influenza season, with a peak during week 7 2007, peaking at 67.6 per 100,000 population (figure 1). During the peak in ILI consultation rates, the majority of cases reported were in the 15-64 year age group. Figure 2 shows the age-specific GP ILI consultation rate per 100,000 population by week for the 2006/2007-influenza season. A total of 821 ILI cases were reported by sentinel GPs during the 2006/2007 season compared to 905 during the 2005/2006 season (figure 3).

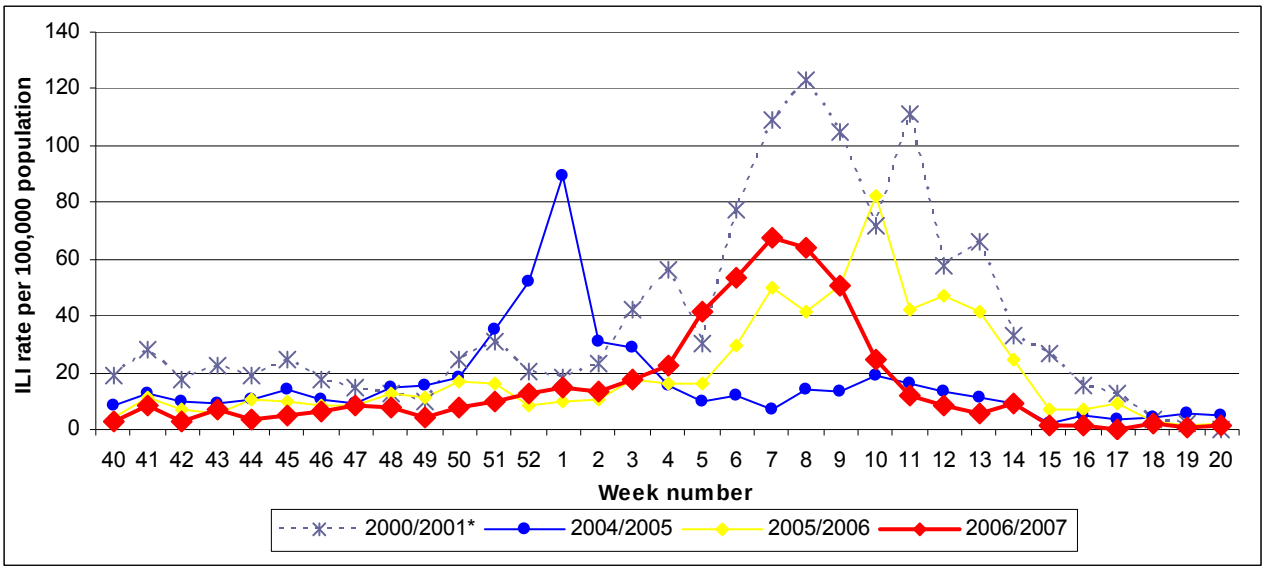

Figure 1. GP ILI consultation rate per 100,000 population by week during the 2000/2001*, 2004/2005, 2005/2006 and 2006/2007 influenza seasons. Please note that for comparison with previous years, data for week 52 2004 on this graph represents the average of weeks 52 and 53 2004. * Highest recorded ILI rates since the initiation of the sentinel surveillance system.

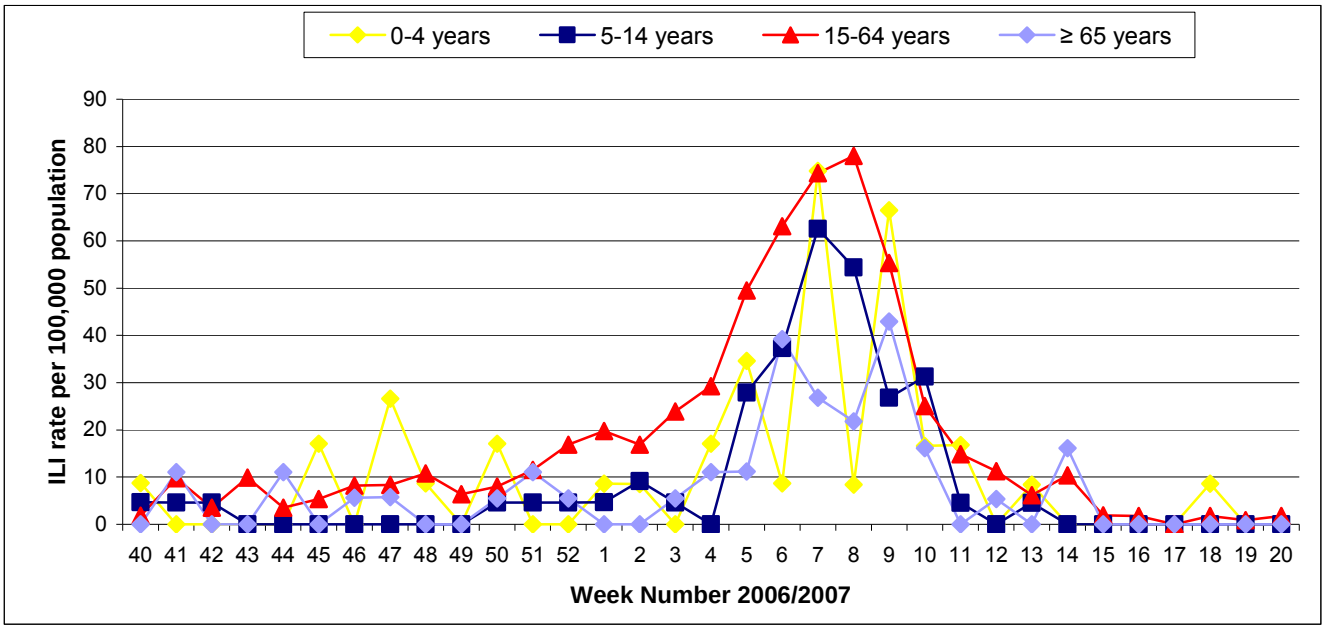

Figure 2. Age-specific[†] GP ILI consultation rate per 100,000 population by week for the 2006/2007-influenza season

