



Public Health
England

Protecting and improving the nation's health

Surveillance of influenza and other respiratory viruses in the United Kingdom: winter 2014 to 2015

About Public Health England

Public Health England exists to protect and improve the nation's health and wellbeing, and reduce health inequalities. It does this through world-class science, knowledge and intelligence, advocacy, partnerships and the delivery of specialist public health services. PHE is an operationally autonomous executive agency of the Department of Health.

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Published May 2015
PHE publications gateway number: 2015046



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Executive summary

Moderate levels of influenza activity were seen in the community in the UK in 2014 to 2015, with influenza A(H3N2) the predominant virus circulating for the majority of the season, and influenza B circulating later in the season. The impact of H3N2 was predominantly seen in the elderly, with numerous outbreaks in care homes and levels of excess mortality significantly higher than the last notable significant H3N2 season of 2008 to 2009. Peak admissions to hospital and intensive care were higher than seen in the previous few seasons, but lower than the recent notable season of 2010 to 2011. The UK, as with many Northern Hemisphere countries has reported the emergence of A(/H3N2) strains this season that have been antigenically and genetically drifted from the 2014 to 2015 vaccine strain, A/Texas/50/2012, and more closely related to the A/Switzerland/9715293/2013 (H3N2) virus, the vaccine strain for the 2015 to 2016 season.

Influenza vaccine uptake in 2014 to 2015 in England was similar to recent seasons in the elderly (72.7%) and in healthcare workers (54.6%), though slightly lower in under 65 year olds in a pre-defined clinical risk group (50.3%). An increase was seen in pregnant women (44.1%) compared to 2013 to 2014 (39.8%). In 2014 to 2015, the universal childhood influenza vaccine programme with live attenuated influenza vaccine (LAIV) was offered to all two, three and four year olds in England, achieving an uptake of 38.5%, 41.3% and 32.9% respectively. For the pilot programme for children of primary and secondary school age (4 to 13 years) in England, an overall uptake of 53.2% was achieved. In Scotland, an uptake of 71.8% was achieved in primary school age children, in Northern Ireland an uptake of 79.7% also in primary school age children and in Wales, children aged 11 to 13 years were offered vaccine, achieving an uptake of 74.3%.

The UK mid-season overall adjusted vaccine effectiveness (VE) in preventing influenza A confirmed infection in primary care was low, likely reflecting the mismatch between circulating A(H3N2) viruses and the 2014 to 2015 Northern Hemisphere vaccine strain. Work continues to evaluate the impact of the LAIV programme in terms of both direct and indirect protection for the general population across the country of the UK. The importance of ensuring high uptake in target groups for the national influenza vaccination programme for the forthcoming influenza season remains.

Activity from other circulating seasonal respiratory viruses was similar to levels reported in recent years. Two novel respiratory viruses which emerged in 2012 to 2013, Middle East Respiratory Syndrome coronavirus (MERS-CoV) in the Middle East and avian-origin influenza A(H7N9) in Eastern China, have continued to result in human cases in affected countries in 2014 to 2015. There has also been an unprecedented number of human infections with avian influenza A(H5N1) reported in Egypt in 2015. Surveillance and public health measures established in the UK for travellers returning with severe respiratory disease from these regions are on-going while the risk remains.

Background

Surveillance of influenza and other respiratory viruses in the United Kingdom (UK) is undertaken throughout the year and collated by the Respiratory Diseases Department (RDD) of the PHE Centre for Infectious Disease Surveillance and Control, with regular outputs published during the winter season between October (week 40) and May (week 20) when influenza typically circulates¹. This is in collaboration with teams within PHE, with Health Protection Scotland², Public Health Wales³ and the Northern Ireland Public Health Agency⁴. A variety of data sources are collated to provide information on circulating influenza strains (including antigenic and genetic characterisation) and antiviral resistance monitoring, timing of influenza activity and to provide rapid estimates of burden within the community, on the health service and in relation to excess mortality. In addition, in-season and end-of-season monitoring of influenza vaccine uptake and effectiveness is undertaken.

Background information on the data sources covered in this report has previously been described⁵. The moving epidemic method (MEM)⁶ as used by the European Centre for Disease Prevention and Control to standardise reporting of influenza activity across Europe has been adopted by the UK and is publicly presented for GP influenza-like illness (ILI) consultation rates for each UK scheme. For the first time in 2014 to 2015, this has also been applied for the proportion of samples positive for influenza through the respiratory DataMart scheme.

Additionally in 2014 to 2015, the roll-out of a newly licensed live attenuated influenza vaccine (LAIV) has continued across the UK. LAIV was offered to all healthy two, three and four year olds through primary care in 2014 to 2015. Additional influenza vaccination activity for children of school age was carried out with strategies varying by country of the UK:

England: geographical pilots targeting children aged 4 to 11 years in primary schools and 11 to 13 years in secondary schools:

- Scotland: all primary school age children

¹www.hpa.org.uk/webw/HPAweb&HPAwebStandard/HPAweb_C/1287147913271

²www.hps.scot.nhs.uk/resp/index.aspx

³www.wales.nhs.uk/sites3/page.cfm?orgid=457&pid=34338

⁴www.publichealth.hscni.net

⁵Health Protection Agency. Surveillance of influenza and other respiratory viruses in the UK: 2011-2012 report. Available from

http://webarchive.nationalarchives.gov.uk/20140714084352/http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1317134705939

⁶Vega T, et al. Influenza surveillance in Europe: establishing epidemic thresholds by the Moving Epidemic Method. *Influenza and Other Respiratory Viruses* 2012. doi: 10.1111/j.1750-2659.2012.00422.x.

- Northern Ireland: all primary school age children
- Wales: all children age 11 to13 years

As well as influenza and typical circulating respiratory viruses, PHE carries out surveillance for novel respiratory viruses, including Middle East Respiratory Syndrome Coronavirus (MERS-CoV) which was first recognised in September 2012 and influenza A(H5N1) which emerged in South East Asia, with cases seen particularly now in Egypt and A(H7N9) which emerged in Eastern China in 2013. In addition, 2014 saw reports of severe respiratory illness associated with infection due to enterovirus D68 (EV-D68) in North America.

This report describes influenza activity experienced in the UK in the 2014 to 2015 season from week 40 2014 (w/c 29/09/2014) to week 15 2015 (w/c 12/04/2015), activity of other seasonal circulating respiratory viruses, observations from the newly introduced childhood influenza vaccination programme and commentary on UK surveillance work undertaken for novel respiratory viruses.

Observations

Influenza

Syndromic surveillance

National PHE syndromic surveillance systems, including GP in hours and out of hours consultations, sentinel emergency department attendances (EDSSS) and NHS 111 calls monitor a range of syndromic indicators sensitive to community influenza activity eg NHS 111 cold/flu calls and GP consultations for ILI.

