

Influenza Surveillance in Ireland – Weekly Report

Influenza Week 5 2013 (28th January – 3rd February 2013)



Feilimeannacht na Seibhíse Sláinte
Health Service Executive



 **Intensive Care Society of Ireland**

Summary

- **Influenza activity in Ireland increased during week 5 2013, compared to the previous week. Hospitalisations and outbreaks associated with influenza/influenza-like illness continue to be reported.**
 - The sentinel GP influenza-like illness (ILI) consultation rate was 62.2 per 100,000 population in week 5 2013, an increase compared to the updated rate of 48.0 per 100,000 during week 4 2013.
 - ◆ ILI rates are above the Irish baseline threshold (21.0 per 100,000 population).
 - ◆ ILI age specific rates were highest in the 5-14 year age group.
- The proportion of influenza-related calls to GP Out-of-Hours services remained stable during week 5 2013, compared to the previous week.
- Influenza positivity increased to 31.3% during week 5 2013, compared to 17.8% during the previous week. Fifty-seven influenza B, eight influenza A(H3) and five influenza A(H1)pdm09 positive specimens were reported from the NVRL for week 5 2013.
- Influenza B remains the dominant circulating influenza virus to date this season, accounting for 81.4% of all influenza positive specimens detected by the NVRL this season. Influenza A and B positivity increased during week 5 2013, compared to the previous week.
- Respiratory syncytial virus (RSV) positivity peaked during week 51 2012 and has decreased significantly since. RSV continues to circulate at low levels.
- Positivity levels for adenovirus, parainfluenza viruses and human metapneumovirus have remained at low levels this season.
- During week 5 2013, 16 confirmed influenza cases were reported as hospitalised, three associated with influenza A and 13 with influenza B. To date this season, 101 confirmed influenza cases were reported as hospitalised, 79.2% were associated with influenza B.
- Nine adult and four paediatric confirmed influenza cases have been admitted to critical care to date this season. Of these 13 cases, 10 were associated with influenza B, one with influenza A (H1)pdm09 and two with influenza A (unsubtyped). Thirty-two RSV* paediatric cases were also admitted to critical care this season.
- One confirmed influenza B-associated death was reported to HPSC to date this season.
- Three acute respiratory outbreaks were reported to HPSC during week 5 2013.
- Influenza activity continued to increase in week 4 2013 across Europe, although the epidemic may have passed its peak in some north-western countries.

*The majority of these RSV admissions to critical care were admitted during November and December 2012.

1. GP sentinel surveillance system

Clinical Data

During week 5 2013, 130 influenza-like illness (ILI) cases were reported from sentinel GPs, corresponding to an ILI consultation rate of 62.2 per 100,000 population, an increase compared to the updated rate of 48.0 per 100,000 in week 4 2013. Forty-six of 60 (76.7%) sentinel general practices provided data during week 5 2013, with 31 practices (67.4%) reporting ILI cases. The ILI consultation rates for week 5 2013 remained above the Irish baseline threshold (21.0 per 100,000 population)[†]. Figure 1 shows the ILI consultation rates, the baseline threshold rate and the number of positive specimens detected by the NVRL.

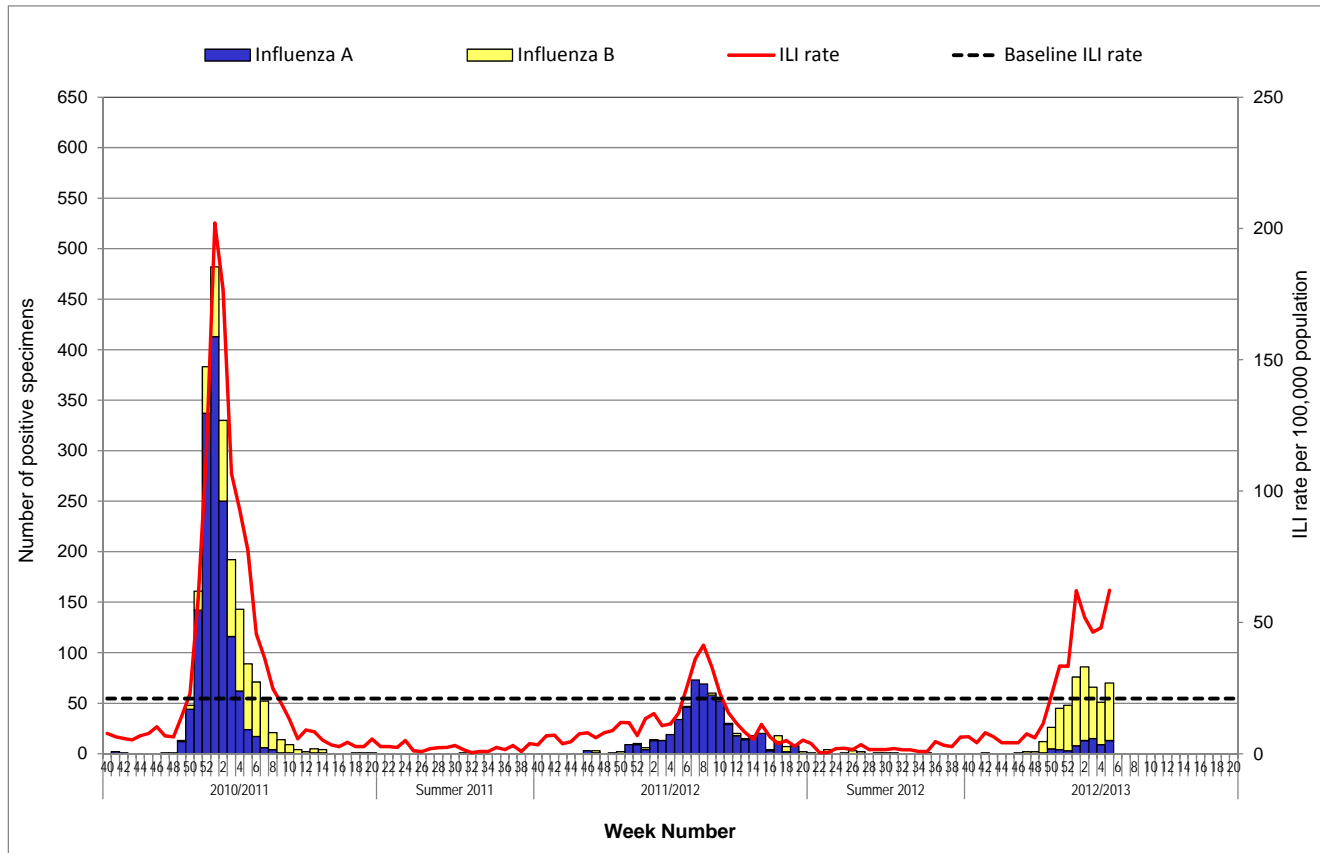


Figure 1. ILI sentinel GP consultation rates per 100,000 population, baseline ILI threshold rate, and number of positive influenza A and B specimens tested by the NVRL, by influenza week and season.