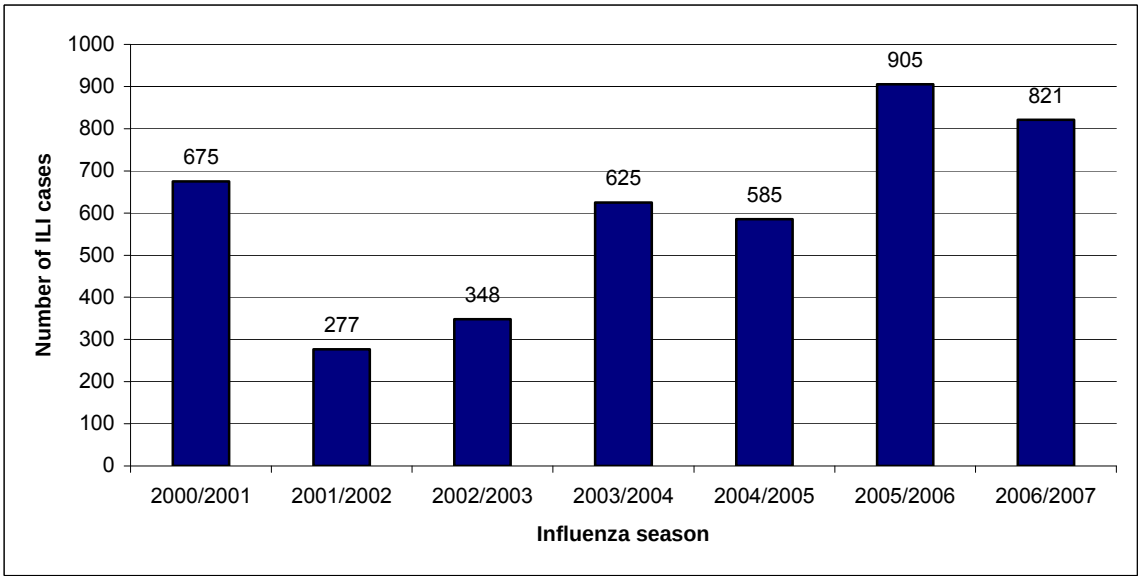

Figure 3. ILI cases reported by sentinel GPs by season[‡] from 2000/2001 to 2006/2007

[†] Please note the denominator used in the age-specific consultation rate is from the 2006 census data; this assumes that the age distribution of the sentinel general practices is similar to the national age distribution.

[‡] Please note when comparing the number of ILI cases reported per season that the number of sentinel practices has increased each season (see table 2).

Virological Data

The NVRL tested 351 sentinel specimens for influenza virus during the 2006/2007 season (tables 2 & 3). One hundred and twenty-six (35.9%) sentinel specimens were positive for influenza: 124 influenza A [119 A (H3), 2 A (H1) and 3 A (unsubtyped)] and two influenza B. The predominant influenza virus subtype identified was influenza A (H3), accounting for 96.0% of positive influenza A sentinel specimens. The majority of positive influenza sentinel cases were in the 15-64 year age group (82.4%) (figure 4). The NVRL also tested 1824 non-sentinel[§] respiratory specimens, mainly from hospitals. Of the 1824 specimens tested, 43 (2.4%) were positive for influenza A and 340 (18.6%) were positive for RSV. The majority of non-sentinel influenza (65.1%) and RSV (92.9%) positive specimens were aged between 0 and 4 years (table 4). It should be noted that non-sentinel specimens are predominantly from hospitalised paediatric cases.

The number of sentinel and non-sentinel positive influenza specimens by season is shown in figure 5, compared to the ILI rate per 100,000 population. Figure 6 shows the number of non-sentinel influenza and RSV positive specimens by week for the 2006/2007 season.

Table 2. Number of sentinel GP swabs tested and number and percentage positive for influenza by season

Season	Sentinel practices	Total specimens tested	Influenza	% Influenza positive	Influenza A	Influenza B
2000/2001	20	339	151	44.5	59	92
2001/2002	32	243	58	23.9	57	1
2002/2003	34	249	86	34.5	27	59
2003/2004	35	350	149	42.6	142	7
2004/2005	36	370	142	38.4	103	39
2005/2006	46	378	132	34.9	64	68
2006/2007	48	351	126	35.9	124	2
Total	**-**	**2280**	**844**	**37.0**	**576**	**268**

Table 3. Number of sentinel and non-sentinel[§] respiratory specimens and positive results for 2006/2007 season

Specimen Type	Total Specimens	No. Influenza Positive	% Influenza Positive	Influenza A	Influenza B	RSV	% RSV Positive
Sentinel	351	126	35.9	124	2	NA	NA
Non-Sentinel	1824	43	2.4	43	0	340	18.6
Total	**2175**	**169**	**7.8**	**167**	**2**	**340**	**15.6**

[§] Please note that non-sentinel specimens include all specimens referred to the NVRL, these specimens are mainly from hospitals and some GPs and may include more than one specimen from each case.

Table 4. Total number of sentinel and non-sentinel[§] influenza A and B positive specimens by age group (in years) for the 2006/2007 season

Age group (years)	Sentinel			Non-Sentinel			Total		
	Flu A	Flu B	Total	Flu A	Flu B	Total	Flu A	Flu B	Total
0-4	5	0	5	28	0	28	33	0	33
5-14	15	0	15	2	0	2	17	0	17
15-64	101	2	103	9	0	9	110	2	112
65+	2	0	2	4	0	4	6	0	6
Unknown	1	0	1	0	0	0	1	0	1
Total	**124**	**2**	**126**	**43**	**0**	**43**	**167**	**2**	**169**