Weekly acute respiratory infections presenting to emergency departments and GP out of hours services peaked during week 52 (Figure 1). Syndromic surveillance indicators for weekly GP ILI consultations peaked during week 52 2014 for GP out of hours, and week 1 2015 for GP in hours (Figure 2). NHS 111 calls for cold/flu symptoms peaked during week 52. Activity decreased in subsequent weeks, although it persisted until week 11 and then decreased towards seasonally expected levels.

Figure 1. Weekly all age acute respiratory infection ED attendances and GP out of hours consultations for winter 2014 to 2015, England

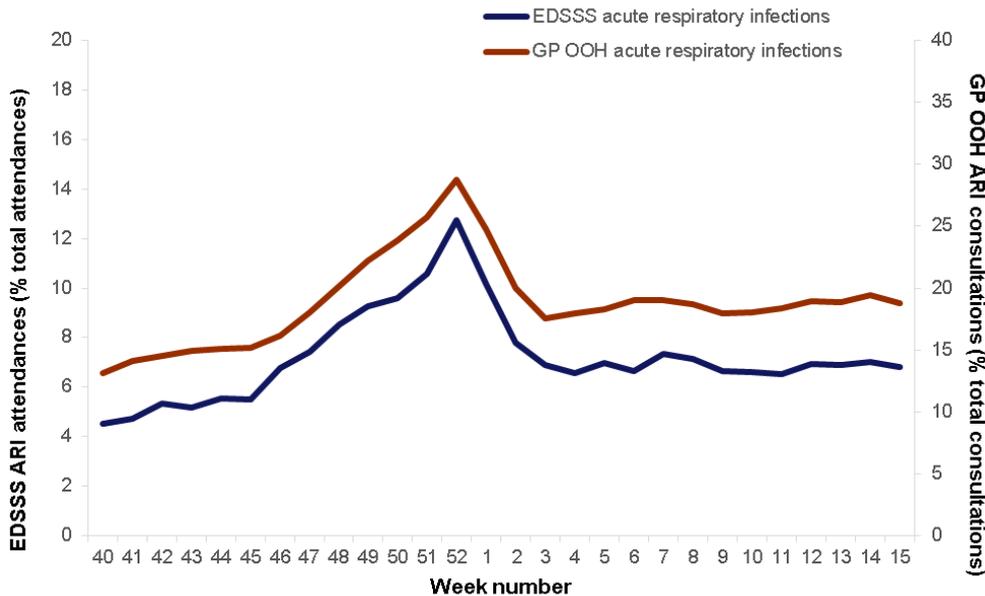
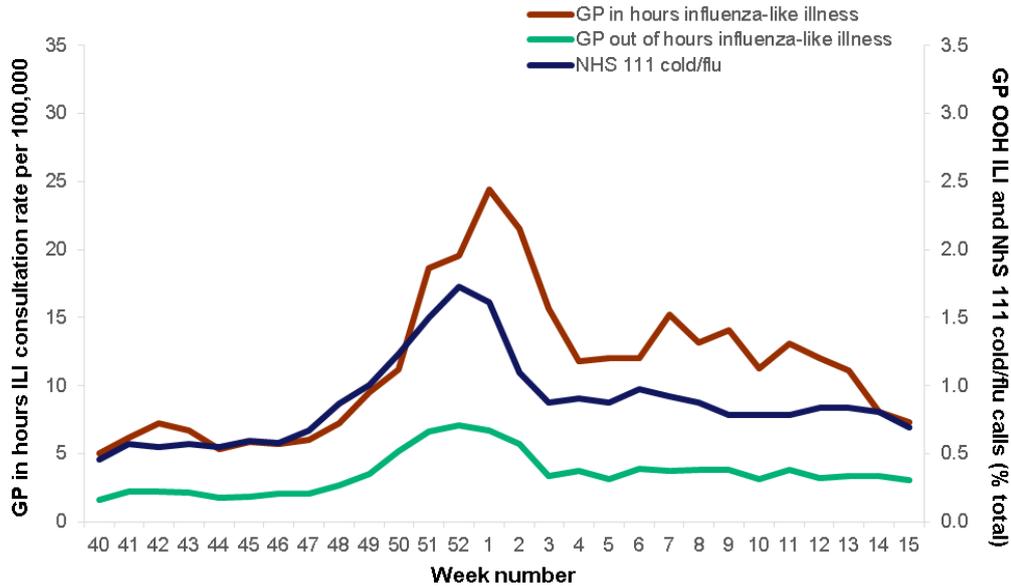
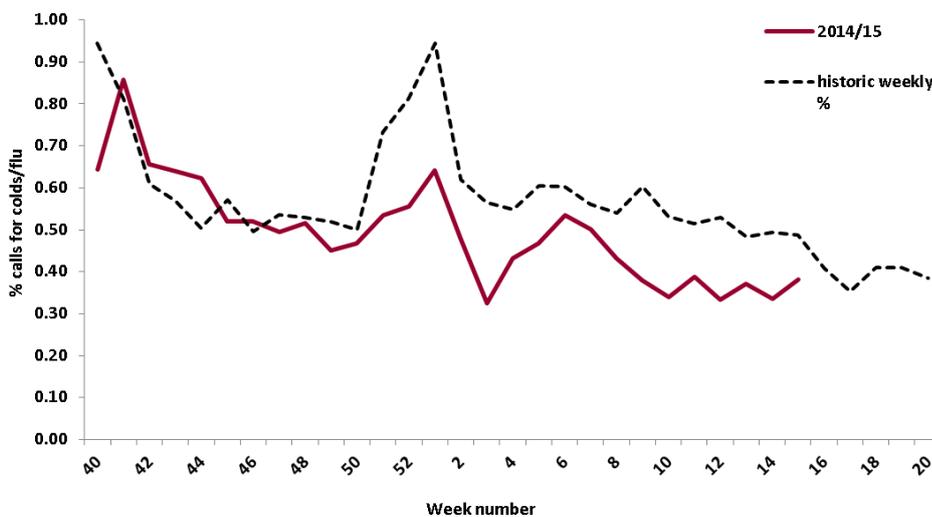


Figure 2. Weekly all age GP in hours and out of hours consultations for influenza-like illness and NHS 111 cold/flu calls for winter 2014 to 2015, England



The weekly proportion of all calls in Scotland to NHS 24 which mention cold/flu was high at the beginning of the season (0.86% in week 41 2014), but consequently declined to 0.45% by week 49 and remained at low levels for the rest of season, with a slight increase seen in weeks 1 2015 and week 6 2015 to 0.64% and 0.53%, respectively (Figure 3). The proportion of cold/flu calls for the season 2014 to 2015 stayed below historic levels (with the exception of weeks 41 to 46) as shown by the historic baseline in Figure 3.