Source: Clinical ILI data from ICGPand virological data from the NVRL[‡]

ILI age specific rates were highest in the 5-14 year age group during week 5 2013, reaching 106.5 per 100,000 population, the highest age specific rate in any age group this season. During week 5 2013, three ILI cases were reported in the 0-4 year age group (18.6 per 100,000), 30 ILI cases were reported in the 5-14 year age group (106.5 per 100,000), 95 cases in the 15-64 year age group (68.4 per 100,000) and 2 ILI cases were reported in those aged 65 years and older (8.3 per 100,000) (figure 2).

[†] HPSC in consultation with the European Centre for Disease Prevention and Control (ECDC) have revised the Irish baseline threshold for the 2012/2013 influenza season to 21.0 per 100,000 population.

[‡] Sentinel GP consultations and virological data are updated on an ongoing basis, ILI rates and virological data are adjusted accordingly.

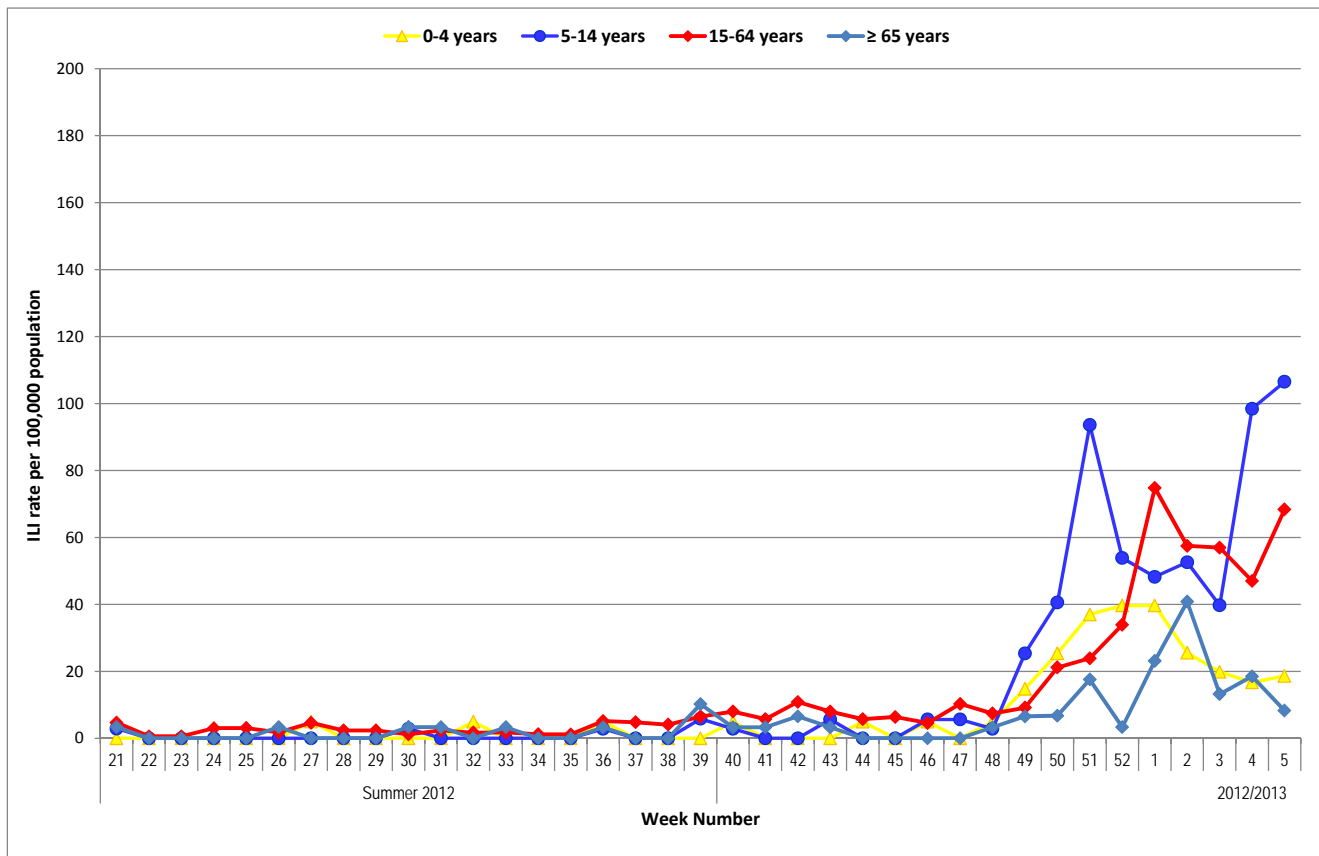


Figure 2: Age specific sentinel GP ILI consultation rate per 100,000 population by week during the summer of 2012 and the 2012/2013 influenza season to date. Source: ICGP ILI clinical data

2. Influenza and Other Respiratory Virus Detections - National Virus Reference Laboratory

The data reported in this section for the 2012/2013 influenza season refers to specimens tested by the National Virus Reference Laboratory (NVRL). The NVRL are now testing all sentinel and non-sentinel specimens for a panel of respiratory viruses: influenza A and B, respiratory syncytial virus (RSV), adenovirus, parainfluenza viruses types 1, 2, and 3 (PIV-1, -2 & -3) and human metapneumovirus.