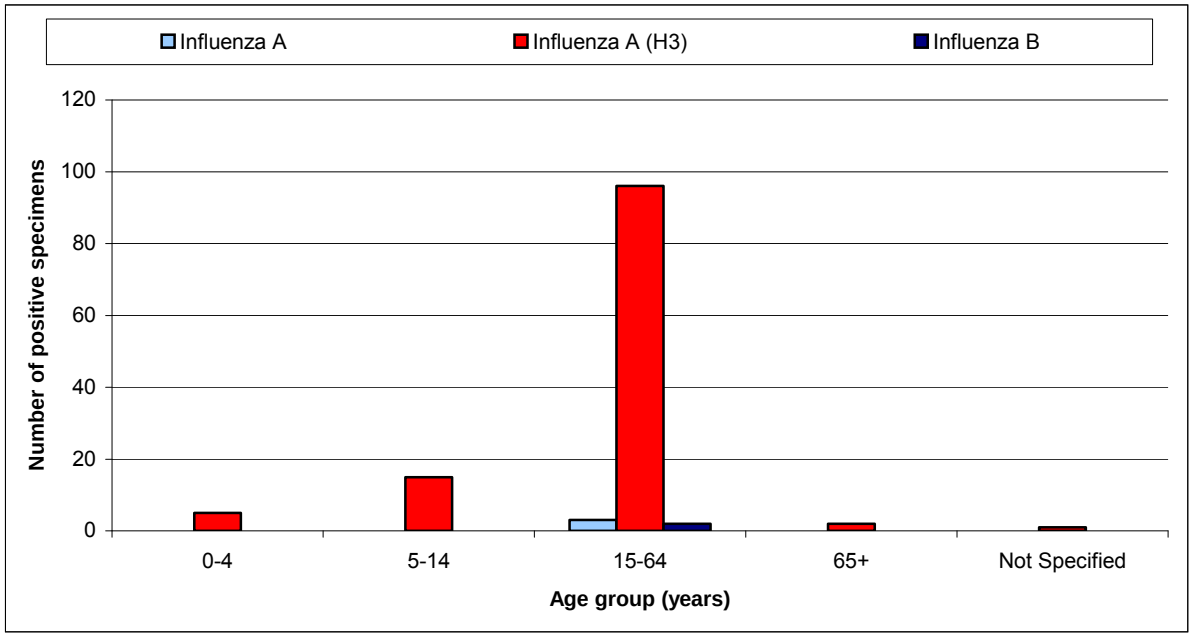

Figure 4. Number of sentinel swabs positive for influenza virus by type, subtype, and age group (years), for the 2006/2007 season

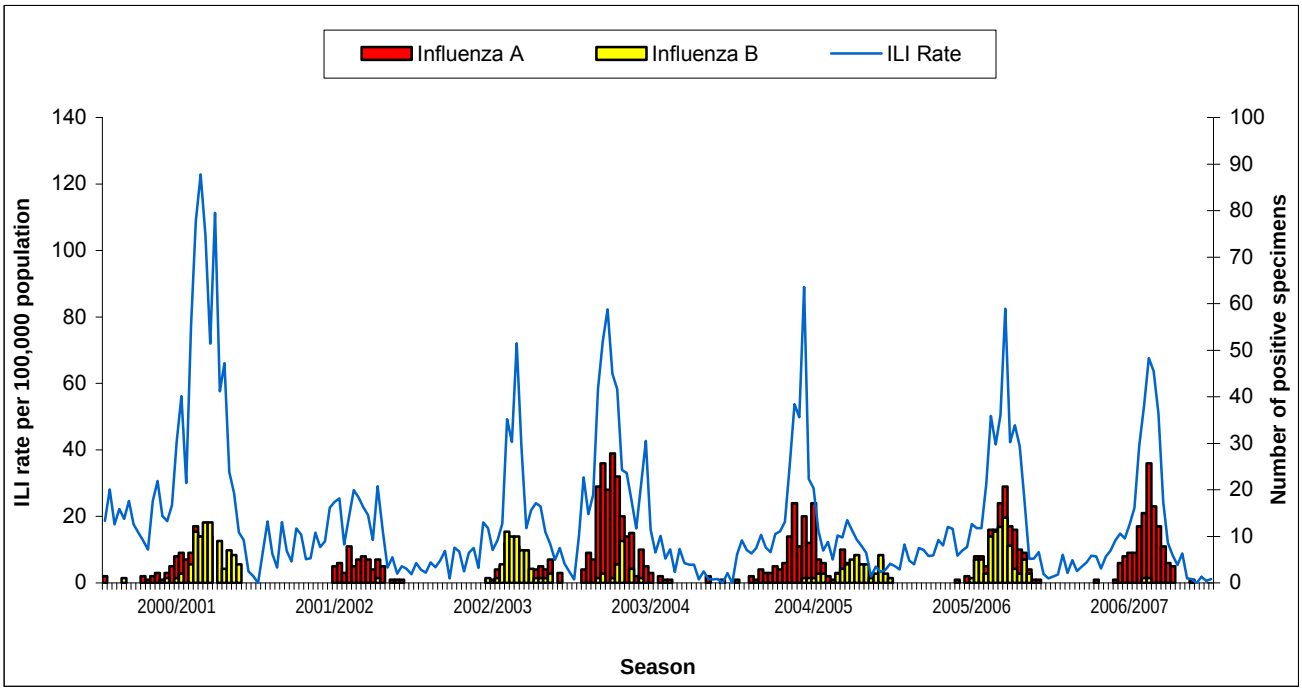

Figure 5: ILI rate per 100,000 population and the number of positive influenza specimens (sentinel & non-sentinel[§]) detected by the NVRL by season from 2000/2001 to 2006/2007