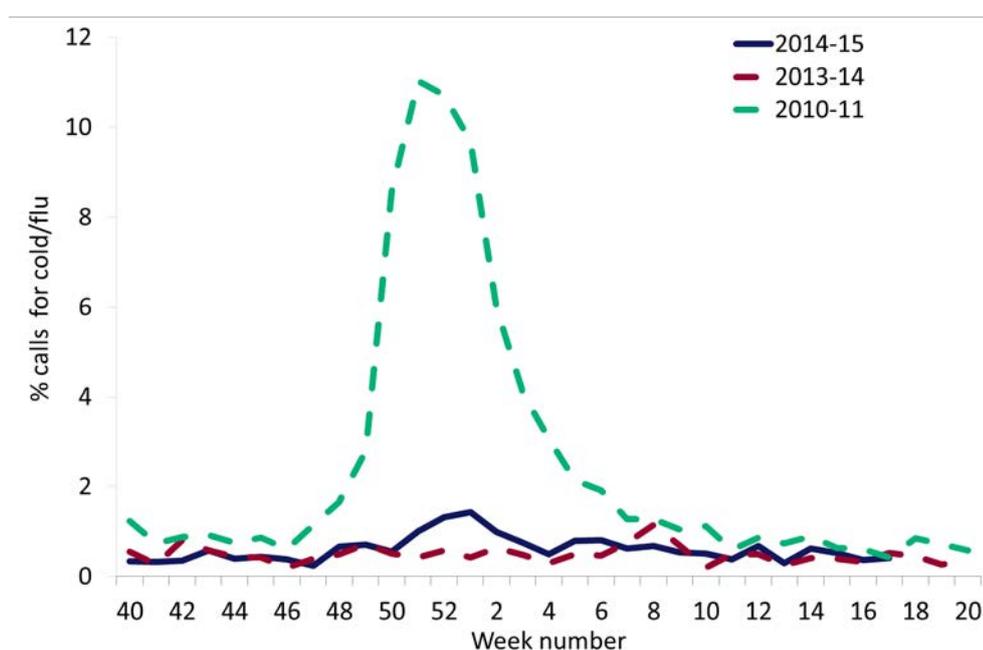
Figure 3. Proportion of calls for cold/flu (all ages) through NHS 24, Scotland, 2014 to 2015*



*The historic baseline is based on NHS 24 data collected from May 2011 to May 2014.

The weekly proportion of all calls in Wales to NHS Direct Wales which mention cold/flu was low at the beginning of the season (0.3% in week 40 2014), but subsequently increased and peaked at 1.4% during week 1 2015 (figure 4). For the remainder of the season there was a downward trend in the proportion of calls which were cold/flu, although smaller peaks were seen around weeks 5 to 6, week 12 and week 14. For the majority of the 2014 to 2015 season in Wales, the proportion of calls which were cold/flu was higher than the corresponding week in 2013 to 2014, although much lower than the proportions seen during the corresponding weeks in 2010 to 2011.

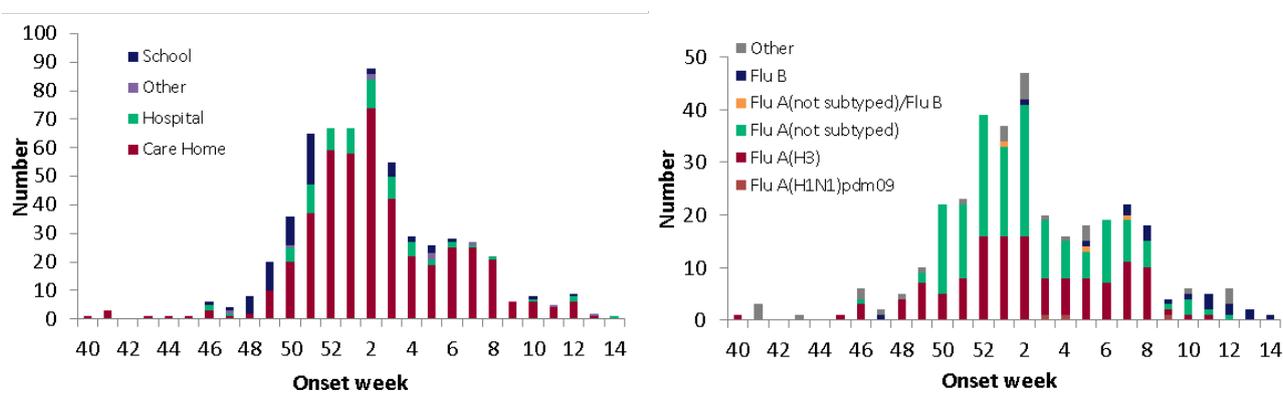
Figure 4. Weekly proportions of calls for cold/flu calls (all ages) to NHS-Direct, Wales, 2014 to 2015



Outbreak reporting

Between week 40 2014 and week 15 2015, 662 Acute Respiratory Illness (ARI) outbreaks in closed settings were reported in the UK (Figure 5A). 497 (75.1%) occurred in care homes, 81 (12.2%) in hospitals, 74 (11.2%) in schools and 10 (1.5%) in other settings. The week of onset information was available from 586 (88.5%) outbreaks. By week of onset, the peak occurred in week 2 2015 with 88 outbreaks, with the majority (74/88) reported from care homes. The peak period for hospital outbreaks occurred between week 51 2014 to week 3 2015 while the peak period for schools was between weeks 49 and 51 2014. Where information on virological testing and onset week were available, the majority of outbreaks were caused by influenza A(H3) or Influenza A(not subtyped), (283/334, 84.7% of outbreaks were caused by influenza A). 18 outbreaks were caused by influenza B (18/334, 5.4% of outbreaks were caused by influenza B) and 27 outbreaks by other non-influenza viruses. The distribution of the causative pathogen by onset week is shown in Figure 5B.

Figure 5. Weekly number of outbreaks by institution (A) and virological test results where available (B) by week of onset, 2014 to 2015 UK



The number of ARI outbreaks reported in Scotland in 2014 to 2015 up to week 15 2015 (54) was higher compared to previous influenza seasons (seven in 2013 to 2014, 34 in 2012 to 2013 and 16 in 2011 to 2012). The proportion of outbreaks in care home settings (70.4%) was higher than seen in the last two seasons (43.0% in 2013 to 2014 and 56.0% in 2012 to 2013) but was similar to the 2011 to 2012 season (75.0%). The majority of outbreaks were caused by influenza A(H3)/ or Influenza A(not subtyped), (36/54, 66.7%). Two outbreaks were caused by influenza B (2/54, 3.7%), one outbreak was caused by both influenza A(H3) and influenza B and two outbreaks by other non-influenza viruses. The week of onset information was available from 47 (87.0%) outbreaks. By week of onset, the peak occurred in weeks 5 and 6 2015 with seven outbreaks each,

In Wales, 31 community outbreaks of ARI were reported to the Public Health Wales Health Protection team. The proportion of these outbreaks occurring in nursing or residential home settings was 97.0%. The majority of outbreaks (93%), where laboratory confirmation data were available, were due to influenza A.