During week 5 2013, a total of 224 specimens (48 sentinel and 176 non-sentinel[§] specimens) were tested by the NVRL. Seventy (70/224; 31.3%) sentinel and non-sentinel specimens tested positive for influenza virus during week 5 2013: 8 A(H3), 5 A(H1)pdm09 and 57 B. Thirty-two (32/48; 66.7%) sentinel specimens tested positive for influenza virus during week 5 2013: 2 A(H3), 2 A(H1)pdm09 and 28 B. Thirty-eight (38/176; 21.6%) non-sentinel specimens tested positive for influenza virus during week 5 2013: 6 A(H3), 3 A(H1)pdm09 and 29 B (tables 1 & 2).

Influenza B remains the dominant influenza virus circulating this season. Eighty-one percent (414/486) of all influenza positive sentinel and non-sentinel specimens detected by the NVRL this season were influenza B. Influenza A and B positivity increased during week 5 2013, compared to the previous week (figures 3 & 4).

[§]Please note that non-sentinel specimens relate to specimens referred to the NVRL (other than sentinel specimens) and may include more than one specimen from each case.

Influenza Virus Characterisation

The National Virus Reference Laboratory (NVRL) has genetically characterised seven influenza B viruses this season to date. Of these seven influenza B viruses, six were similar to the B/Yamagata lineage which is included in the 2012/2013 influenza vaccine and one was similar to the B/Victoria lineage which is not included in the vaccine. As part of the WHO Global influenza surveillance programme, a proportion of influenza viruses are submitted to the WHO Collaborating Centre for Reference and Research on Influenza (Mill Hill, London) for characterisation of influenza strains. These viruses have been submitted for further antigenic characterisation and confirmatory testing.

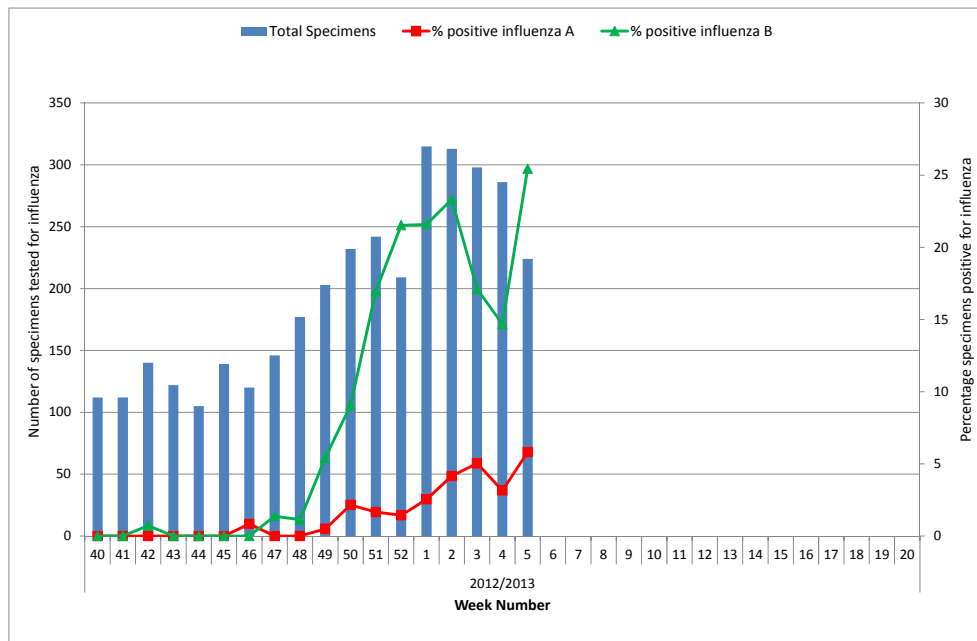


Figure 3: Number of sentinel and non-sentinel specimens tested for influenza and percentage influenza positive by week for the 2012/2013 influenza season. *Source: NVRL*

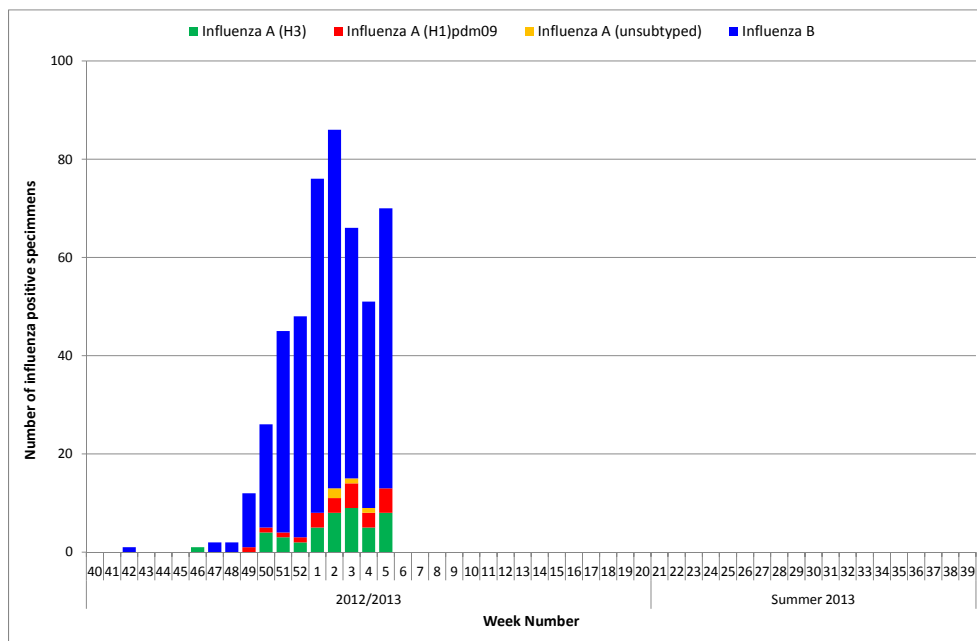


Figure 4: Number of positive influenza specimens by influenza type/subtype from sentinel and non-sentinel sources tested by the NVRL, by week for the 2012/2013 influenza season. *Source: NVRL*

Respiratory Syncytial Virus (RSV)

Respiratory syncytial virus (RSV) positivity reported from the NVRL (non-sentinel sources) decreased to 6.2% (11/176) during week 5 2013, compared to 9.1% during week 4 2013. RSV positivity peaked at 36.7% during week 51 2012 (figure 5). Sporadic cases of RSV have been detected this season from sentinel GP sources (table 2).