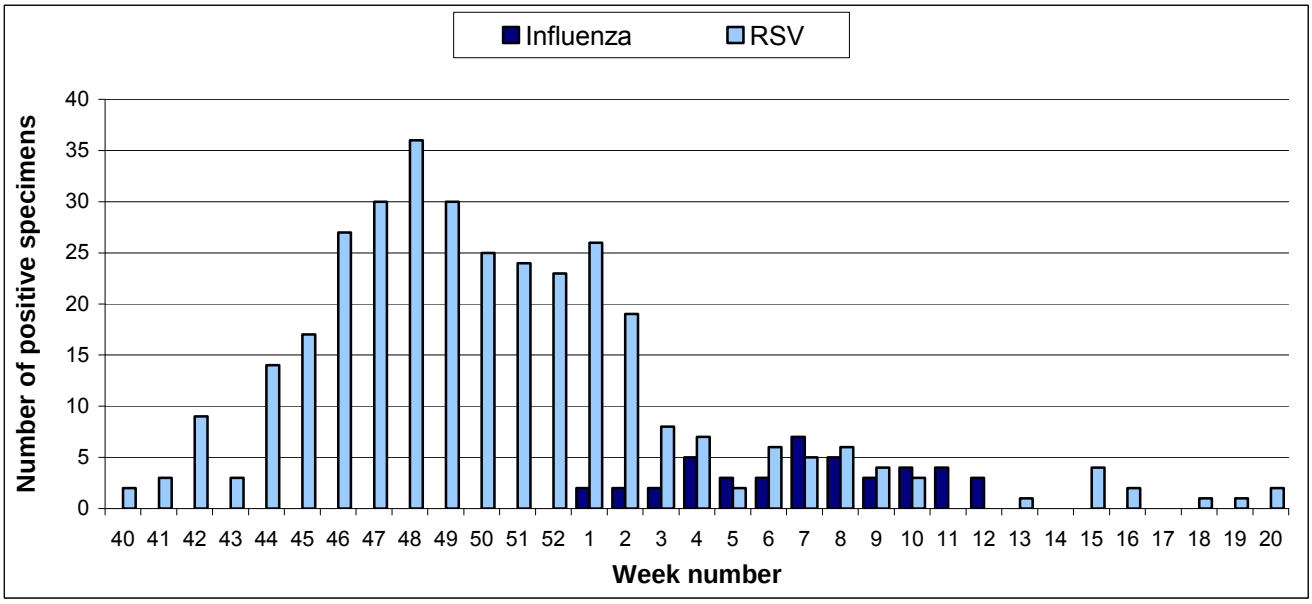

Figure 6. Number of influenza and RSV positive non-sentinel specimens detected during the 2006/2007 season

Vaccination Status

Of the 126 positive influenza virus detections from sentinel specimens, 106 (84.1%) were unvaccinated, 3 (2.4%) were vaccinated and vaccination status was unknown in 17 (13.5%) cases. Of the three cases that were vaccinated, influenza A (H3) was detected in all three (table 5).

Table 5: Influenza vaccination status of influenza virus positive cases detected from sentinel specimens during the 2006/2007-influenza season (n=126)

Influenza type/subtype	Vaccinated	Not Vaccinated	Unknown vaccination status	Positive cases
Influenza A (unsubtyped)	0	3	0	3
Influenza A (H1)	0	1	1	2
Influenza A (H3)	3	100	16	119
Influenza B	0	2	0	2
Total	**3**	**106**	**17**	**126**

Antigenic Characterisation

Four influenza A (H3) specimens were sequenced at the NVRL and antigenic characterisation was undertaken at the WHO laboratory (Mill Hill) in London. All four influenza A (H3) strains were antigenically similar to A/Wisconsin/67/2005 and A/Hiroshima/52/2005, both of which were vaccine strains recommended for the 2006/2007 influenza vaccine.

Regional Influenza Activity

Influenza A was the predominant influenza type detected in all HSE-Areas during the 2006/2007 season. Influenza B was only detected in HSE-SE during the 2006/2007 season (table 6). Influenza activity peaked during week 7 2007, with HSE-E, -MW, and -SE all reporting localised influenza activity. HSE-M, -NE, -NW, -S and –W all reported sporadic influenza activity during week 7 2007. Regional or widespread influenza activity were not reported by any HSE-Area during the 2006/2007 season (figure 7). Overall, influenza activity was most intense in HSE-E, -MW and -SE during the 2006/2007 season (figure 8). The highest ILI consultation rates were observed in HSE-M, peaking during week 6 2007[**].

Table 6. Total number of sentinel and non-sentinel[††] influenza A and B positive specimens by HSE-Area for the 2006/2007 season to date

HSE-Area	Sentinel			Non-Sentinel			Total		
	Flu A	Flu B	Total	Flu A	Flu B	Total	Flu A	Flu B	Total
HSE-E	35	0	35	23	0	23	58	0	58
HSE-M	1	0	1	5	0	5	6	0	6
HSE-MW	13	0	13	0	0	0	13	0	13
HSE-NE	14	0	14	1	0	1	15	0	15
HSE-NW	4	0	4	12	0	12	16	0	16
HSE-SE	22	2	24	1	0	1	23	2	25
HSE-S	22	0	22	1	0	1	23	0	23
HSE-W	13	0	13	0	0	0	13	0	13
Total	**124**	**2**	**126**	**43**	**0**	**43**	**167**	**2**	**169**

[**] It should be noted that rates for individual HSE-Areas may be based on small numbers and denominators and can vary substantially from week to week. The national ILI consultation rates are more likely to give a more consistent and accurate picture of influenza activity.

[††] Please note that non-sentinel specimens include all specimens referred to the NVRL, these specimens are mainly from hospitals and some GPs and may include more than one specimen from each case.