In Northern Ireland, 28 confirmed influenza outbreaks were reported in 2014 to 2015 up to week 18 2015, of which 26 were confirmed as influenza A (H3) and two as influenza B. This compares with a total of three outbreaks in 2013 to 2014 season and 35 in 2012 to 2013.

Community activity (telephone survey and internet-based surveillance)

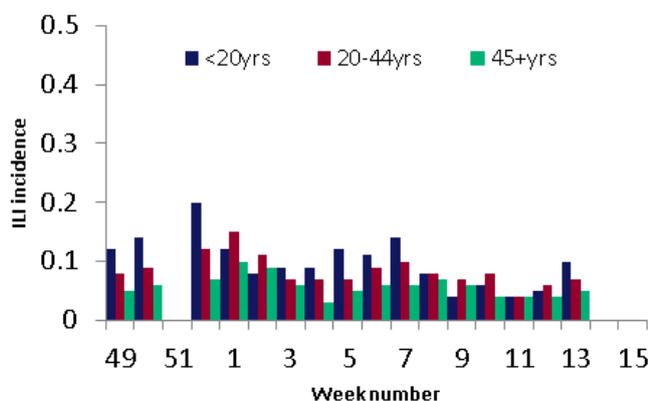
A two-staged cross-sectional telephone survey was organised by PHE to measure rates of respiratory illness in the community at the peak of the season. In addition, it was designed to measure the impact of the childhood vaccination programme by comparing respiratory disease in pilot and non-pilot areas in England, but also in Scotland and Wales, before and after peak influenza activity during the 2014 to 2015 season.

A repeat-stratified sampling of households in England, Scotland and Wales was undertaken using random digital dialling. Quota sampling was used on gender, age, region and work status to ensure representativeness with the general population. Background demographic, influenza vaccination status, underlying health conditions and household composition information were collected from the primary respondent aged 18+ at recruitment together with information on household members. Self-reported influenza-like-illness and health-seeking behaviour was collected post peak influenza activity.

A total of 1,242 respondents and their households were recruited during the pre-season survey of whom 1,005 (80.9%) were successfully re-contacted during the post peak survey. Data was available for at least 2,884 individuals, 492 of which were <18 years old. The crude clinical attack rate for two weeks at the time of peak activity for influenza-like-illness (ILI) according to the WHO ILI case definition (fever >38 degrees Celsius, cough/sore throat and sudden onset of symptoms) was 4.0%.

Flusurvey is an EU-funded project run by the London School of Hygiene and Tropical Medicine, providing internet-based surveillance of ILI in the UK population. During the 2014 to 2015 season, the proportion of online Flusurvey participants reporting ILI peaked in week 52 2014 in under 20 year-olds (Figure 6).

Figure 6. Proportion of Flusurvey registered participants reporting ILI by week and age group, UK, 2014 to 2015*



*Data not available for week 51 2014.

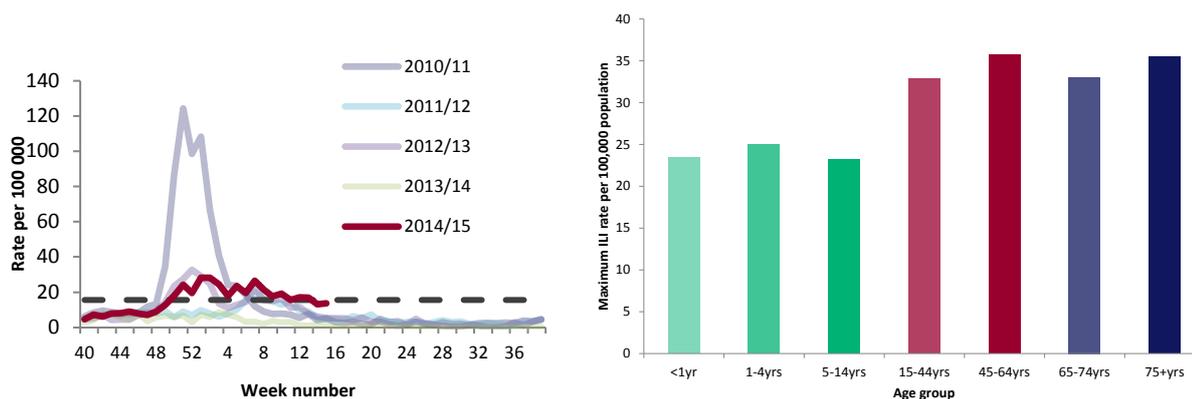
General Practitioner consultations

Weekly rates of General Practitioner (GP) consultations for influenza-like illness (ILI) through the Royal College of General Practitioners (RCGP) scheme⁷ went above the Moving Epidemic Method (MEM) threshold of 15.6 per 100,000 population in week 50 2014, peaking in weeks 1 and 2 at 28.3 per 100,000. Rates remained at or above the threshold until week 14 2014 (Figure 7).

When compared to previous seasons, the peak in activity was similar to 2012 to 2013 when influenza A(H3N2) last circulated and was considerably lower than the last notable season of 2010 to 2011 when A(H1N1)pdm09 was the predominant circulating subtype.

By age group, activity peaked at a higher level in adults compared to children, with the highest levels seen in 45 to 64 year olds (35.7 per 100,000 in week 1 2015) and 75+ year olds (35.5 per 100,000 in week 3 2015)(Figure 7).

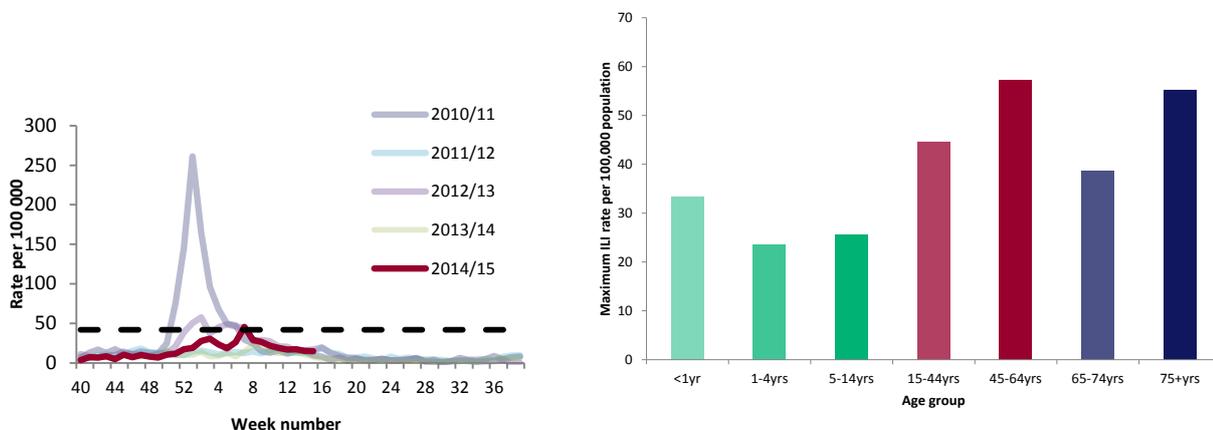
Figure 7. Weekly all age GP influenza-like illness rates for 2014 to 2015 and past seasons, and peak rates by age group in 2014 to 2015, England and Wales (RCGP)