RSV was made notifiable in Ireland on 1st January 2012. During week 5 2013, 41 laboratory notifications of RSV were reported on Ireland's Computerised Infectious Disease Reporting System (CIDR). Laboratory notifications of RSV are reported in more detail in the [Weekly Infectious Disease Report for Ireland](#).

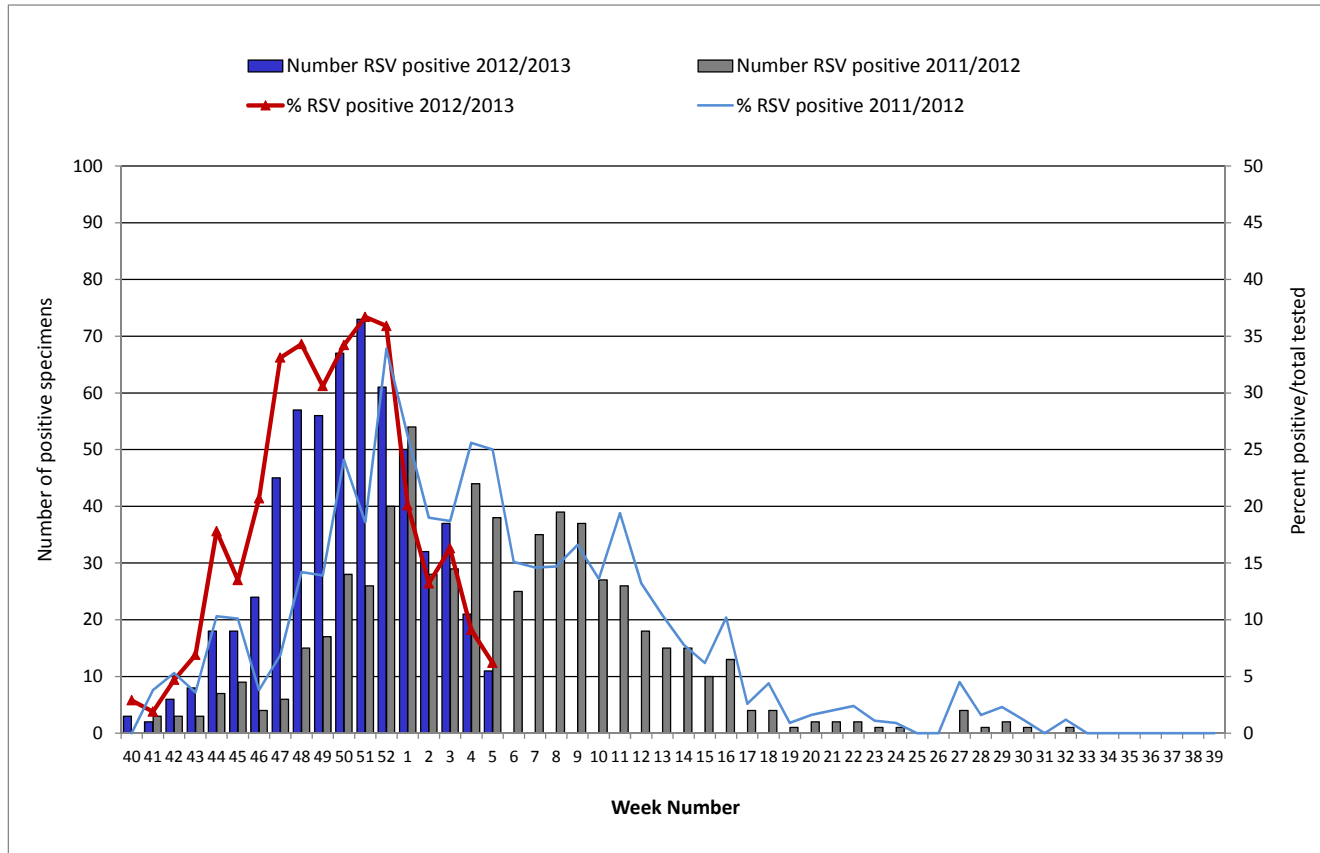


Figure 5: Number and percentage of non-sentinel RSV positive specimens detected by the NVRL during the 2012/2013 season, compared to the 2011/2012 season. Source: NVRL

Other Respiratory Viruses

Two parainfluenza virus (PIV) type 3 positive specimens were reported from the NVRL from non-sentinel sources during week 5 2013. One adenovirus and one hMPV positive detections were also reported from the NVRL from sentinel GP sources during week 5 2013 (table 2). Positivity levels for adenovirus, hMPV and parainfluenza viruses have remained at low levels this season.

Table 1: Number of sentinel and non-sentinel respiratory specimens tested by the NVRL and positive influenza results, for week 5 2013 and the 2012/2013 season to date. Source: NVRL**

| Week | Specimen type | Total tested | Number influenza positive | % Influenza positive | Influenza A | | | | Influenza B |
|------------------|---------------|--------------|---------------------------|----------------------|-------------|-----------|----------------|-------------------|-------------|
| | | | | | A (H1)pdm09 | A (H3) | A (unsubtyped) | Total influenza A | |
| 5 2013 | Sentinel | 48 | 32 | 66.7 | 2 | 2 | 0 | 4 | 28 |
| | Non-sentinel | 176 | 38 | 21.6 | 3 | 6 | 0 | 9 | 29 |
| | Total | 224 | 70 | 31.3 | 5 | 8 | 0 | 13 | 57 |
| 2012/2013 | Sentinel | 518 | 274 | 52.9 | 12 | 20 | 1 | 33 | 241 |
| | Non-sentinel | 2977 | 212 | 7.1 | 11 | 25 | 3 | 39 | 173 |
| | Total | 3495 | 486 | 13.9 | 23 | 45 | 4 | 72 | 414 |