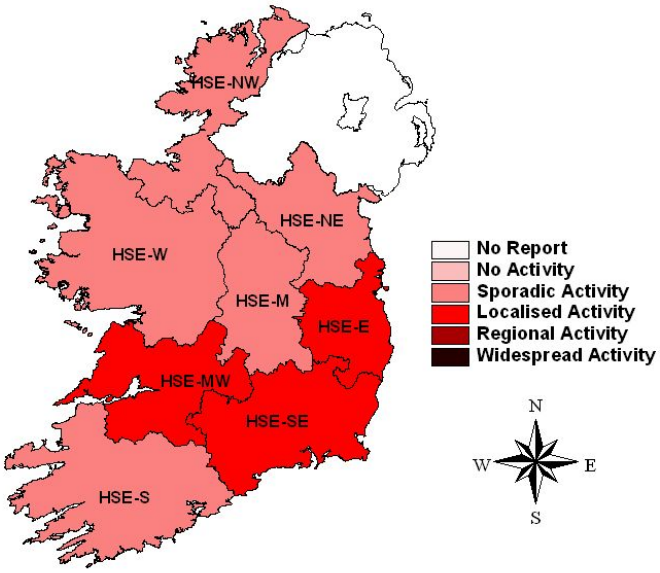

Figure 7. Map of influenza activity by HSE-Area during the 2006/2007 season peak of influenza activity, week 7 2007

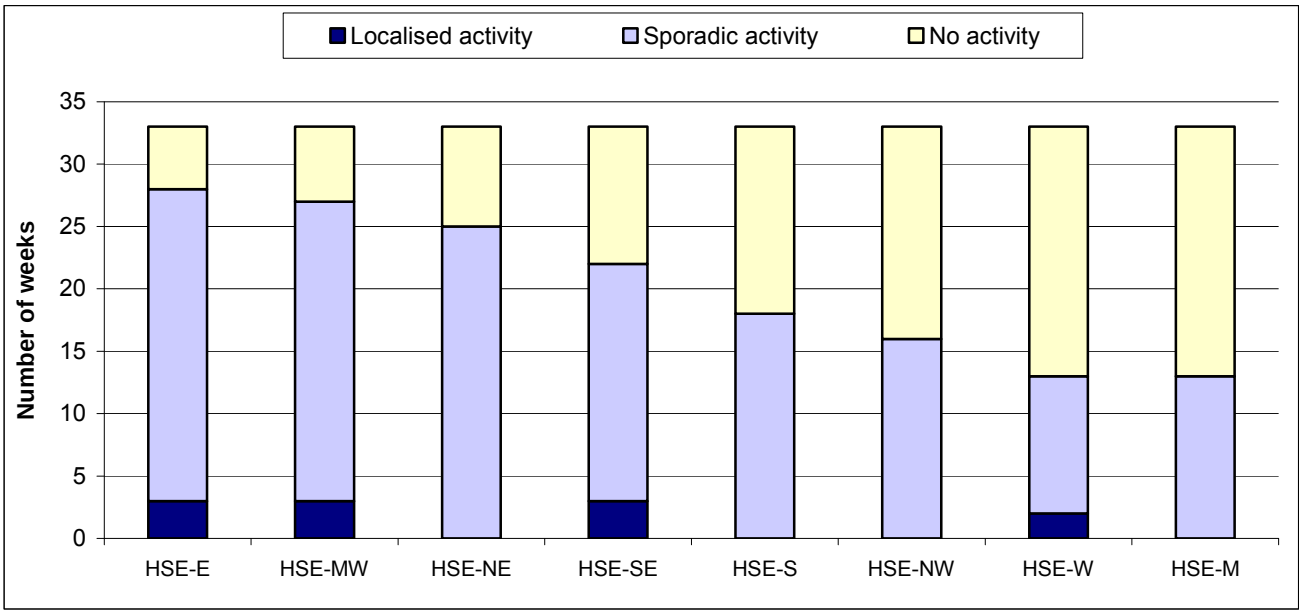

Figure 8. Number of weeks during the 2006/2007 season that each HSE-Area reported influenza activity

Outbreaks

During the 2006/2007 influenza season, no ILI/influenza outbreaks were reported to HPSC.

Sentinel Hospitals & Sentinel Schools

Hospital respiratory admissions (as a proportion of total hospital admissions) in sentinel hospitals peaked during week 52 2006, following the seasonal peak in RSV and during week 8 2007, one week after the peak in sentinel GP ILI consultation rates (figures 9 & 10). Absenteeism in several sentinel schools was also at elevated levels during the peak in ILI consultation rates.

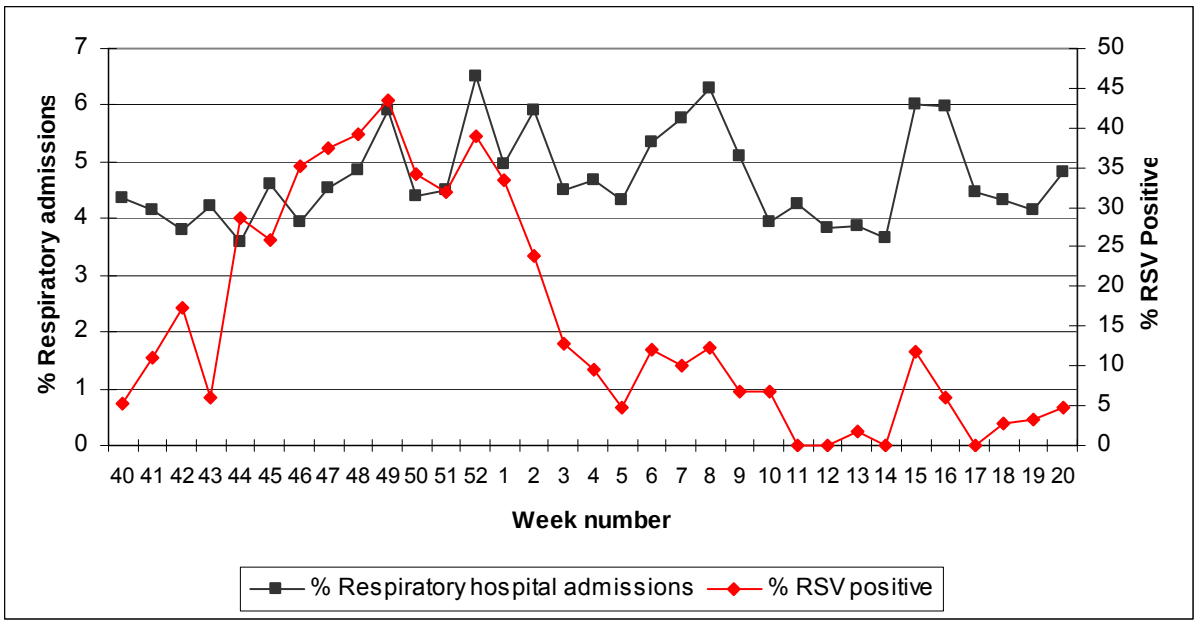

Figure 9. Respiratory admissions as a percentage of total hospital admissions in eight sentinel hospitals and RSV positive specimens (from non-sentinel sources) by week for the 2006/2007-influenza season.