In Scotland, ILI rates increased above the MEM threshold of 41.7 per 100,000 only in week 7 2015, peaking at 45.4 per 100,000. This peak was slightly lower than seen in 2012 to 2013. By age group, the highest levels of activity were, as for England, seen in 45 to 64 year olds (57.3 per 100,000 in week 7 2015) and in 75+ year olds (55.2 per 100,000 in week 7 2015)(Figure 8) similar to England.

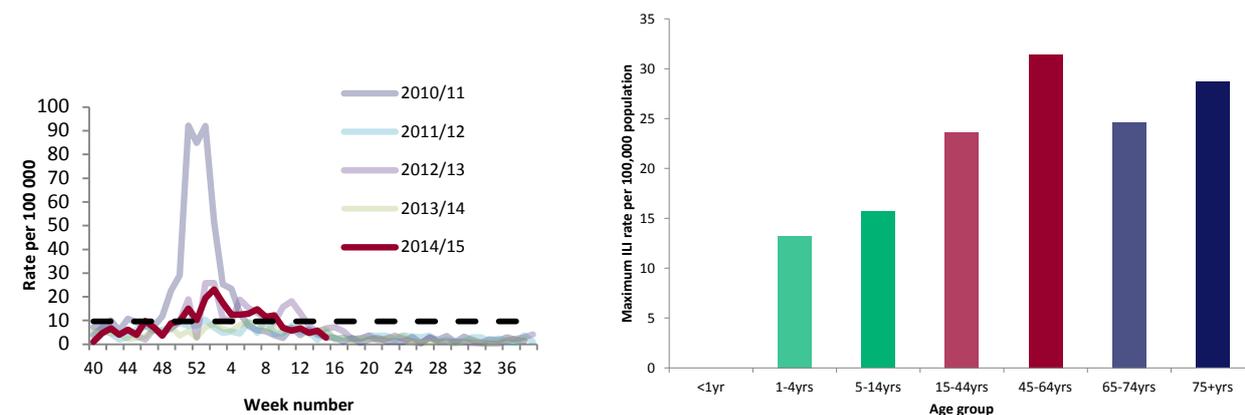
⁷Royal College of General Practitioners Research and Surveillance Centre www.rcgp.org.uk/clinical-and-research/our-programmes/research-and-surveillance-centre.aspx

Figure 8. Weekly all age GP influenza-like illness rates for 2014 to 2015 and past seasons, and peak rates by age group in 2014 to 2015, Scotland



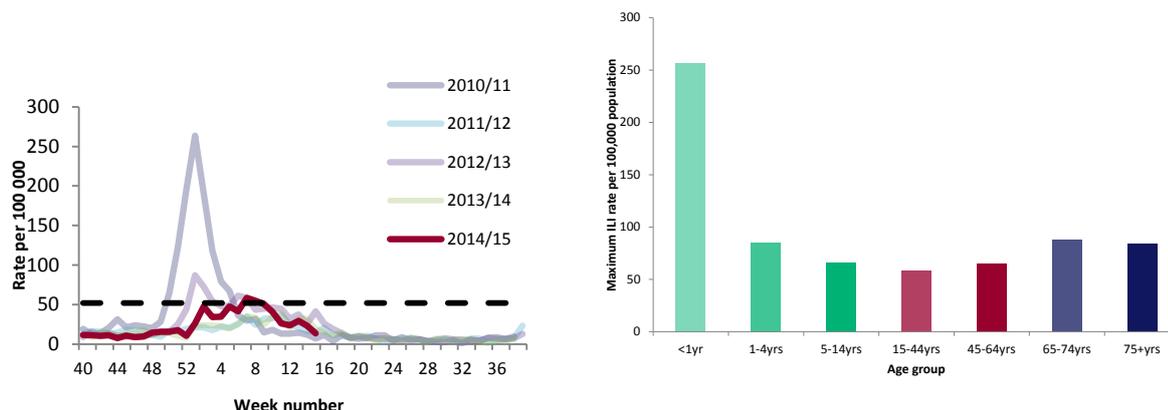
In Wales, ILI rates increased above the MEM threshold of 9.7 per 100,000 for more than one consecutive week in week 51, peaked at 23.2 per 100,000 in week 2 and decreased below the threshold in week 10 2015 (Figure 9). This peak was similar to levels seen in 2012 to 2013. By age group, the highest levels of activity were, as for England and Scotland, seen in 45 to 64 year olds (31.4 per 100,000 in week 1 2015) and in 75+ year olds (28.7 per 100,000 in week 2 2015).

Figure 9. Weekly all age GP influenza-like illness rates for 2014 to 2015 and past seasons, and peak rates by age group in 2014 to 2015, Wales



In Northern Ireland, ILI rates increased above the MEM threshold of 52.0 per 100,000 in weeks 7 and 8, peaking at 58.3 per 100,000 in week 7 (Figure 10). This peak was slightly lower than seen in 2012 to 2013. Unlike the other countries of the UK, by age group, the highest levels of activity were seen in under one year olds (256.8 per 100,000 in week 50 2014, although there are small weekly denominators in this age group) and in one to four year olds (85.5 per 100,000 in week 8 2015), with low rates observed in adults.