Table 2: Number of sentinel and non-sentinel specimens tested by the NVRL for other respiratory viruses and positive results, for week 5 2013 and the 2012/2013 season to date. Source: NVRL

| Week | Specimen type | Total tested | RSV | % RSV | Adenovirus | % Adenovirus | PIV-1 | % PIV-1 | PIV-2 | % PIV-2 | PIV-3 | % PIV-3 | hMPV | % hMPV |
|------------------|---------------|--------------|------------|-------------|------------|--------------|----------|------------|----------|------------|-----------|------------|-----------|------------|
| 5 2013 | Sentinel | 48 | 0 | 0.0 | 1 | 2.1 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 2.1 |
| | Non-sentinel | 176 | 11 | 6.2 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 2 | 1.1 | 0 | 0.0 |
| | Total | 224 | 11 | 4.9 | 1 | 0.4 | 0 | 0.0 | 0 | 0.0 | 2 | 0.9 | 1 | 0.4 |
| 2012/2013 | Sentinel | 518 | 13 | 2.5 | 16 | 3.1 | 1 | 0.2 | 0 | 0.0 | 1 | 0.2 | 7 | 1.4 |
| | Non-sentinel | 2977 | 589 | 19.8 | 42 | 1.4 | 2 | 0.1 | 2 | 0.1 | 34 | 1.1 | 56 | 1.9 |
| | Total | 3495 | 602 | 17.2 | 58 | 1.7 | 3 | 0.1 | 2 | 0.1 | 35 | 1.0 | 63 | 1.8 |

** Please note that non-sentinel specimens relate to specimens referred to the NVRL (other than sentinel specimens) and may include more than one specimen from each case.

3. Regional Influenza Activity by HSE-Area

Influenza activity is reported on a weekly basis for each HSE area. Influenza activity is based on sentinel GP ILI consultation rates, laboratory confirmed influenza cases and ILI/influenza outbreaks.

Regional influenza activity was reported from HSE-S, -SE and -W, localised influenza activity was reported from HSE-E, -M, -MW and -NE and sporadic influenza activity was reported from HSE-NW during week 5 2013 (figure 6).

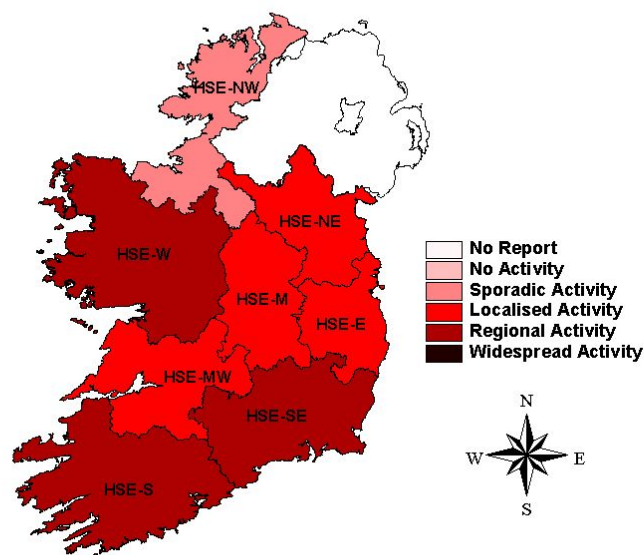


Figure 6: Map of provisional influenza activity by HSE-Area during week 5 2013

Sentinel hospitals

The Departments of Public Health have established at least one sentinel hospital in each HSE-Area, to report data on total hospital admissions, total emergency admissions and total respiratory admissions by age group on a weekly basis. Hospital admissions data act as a crude indicator for influenza activity.

Overall, the total number of respiratory admissions reported from sentinel hospitals was 229 during week 5 2013, a slight decrease compared to 258 during week 4 2013. It should be noted that data for week 5 2013 were incomplete. To date this season, hospital respiratory admissions peaked at 413 during week 50 2012 (figure 7).