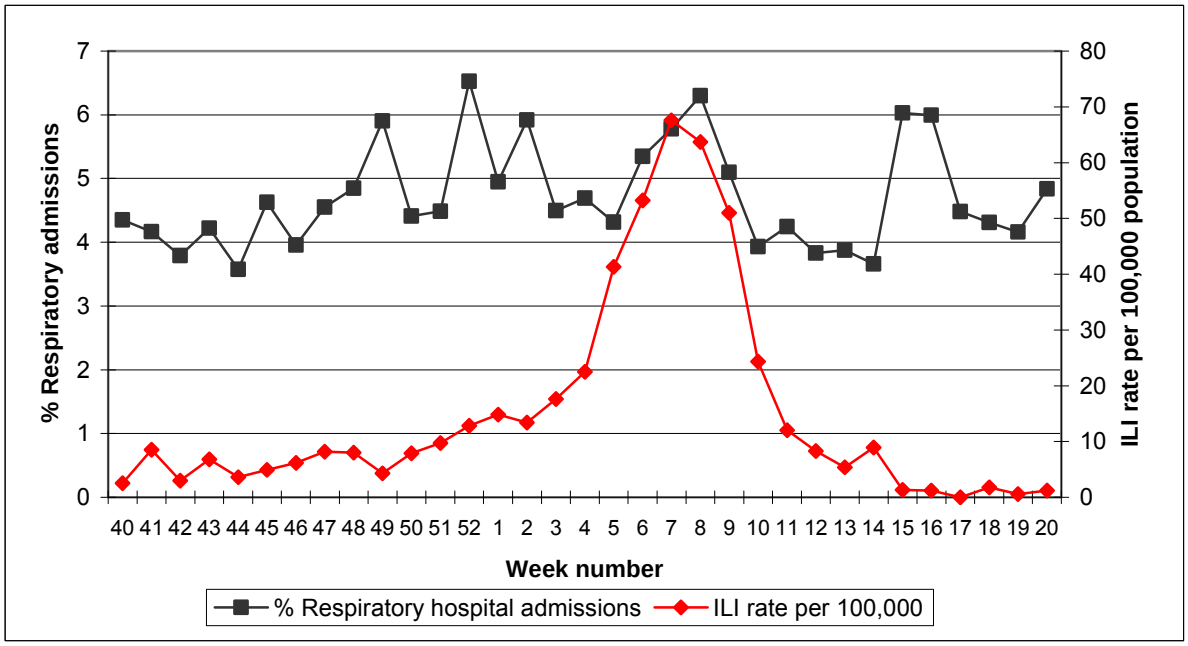

Figure 10. Respiratory admissions as a percentage of total hospital admissions in eight sentinel hospitals and GP sentinel ILI consultation rates per 100,000 population by week for the 2006/2007-influenza season.

Influenza Notifications Data

A total of 267 influenza notifications were reported to HPSC during the 2006/2007 influenza season. Fifty-five (20.6%) cases were in the 0-4 year age group, 21 (7.9%) were in the 5-14 year age group, 174 (65.2%) were in the 15-64 year age group and 16 (6.0%) cases were aged 65 years or older (date of birth was not provided for one case). Influenza notifications peaked during week 8 2007. The number of influenza notifications (possible & confirmed) by type and week of notification are shown in figure 10 and compared to the GP sentinel ILI consultation rate per 100,000 population.

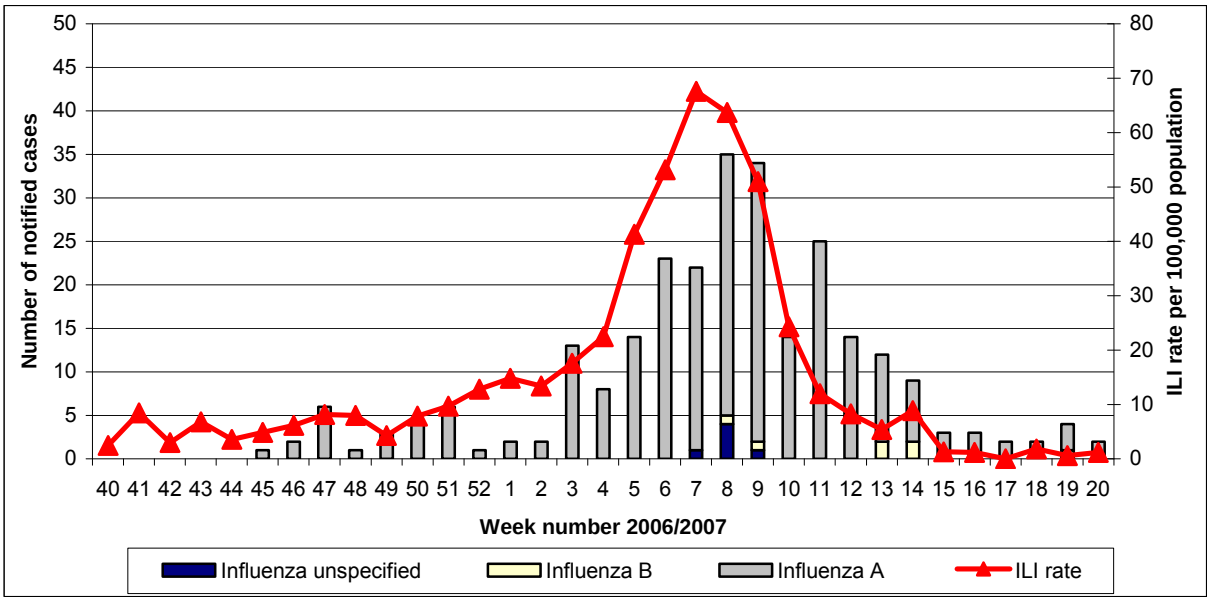

Figure 11. Number of notifications of influenza (possible & confirmed) by type and by week of notification* and ILI rates per 100,000 population during the 2006/2007 influenza season.******Please note that notification data are provisional and were extracted from CIDR on 06/12/207 15:35.*