Figure 10. Weekly all age GP influenza-like illness rates for 2014 to 2015 and past seasons, and peak rates by age group in 2014 to 2015, Northern Ireland

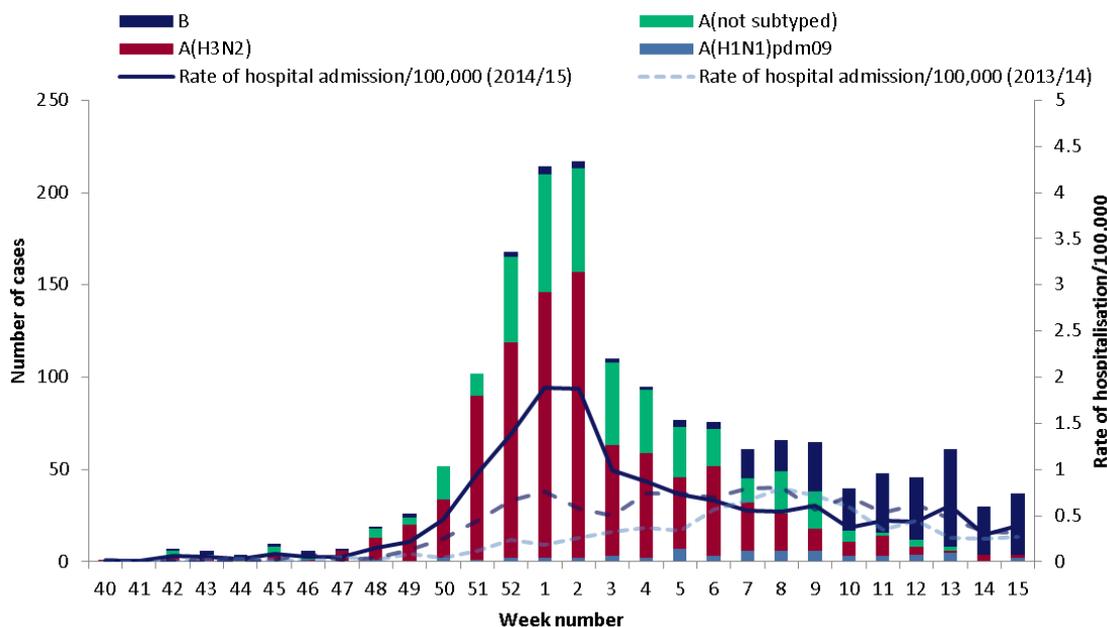


Hospital surveillance of confirmed influenza cases

In the UK Surveillance of Severe Influenza System (USISS) sentinel hospital surveillance scheme, a total of 1,652 hospitalised confirmed influenza cases were reported from the 32 participating sentinel NHS acute trusts across England during 2014 to 2015. An average of 29/32 (91.0%) trusts reported each week. Compared to ICU/HDU admissions reported through the USISS mandatory scheme, subtyping information was available on a higher proportion of hospitalised cases with influenza A (70.0% compared with 29.0% for USISS mandatory). Influenza A(H3N2) was the dominant subtype. The number and rate of hospital admissions peaked in week 2 2015 (217 admissions, 1.9/100,000 trust catchment area) (Figure 11). The peak rate of hospitalisation in 2014 to 2015 was higher than the peak seen during 2013 to 2014 (0.8/100,000) and 2012 to 2013 (0.8/100,000).

Out of the 1,652 hospitalised cases reported, 366 were in children under 17 years of age. Individual level data was available on 303 children, of whom one was reported to have died (0.3%). Of these individual paediatric cases, 81 had an underlying clinical risk factor (27.0%).

Figure 11. Weekly number of influenza confirmed admissions to hospital by influenza subtype through the USISS sentinel scheme in England, with crude hospitalisation rate, 2014 to 2015



Through the USISS mandatory scheme which monitors laboratory confirmed influenza admissions into intensive care (ICU/HDU), a total of 1,187 ICU/HDU admissions of confirmed influenza were reported across England from week 40 2014 to week 15 2015, including 100 (8.4%) deaths. The cumulative number of cases and deaths were higher compared with the same scheme in 2013 to 2014 when 905 admissions and 98 deaths were reported (Figure 12). A similar proportion of deaths (10.8%) were reported among ICU/HDU cases compared with 2013 to 2014.

Case numbers in 2014 to 2015 started increasing from week 50 2014 and peaked in week 1 2015 (0.27/100,000), a similar pattern to influenza positivity reported through Respiratory DataMart (Figure 12). The peak in week 1 2014 to 2015 compares to week 7 in 2013 to 2014 and weeks 1 and 7 in 2012 to 2013.

The majority of ICU/HDU admissions were due to influenza A (970, 81.7%), with the remainder due to influenza B (217, 18.3%). Of the influenza A admissions, 685 (70.6%) were due to A(not subtyped), 183 (18.9%) A(H3N2) and 102 (10.5%) A(H1N1pdm09) (Figure 13).

ICU/HDU admissions occurred in all age groups with the largest number seen in those 45 year olds and above (30.7% of all cases in 45 to 64 year olds and 34.7% in 65+ year olds). Influenza ICU/HDU deaths were reported with all sub-types (influenza A(not subtyped) (60), influenza A(H3N2) (21), influenza A(H1N1pdm09) (10), and influenza B (nine)).

Figure 12. Weekly number, and rate, of influenza confirmed admissions to ICU/HDU in 2014 to 2015 and 2013 to 2014 through the USISS mandatory scheme, England