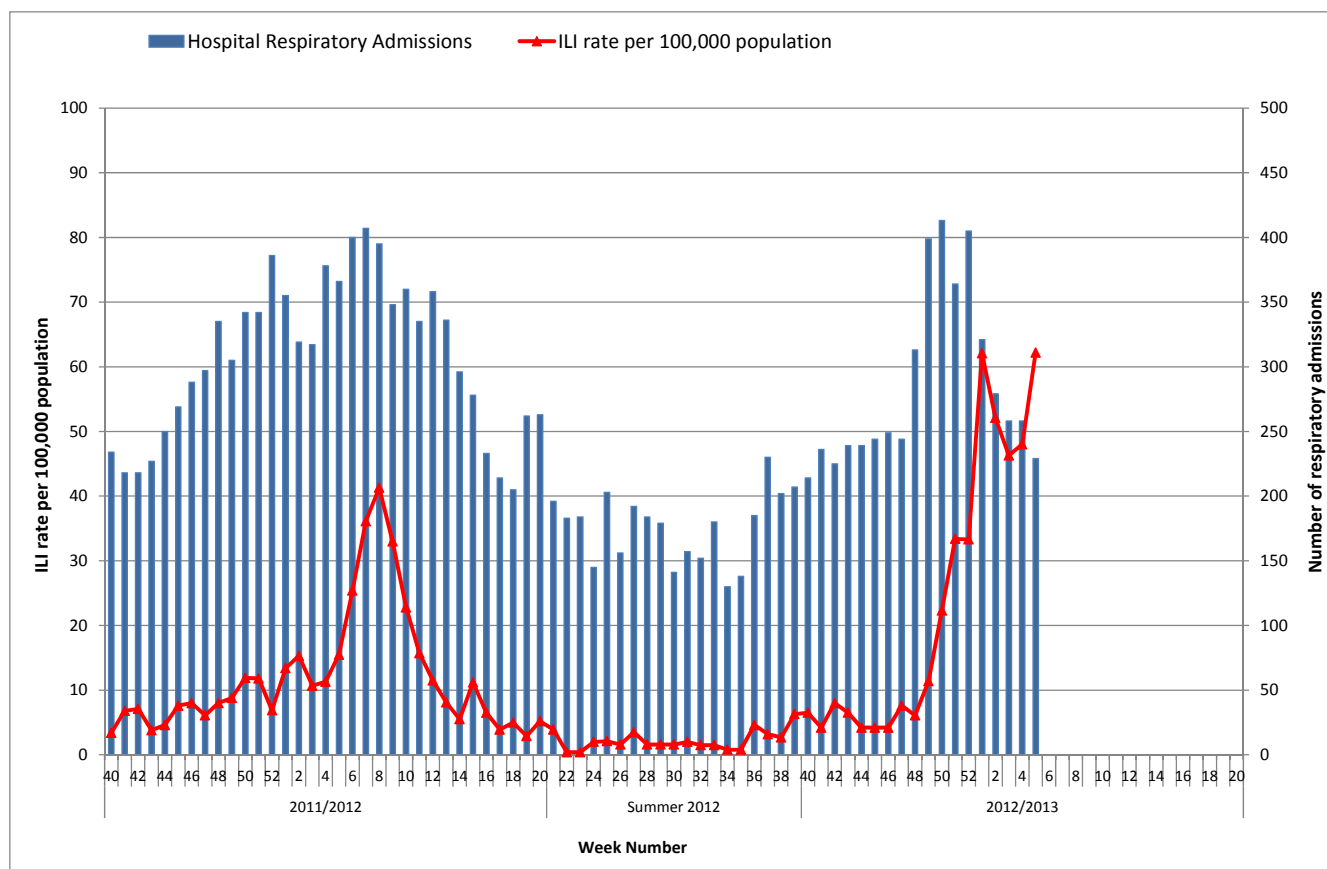


Figure 7: Number of respiratory admissions reported from sentinel hospitals and national sentinel GP ILI consultation rate per 100,000 population by week for the 2011/2012 season, summer 2012 and the 2012/2013 season to date.
 Source: Departments of Public Health - Sentinel Hospitals & ICGP.

4. GP Out-Of-Hours services surveillance

The Department of Public Health in HSE-NE is collating national data on calls to nine of thirteen GP Out-of-Hours services in Ireland. Clinical details from all calls are recorded. Records with clinical symptoms reported as flu or influenza are extracted for analysis. This information may act as an early indicator of increased ILI activity. However, data are self-reported by callers and are not based on coded influenza diagnoses.

The proportion of influenza-related calls to GP Out-of-Hours services during week 5 2013 remained stable at 4.2%, compared to 4.2% in the previous week. Six GP Out-of-Hours services reported during week 5 2013. To date this season, the proportion of influenza-related calls to GP Out-of-Hours services peaked at 6.0% during week 1 2013 (figure 8).

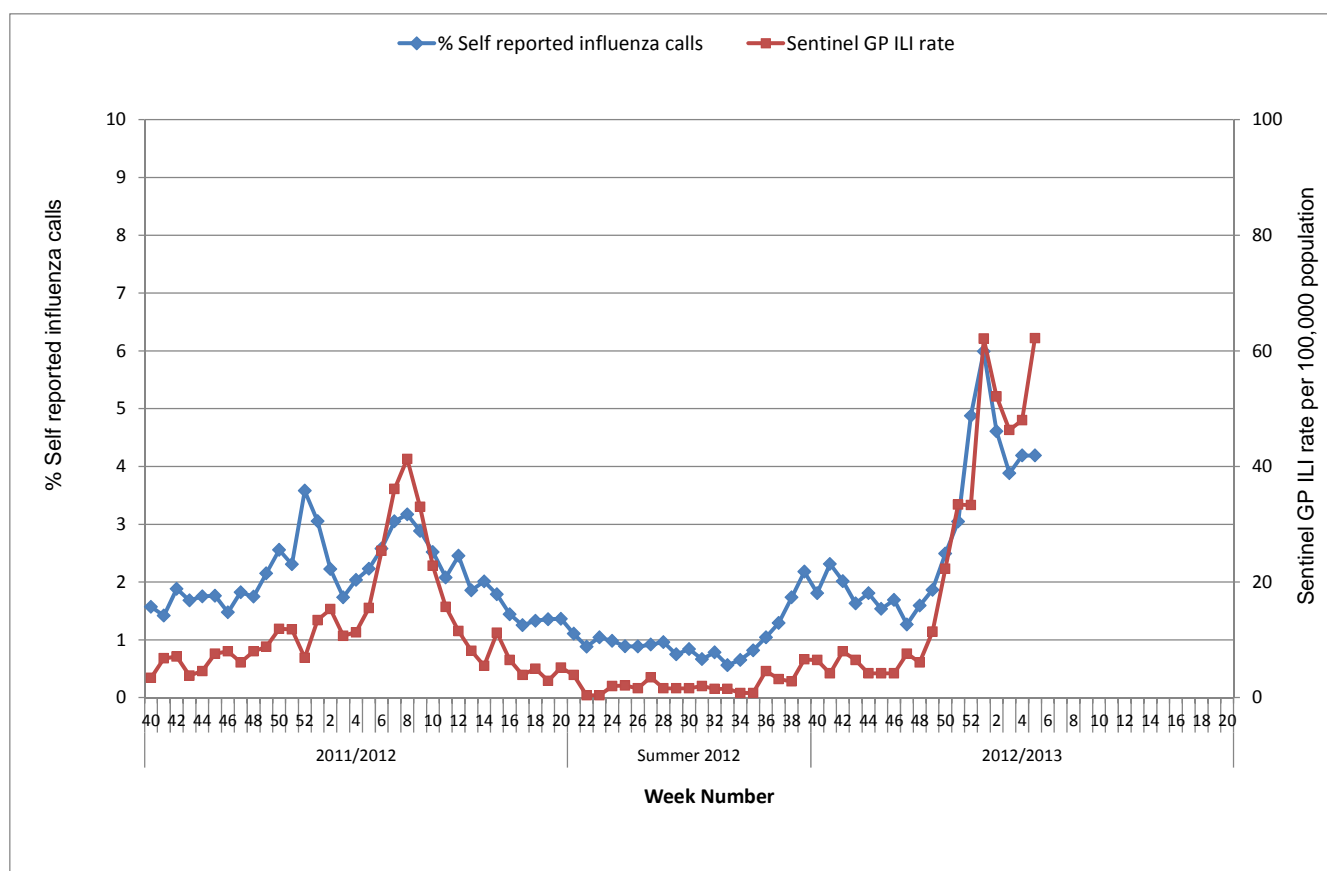


Figure8: Self-reported influenza-related calls as a proportion of total calls to Out-of-Hours GP Co-ops and national sentinel GP ILI consultation rate per 100,000 population by week for the 2011/2012 and 2012/2013 seasons
 Source: GP Out-Of-Hours services in Ireland (collated by HSE-NE) & ICGP.