Enhanced Influenza Surveillance

During the 2006/2007 season, a total of 267 influenza notifications were reported, 76 of which were aged between 0 and 14 years. Twenty-nine of these notifications were hospitalised patients aged between 0 and 14 years. Enhanced data were completed for 27 (93.1%; 27/29) of these cases. This compares to enhanced data received for 10 hospitalised influenza cases during the 2005/2006 season, all from HSE-E. During the 2006/2007 season, ten cases were admitted to hospital in January, seven in February and four in March 2007. Hospital admission date was unknown for six cases; these cases were all reported to HPSC during February and March 2007. Sentinel GP ILI consultation rates were at elevated levels during February 2007. Twenty-six cases were in the 0-4 year age group (19 of the 26 cases were less than one year of age) and one case was in the 5-14 year age group. Ten cases were notified from HSE-E, four cases from HSE-M, 12 cases from HSE-NW and one case from HSE-SE. Twenty-six cases were positive for influenza A and one stated organism unknown. Symptoms included fever (22/27), cough (19/27), gastrointestinal manifestations (12/27), fatigue (11/27) and sore throat (8/27). Complications included bronchitis, acute otitis media, secondary bacterial pneumonia, primary viral pneumonia, croup, liver dysfunction and other respiratory complications. The mean number of days in hospital was 5.3 (ranging from 1-32). Five cases were in at risk categories for influenza, none of whom

were vaccinated. Outcome was recorded in 21 cases, 16 of whom recovered and five where outcome was unknown.

Mortality Data

One death attributed to influenza was registered with the General Register Office during week 3 2007 (from HSE-MW). Influenza was the secondary cause of death and not the primary cause in this case. This death was registered during January 2007; however it occurred during January 2006.

Influenza Activity Worldwide

During the 2006/2007 season, the United Kingdom experienced the seventh consecutive year of low levels of influenza activity, peaking in mid-February 2007. The predominant circulating strain was A/Wisconsin/67/05 (H3N2)-like.[4]

The 2006/2007 influenza epidemic in Europe was characterised by moderate clinical activity. Seasonal influenza epidemics started around the New Year, with ILI consultation rates first increasing in Scotland, Greece and Spain. Spatial analysis revealed a significant south to north trend in the timing of influenza activity across Europe, similar to three of the eight preceding winters. Influenza activity was mainly associated with influenza A viruses (97%), except for Romania where 45% of the viruses were influenza B. Most influenza A viruses in Europe during the 2006/2007 season were of the H3 subtype (93% of the 8934 H-subtyped viruses). Of the 3877 antigenically and/or genetically characterised viruses, 3318 (86%) were closely related to the A/Wisconsin/67/2005 (H3N2)-like reference virus. Overall there was a good match between the vaccine virus strains and the reported virus strains.[2]

In Canada, ILI activity peaked during week 9 2007, with influenza A predominating. The National Microbiology Laboratory characterised 1,005 influenza viruses: 261 (26%) A/NewCaledonia/20/1999(H1N1)-like, 626 (62%) A/Wisconsin/67/05(H3N2)-like, 12 (1%) B/Malaysia/2506/2004-like and 106 (11%) B/Shanghai/361/2002-like. All but the B/Shanghai/361/2002-like strain were included in the composition of the 2006/2007 Canadian influenza vaccine. Three hundred and sixty-five paediatric hospitalisations were reported during the 2006/2007 season, the majority (84%) of which were due to influenza A. In addition, two paediatric deaths were reported, one due to influenza A and one due to influenza B.[5]

In the US, low levels of influenza activity were reported from October to mid-December 2006; activity increased during January, and peaked in mid-February 2007. Influenza A (H1) viruses were most commonly isolated during the 2006/2007 season; however A (H3) viruses were more frequently identified from early March to May 2007. A small number of influenza B viruses were also identified. CDC antigenically characterised 439 viruses as similar to A/New Caledonia/20/99 and 45 viruses showed reduced titers with antisera produced against A/New Caledonia/20/99 and were similar to A/Solomon Islands/3/2006. Two influenza A (H1) viruses showed reduced titers with antisera produced against both A/New Caledonia/20/99 and A/Solomon Islands/3/2006. Of the 289 influenza A (H3) viruses, 69 (24%) were characterised as similar to A/Wisconsin/67/2005 and 220 (76%) showed reduced titers with antisera produced against A/Wisconsin/67/2005. Two hundred and fifty-four (77%) of the 332 influenza B viruses that have been characterised belong to the B/Victoria lineage and 78 (23%) were identified as belonging to the B/Yamagata lineage.[6]

The most significant global influenza event during the 2006/2007 influenza season was the continuing spread of poultry outbreaks of avian influenza A (H5N1). As of August 20th 2007, 16 EU Member States (Austria, Bulgaria, Czech Republic, Denmark, France, Germany, Greece, Hungary, Italy, Poland, Romania, Slovakia, Slovenia, Spain, Sweden and the UK) have reported cases of highly pathogenic avian influenza A (H5N1) in wild birds/poultry. As of December 9th 2007, 337 human cases and 207 deaths (CFR: 61.4%) have been reported in 11 countries worldwide.[1]

The WHO announced its recommendations for the composition of the influenza vaccine for the northern hemisphere for 2007/2008 in February 2007. It was recommended that vaccines used in the 2007/2008 season (northern hemisphere winter) contain the following strains: A/Solomon Islands/3/2006 (H1N1)-like virus, A/Wisconsin/67/2005 (H3N2)-like virus (vaccine viruses include A/Wisconsin/67/2005 and A/Hiroshima/52/2005) and B/Malaysia/2506/2004-like virus.[7]

Discussion

Influenza activity was moderate in Ireland during the 2006/2007-influenza season, with 15-64 year olds being the main age group affected. Influenza A (H3) was the predominant circulating subtype. The A (H3) strains circulating matched the strains contained in this season's vaccine. Medium levels of influenza activity were also reported in most of Europe, Canada and the US during the 2006/2007 season.[2, 4, 5, 6]

Surveillance of hospital admissions data and school absenteeism data plays a significant role in monitoring influenza activity and planning health service requirements. This was demonstrated during the 2006/2007 season, with increased levels of admissions reported from sentinel hospitals following the seasonal peak in RSV and the peak in sentinel GP ILI consultation rates. The value of collating school absenteeism data as a crude indicator for influenza activity was also highlighted with increased absenteeism reported from several sentinel schools during the peak of influenza activity.