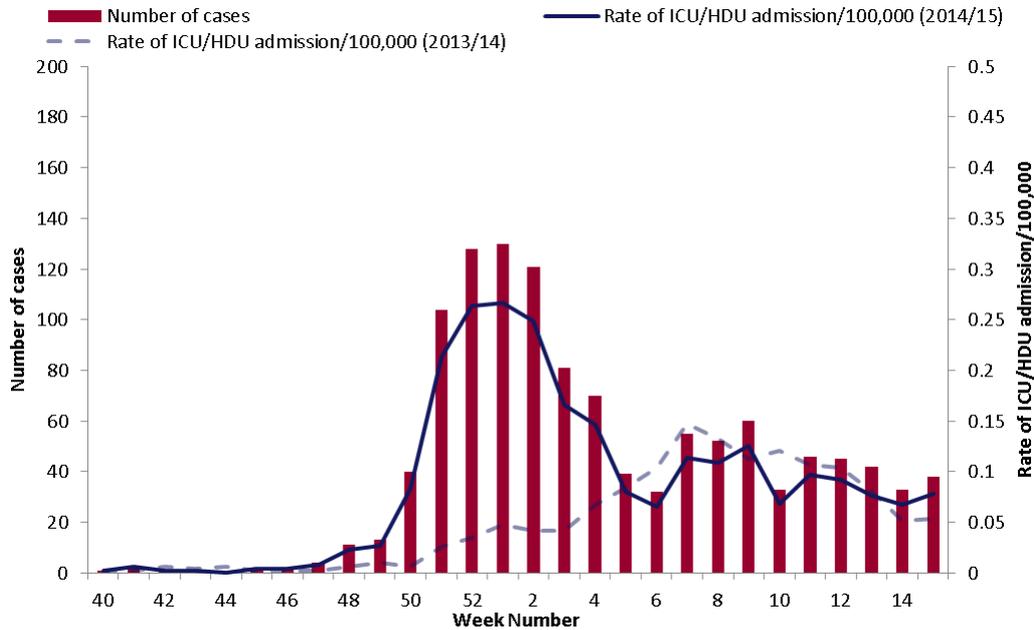
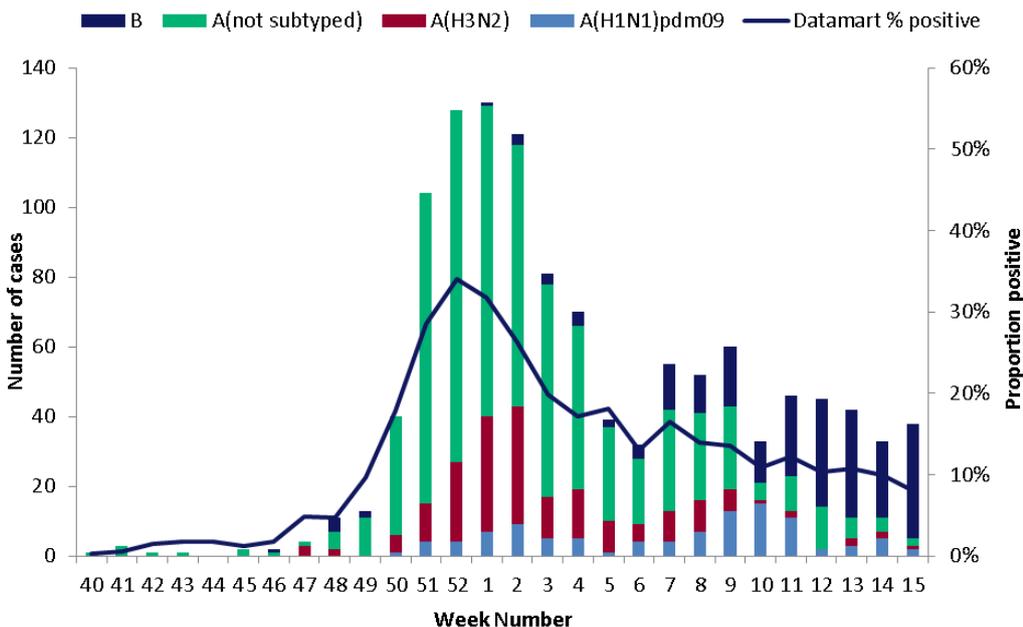


Figure 13. Weekly number of influenza confirmed admissions to ICU/HDU by influenza subtype through the USISS mandatory scheme (England), weekly all age ILI consultation rate per 100,000 population through the RCGP scheme (England and Wales), and proportion of samples positive for influenza through the DataMart scheme(England), 2014 to 2015

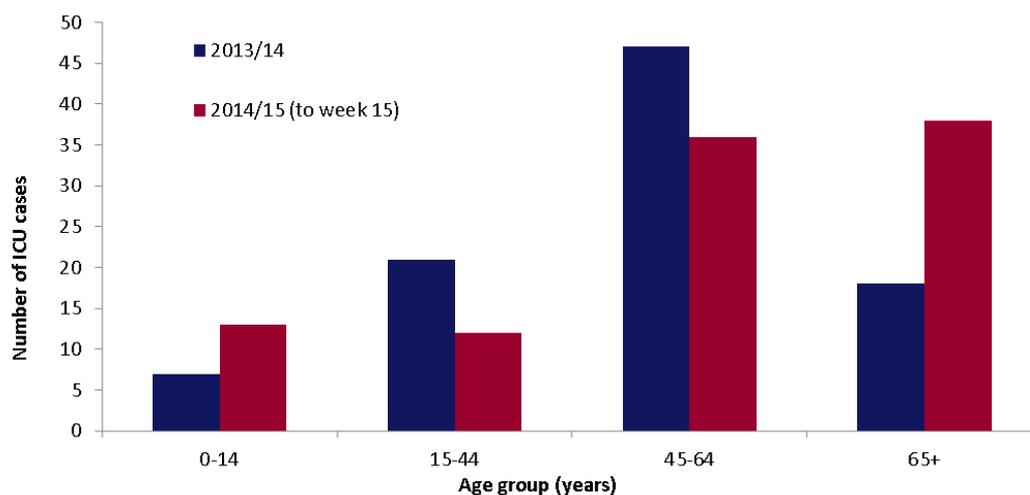


The majority of laboratory confirmed influenza cases requiring intensive care management reported in Scotland in the 2014 to 2015 season (up to week 15 2015), were due to

influenza A H3N2 (51.5%) or A untyped (20.2%) with a small percentage due to influenza B (17.2%) and influenza A(H1N1)pdm09 (11.1%). Similar to previous years, the majority of the cases had underlying medical conditions that predisposed them to severe influenza infection (75.8%).

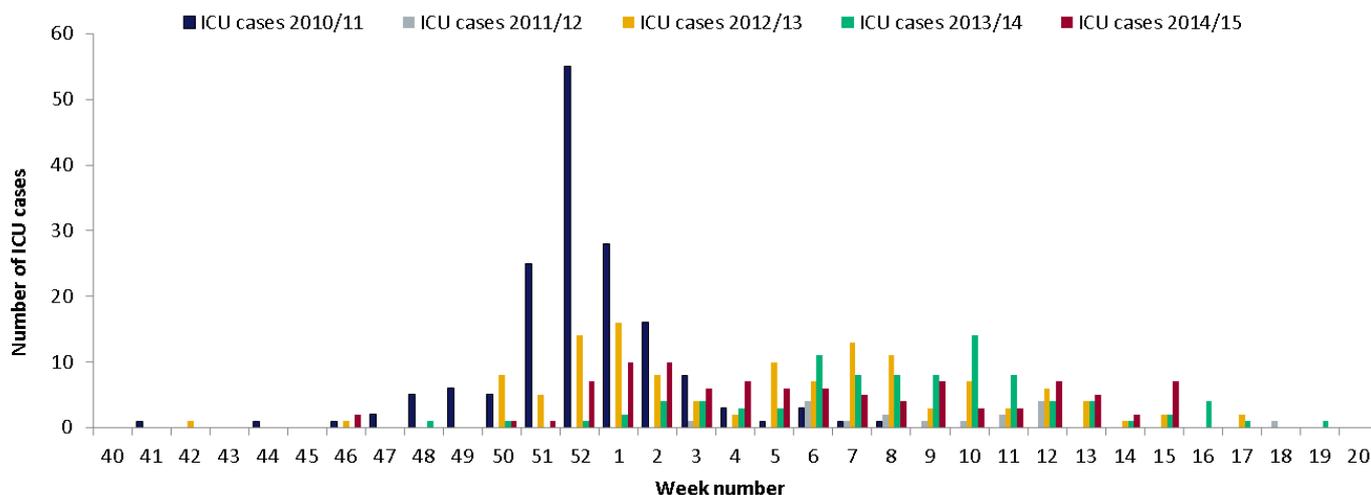
The mean age of the cases was 52 years (0 to 88), similar to recent seasons (2013 to 2014 – 50 years (1 to 86) and 2012 to 2013 – 51 years (0 to 91)), however, the age profile of the cases this season differed slightly to the 2013 to 2014 season (Figure 14). In the current season, a larger proportion of cases were reported in those 45 year olds and above, whereas in 2013 to 2014 a larger proportion was seen in the 15 to 44 and 45 to 64 age groups. Out of the 99 laboratory confirmed influenza cases requiring intensive care management reported in Scotland in the 2014 to 2015, 14 (14.1%) were in children under 17 years of age. Of these cases, five had an underlying clinical risk factor (35.7%).