5. Influenza notifications and hospitalisation status

Laboratory confirmed influenza cases notified on Ireland’s Computerised Infectious Disease Reporting System (CIDR) include all positive influenza specimens reported from all laboratories testing for influenza and reporting to CIDR. Currently, the NVRL is the only laboratory subtyping positive influenza A specimens for *all* influenza A subtypes.

Sixty-three laboratory confirmed influenza cases were notified during week 5 2013, 12 influenza A (4 A(H3), 6 A(H1)pdm09 & 2 A(untsubtyped)) and 51 influenza B. The number of confirmed influenza cases reported as hospitalised during week 5 2013 was 16, compared to 19 during week 4 2013. Of the 16 cases reported as hospitalised during week 5 2013, three were associated with influenza A (2 A(H1)pdm09 and 1 A(untsubtyped)) and 13 were associated with influenza B. To date this season, 101 confirmed influenza cases (80 influenza B, 10 influenza A (H3), 7 A (H1)pdm09 and 4 influenza A (untsubtyped)) have been reported as hospitalised, 79.2% of these cases were associated with influenza B.

6. Critical care surveillance

The Intensive Care Society of Ireland (ICSI) are continuing with the enhanced surveillance system set up during the 2009 pandemic, on all critical care patients with confirmed influenza. A study on severe acute respiratory infections (SARI) in critical care at two pilot ICU sites which commenced during the 2011/2012 season will continue during the 2012/2013 season. HPSC process and report on this information on behalf of the regional Directors of Public Health/Medical Officers of Health and ICSI.

To date this season, nine adult and four paediatric confirmed influenza cases have been admitted to critical care and reported to HPSC, ten were associated with influenza B, one with influenza A (H1)pdm09, and two influenza A (unsubtyped). Thirty-two RSV paediatric cases were also admitted to critical care this season. The majority (90.6%) of these RSV admissions to critical care were admitted during November and December 2012.

7. Mortality surveillance

One confirmed influenza B-associated death was reported to HPSC during week 5 2013. Influenza-associated deaths include all deaths where influenza is reported as the primary/main cause of death by the physician or if influenza is listed anywhere on the death certificate as the cause of death.

HPSC receives daily mortality data from the General Register Office (GRO) on all deaths from all causes registered in Ireland. These data have been used to monitor excess all-cause and influenza and pneumonia deaths as part of the influenza surveillance system and the European Mortality Monitoring Project (Euro MoMo). During week 5 2013, no excess all-cause mortality was reported in Ireland after correcting GRO data for reporting delays with the standardised EuroMOMO algorithm. However, during week 52 2012, excess all-cause mortality in those aged 65 years and older and excess mortality due to influenza and pneumonia were reported. These data are provisional due to the time delay in deaths' registration in Ireland. <http://www.euromomo.eu/>

8. Outbreak surveillance

Three acute respiratory outbreaks (one influenza A(H3), one ILI and one pathogen unknown), were reported to HPSC during week 5 2013. To date this influenza season, 16 acute respiratory outbreaks have been reported to HPSC, six with influenza B, two influenza A (H3), one associated with RSV, one hMPV and six associated with unidentified pathogens (three of which were not associated with influenza). The majority of these outbreaks have been associated with residential care facilities/long stay units for the elderly. It should be noted that family outbreaks are not recorded in this report.

9. International summary

United Kingdom

Indicators of influenza activity across England have remained stable compared to the previous week but outbreaks and hospitalisations continue to be reported. In week 4 2013, the weekly primary care ILI consultation rate decreased in England (11.1 per 100,000) and Northern Ireland (47.9 per 100,000), increased slightly in Scotland (40.5 per 100,000) and remained stable in Wales (10.5 per 100,000). In week 4 2013, the weekly proportion of NHS Direct calls for colds/influenza and fever (in 5-14 year olds) remained below their respective influenza thresholds of 1.6% and 11.7%. Nineteen acute respiratory disease outbreaks were reported during week 4 2013. Four had a virological result available (three influenza A(unsubtyped) and one B). 141 (16.3%) of the 867 respiratory specimens reported to DataMart (England) tested positive for influenza in week 4 (76 B, 25 A(H3), 33 A subtype not known and 7 A(H1N1)pdm09). The proportion of samples positive in DataMart (England) decreased slightly for RSV and remained stable for rhinovirus, hMPV, adenovirus and parainfluenza. Eight influenza positive detections were recorded through the two English GP-based sentinel schemes in week 4 (4 B and 4 A(H3)), giving a positivity of 22%. Thirty-eight new admissions to ICU/HDU with confirmed influenza (21 B, 15 A(subtype not known), six A(H1N1)pdm09 and four A(H3N2) were reported across the UK in week 4 2013. Seventy-five new hospitalised confirmed influenza cases were reported across England. In week 4 2013, excess all-cause mortality was reported in those 65 years and older in England and no excess was reported in Scotland, Wales and Northern Ireland. Since week 40 2012, the HPA has isolated and antigenically characterised forty-nine influenza A(H3N2) viruses, all similar to the A/Victoria/361/2011 vaccine strain, and five influenza A(H1N1)pdm09 viruses similar to the A/California/07/2009 vaccine strain. Of 72 influenza B viruses isolated, sixty-five (90%) belong to the B-Yamagata lineage, and are antigenically related to the influenza B vaccine strain, B/Wisconsin/1/2010, and seven (10%) to the B-Victoria lineage.