During the 2006/2007 influenza season, enhanced surveillance of influenza in hospitalised 0-14 year olds significantly improved. The high rate of completion of enhanced influenza forms for hospitalised paediatric cases was very encouraging. The enhanced dataset highlighted the significant morbidity associated with influenza in children e.g. otitis media, pneumonia and liver dysfunction. None of the children in at risk groups were vaccinated, re-iterating the need for health care professionals to promote influenza vaccine uptake in these groups.

The small number of influenza-attributed deaths reported to HPSC for the last few seasons is not unexpected. Excess deaths due to influenza are often not registered as influenza deaths.[8] [‡‡] Monitoring all cause deaths and influenza and pneumonia deaths is one method of identifying these influenza-non-attributed deaths and from this, estimating the mortality burden caused by influenza each season. A system that

[‡‡] The current best Irish national estimate of the number of deaths annually from influenza and its complications is 300-400 deaths per year and is based on extrapolation of studies done in the UK and the US. (Source: HPSC)

monitors all cause deaths and influenza and pneumonia deaths in Ireland is currently being developed which could prove to be a significant early warning tool and would be invaluable for health system response planning in the event of an influenza pandemic.

Avian influenza A (H5N1) outbreaks have posed a significant threat to human health since 2003. In a number of outbreaks, the virus has jumped from infected chickens or ducks directly to humans. These direct human infections have produced severe and sometimes fatal outcomes. The risk of virus transmission to humans from infected poultry will continue as long as poultry outbreaks are occurring. Of greatest concern is the risk that continuing transmission of the virus to humans will give avian and influenza viruses an opportunity to reassort their genes, thereby acquiring the ability to transmit easily from human-to-human and thus triggering a pandemic. Avian influenza A (H5N1) remains predominantly a disease of birds, with outbreaks spreading rapidly and widely and resulting in mass poultry culls. All evidence to date, has shown an association between human cases and close contact with dead or dying poultry. There has been no evidence of efficient human-to-human transmission. Human infections remain a rare event.[1]

However, with the ever-greater threat of a pandemic posed by influenza A (H5N1), EU Member States are strengthening their preparedness for a potential human influenza pandemic. As a result of this threat, a number of additional measures have been put in place in Ireland to improve surveillance of ILI/influenza. Work is in progress to increase the number of sentinel GPs, thereby improving geographical and population representation. Sentinel GPs are also currently monitoring ILI on a year round basis. In addition, influenza and all outbreaks became notifiable in Ireland on January 1st 2004 and an ILI/influenza specific outbreak reporting form was piloted during the 2006/2007 season. Reporting of such events is critical to early detection of influenza activity. Work is also in progress on an age denominator project, to assess the age profile of sentinel GP patient lists. Other activities that are being implemented to improve the surveillance of influenza include weekly surveillance of all cause mortality and mortality due to influenza and pneumonia, the construction of baseline and epidemic threshold levels for influenza activity and monthly surveillance of influenza vaccine uptake data in those aged 65 years and older. A national telephone-survey to estimate influenza and pneumococcal vaccine uptake and morbidity from ILI was completed for the 2005/2006 influenza season.[9] An evaluation of sentinel hospital admissions and school absenteeism data has also been completed and the recommendations are currently being implemented. Work has commenced on a pilot project involving the surveillance of ICU cases in the event of a pandemic. Contact and attendance data are also currently being collated from GP-co-operatives, to act as a crude indicator of influenza activity and a pilot project assessing the feasibility of using these data as an early warning tool has been completed by HSE-NE. Case based reporting of avian influenza is now operational on CIDR and an interim MS Access database is being developed for contacts of avian influenza cases. Data from these projects will in turn inform continuing national progress on pandemic preparedness and will be vital in the event of an influenza pandemic for planning and control measures.

Further information on influenza is available on the HPSC website at
http://www.ndsc.ie/hpsc/A-Z/Respiratory/Influenza/

Acknowledgements

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References

1. WHO Avian Influenza. Available at http://www.who.int/csr/disease/avian_influenza/en/
2. European Influenza Surveillance Scheme. Available at http://www.eiss.org/index.cgi
3. WHO global influenza surveillance programme. Available at http://www.who.int/csr/disease/influenza/en/
4. HPA National Influenza Season Summary 2006/2007. http://www.hpa.org.uk/infections/topics_az/influenza/seasonal/activity0607/reports/Season%20Summary%20200607.pdf
5. Health Canada. Flu Watch Canada. Available at http://www.phac-aspc.gc.ca/fluwatch/index.html
6. CDC. 2006/2007 U.S. Influenza season summary. Available at http://www.cdc.gov/flu/weekly/weeklyarchives2006-2007/06-07summary.htm
7. WHO. Recommended composition of influenza virus vaccines for use in the 2007/2008 influenza season. http://www.who.int/csr/disease/influenza/recommendations2007north/en/index.html
8. Curwen M, Dunnell, K, and Ashley, J. Hidden influenza deaths: 1989-90. *Population Trends*. 1990; 61:31-33.
9. Mereckiene J *et al*. Risk groups and uptake of influenza and pneumococcal vaccine in Ireland. Euro Surveill 2007; 12(12) [Epub ahead of print]. Available at www.eurosurveillance.org/em/v12n12/1212-227.asp

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