Europe

Influenza activity continued to increase in week 4 2013 across Europe, although the epidemic may have passed its peak in some north-western countries, such as Norway and the UK. Notable transmission of influenza began in Europe during week 49 2012, about six weeks earlier than during the 2011/2012 influenza season. For week 4 2013, approximately two-thirds of the 29 countries reporting indicated medium-intensity influenza transmission, wide geographic spread and increasing trends. The proportion of influenza-positive sentinel specimens was high (52%) during week 4 2013, representing an increase on week 3 2013 (45%). Since week 40 2012, an even distribution of influenza virus types was reported; 50% influenza A and 50% influenza B. Among influenza A viruses, an increasing proportion of A(H1N1)pdm09 over A(H3) has been reported during the past two weeks. Since week 40 2012, 714 hospitalised laboratory-confirmed influenza cases have been reported by eight countries, 19 of which had a fatal outcome. Of the 1,143 antigenic characterisations of influenza viruses reported for sentinel and non-sentinel specimens since week 40 2012, 649 (57%) have been characterised as A(H3)/Victoria/361/2011-like. Influenza A(H1N1)pdm09 viruses have continued to show genetic drift from the vaccine virus, A/California/07/2009, but the vast majority have remained antigenically similar. Of the 390 influenza B viruses ascribed to a lineage, 337 (86%) were B/Yamagata and 53 (14%) B/Victoria.

United States of America

During week 4 2013, influenza activity remained elevated in the United States, but decreased in some areas. The proportion of outpatient ILI visits was 4.2%; this is above the national baseline of 2.2%. Of 10,581 specimens tested and reported by collaborating laboratories, 2,701 (25.5%) were positive for influenza: 1053 A(H3), 54 A(H1N1)pdm09, 1034 A(untypable) and 560 B. The proportion of deaths attributed to pneumonia and influenza was above the epidemic threshold. Eight paediatric deaths were reported. A cumulative rate for the season of 25.9 laboratory-confirmed influenza-associated hospitalisations per 100,000 population was reported. Of all hospitalisations, more than 50% were among adults 65 years and older. CDC has antigenically characterised 920 influenza viruses to date this season: 66 (100%) influenza A(H1N1)pdm09 viruses were similar to the vaccine strain A/California/7/2009-like, 554 (99.6%) (H3N2) viruses were similar to the vaccine strain A/Victoria/361/2011-like, 211 (70.8%) influenza B viruses were similar to the vaccine strain B/Wisconsin/1/2010-like and 87 (29.2%) influenza B viruses were similar to the B/Victoria lineage of viruses.

Canada

In week 4 2013, several indicators of influenza activity decreased: the percentage of positive laboratory tests for influenza, the ILI consultation rate, the proportion of antiviral prescriptions, and the number of adult and paediatric influenza-associated hospitalisations. Many regions across Canada continued to report widespread and localised influenza activity and 104 new influenza outbreaks were reported. The ILI consultation rate decreased but continued to be above the expected range for this time of year. During the 2012/2013 season, all 269 influenza A(H3N2) viruses tested were antigenically similar to the vaccine strain A/Victoria/361/2011 and all 45 A(H1N1)pdm09 viruses tested were antigenically similar to the vaccine strain A/California/07/09. Among the influenza B viruses, 47 were antigenically similar to the vaccine strain B/Wisconsin/01/2010 (Yamagata lineage) and 11 were similar to B/Brisbane/60/2008 (Victoria lineage; component of the 2011/2012 seasonal influenza vaccine).

Worldwide

The WHO Global Influenza Programme monitors influenza activity worldwide and publishes an update every two weeks. The most recent update of 1st February 2013 stated that most indicators of influenza transmission began to decrease in North America, although continued to remain high regionally. Influenza A(H3N2) was the most commonly detected virus subtype. The United States of America reported a sharp increase in the number of pneumonia and influenza-related deaths among adults aged 65+ years. In Europe, increasing influenza virus detections were reported over recent weeks, however activity started to decrease in some countries in the northwest. The most commonly detected virus across the continent was A(H1N1)pdm09, while influenza B virus predominated in several countries of western Europe. In the temperate countries of Asia influenza virus

detections increased in recent weeks, while remained low in most of tropical Asia. Influenza activity in North Africa and the Middle East has declined overall, although a few countries reported increases. Influenza A(H1N1)pdm09 was the most commonly detected virus in the region. Low level activity was noted in most tropical countries, with slight increases observed in the Plurinational State of Bolivia and Paraguay. Influenza in countries of the southern hemisphere were currently at inter-seasonal levels

Human Avian Influenza and Novel Coronavirus Updates

Human Avian Influenza

WHO report monthly risk assessments on influenza at the human-animal interface (HAI). The latest summary on 16th January 2013, stated that 610 laboratory-confirmed human cases with avian influenza A(H5N1) virus infection have been officially reported to WHO between 2003 and 16th January 2013 from 15 countries, of which 360 died.

Novel Coronavirus

Information from WHO on novel coronaviruses can be found here: <http://www.euro.who.int/en/what-we-do/health-topics/communicable-diseases/influenza/coronavirus-infections>

2012/2013 seasonal influenza vaccine recommendations – WHO

The WHO vaccine strain selection committee recommended that vaccines for use in the 2012/2013 influenza season (northern hemisphere winter) contain the following:

- an A/California/7/2009 (H1N1)pdm09-like virus;
- an A/Victoria/361/2011 (H3N2)-like virus;
- a B/Wisconsin/1/2010-like virus.

Surveillance Systems

In order to monitor influenza activity in Ireland a number of surveillance systems are currently in place:

1. Irish College of General Practitioners (ICGP) GP sentinel surveillance system
2. Virological data from the National Virus Reference Laboratory (NVRL)
3. GP Out-of-Hours surveillance system
4. Influenza notifications reported on the Computerised Infectious Disease Reporting system (CIDR)
5. Enhanced surveillance of all hospitalised confirmed influenza cases aged 0-14 years
6. Intensive Care Society of Ireland (ICSI) enhanced surveillance of all critical care patients with confirmed influenza and enhanced surveillance of all severe acute respiratory infections (SARI) in two pilot ICU sites.
7. Outbreak reporting on CIDR
8. Network of sentinel hospitals reporting admission data

Further information on influenza in Ireland and internationally

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| Ireland | www.hpsc.ie |
| Northern Ireland | http://www.fluawareni.info/ |
| Europe – ECDC | http://ecdc.europa.eu/ |

Acknowledgements

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