Figure 14. Number of laboratory confirmed influenza cases with severe infection requiring intensive care management (ICU cases) by age group, week 40 2014 to week 15 2015, compared to season 2013 to 2014, Scotland



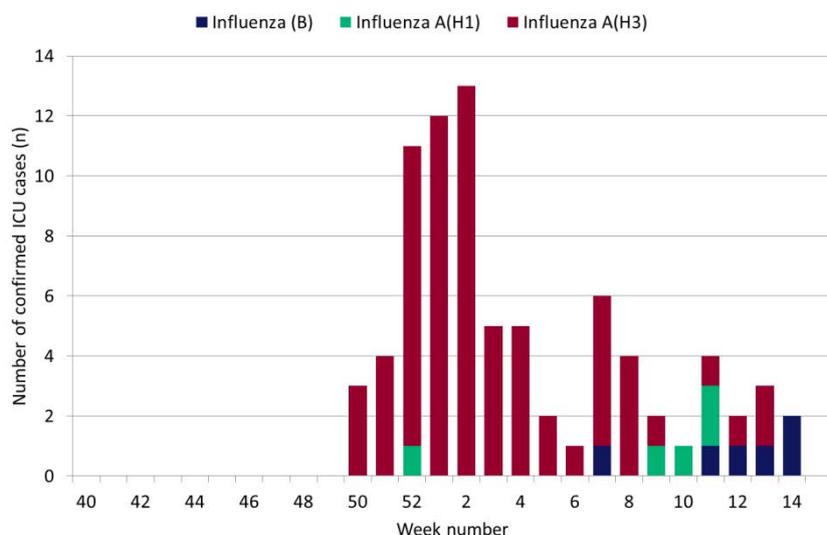
Comparison of the weekly number of ICU admissions for the last five winter seasons in Scotland shows that each season had a different distribution in terms of timing, length and peak (defined as week number where the number of cases reported was highest) (see Figure 15). In the current season, the highest number of cases was seen in weeks 1 and 2 with a prolonged but steady number of cases being reported till week 15.

Figure 15. Number of laboratory confirmed influenza cases with severe infection requiring intensive care management (ICU cases) by week of hospital admission in Scotland, week 40 2014 to week 15 2015, compared to seasons 2010 to 2011, 2011 to 2012, 2012 to 2013 and 2013 to 2014



In Wales, 81 patients in ICU were confirmed with influenza between week 40 2015 to week 15 2015 (Figure 16). Influenza A accounted for 93.0% of the confirmed cases in ICU, with 7.0% due to influenza B. Of the influenza A cases, 92.0% were due to influenza A(H3) and 8.0% were influenza A(H1). Adults aged 45 years and older accounted for 72.0% of the confirmed ICU cases (of which 40.0% were accounted for by adults aged 75 years and older); children younger than 10 years of age accounted for 16.0% of the confirmed ICU cases.

Figure 16. Number of laboratory confirmed influenza cases in Intensive Care Units (ICU cases) in Wales, by sample week



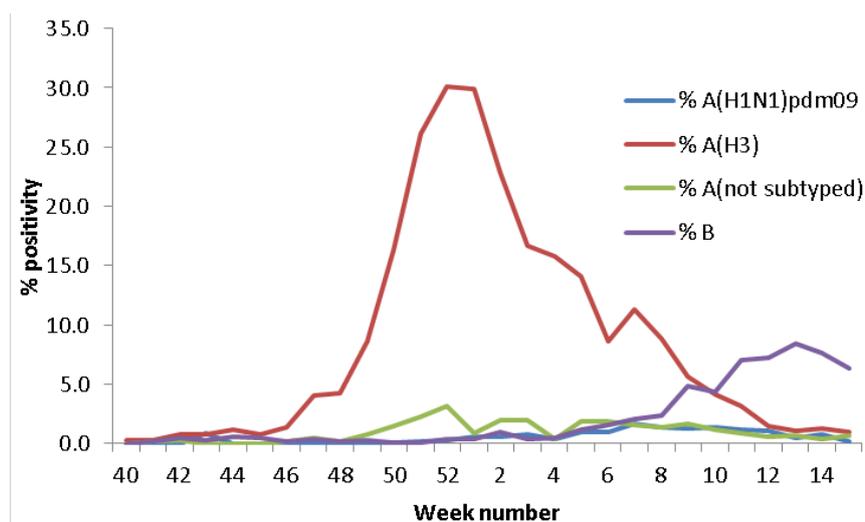
In Northern Ireland, there were 60 critical care (level 2 and level 3) cases with laboratory confirmed influenza in 2014 to 2015 (up to week 15), of which 48 are confirmed as influenza A (H3), five as influenza B, five as influenza A (H1N1)pdm09, and two as influenza A untyped (typing awaited). Fifty of the 60 ICU patients with confirmed influenza had co-morbidities, were pregnant or were aged over 65, of which provisionally 44 met the criteria for inclusion in an influenza vaccine clinical risk group. To date, there have been nine deaths in ICU patients with laboratory confirmed influenza.

Microbiological surveillance

Influenza A and B positivity were monitored through the respiratory DataMart surveillance scheme in England in 2014 to 2015, with overall influenza positivity increasing above the MEM threshold of 5% in week 49 2014. Influenza A(H3) was the dominant circulating virus in most of the 2014 to 2015 season in England, especially early in the season.

Overall influenza A positivity peaked at 33.5% in week 52 2014 with the highest age-specific activity seen in the 65+ year group (peak positivity of 50.0% in week 52 2014). Influenza A(H1N1)pdm09 also circulated in the 2014 to 2015 season, although at a lower level compared to influenza A(H3). Influenza B started to increase, becoming the dominant strain from week 11 2015 and peaking in week 13 2015 at 8.5% positivity. The highest activity was seen in 45-64 year olds (13.0% in week 13 2015) (Figure 17). This contrasts with the lower activity in the 2013 to 2014 season when influenza A(H1N1)pdm09 was the dominant circulating strain, with a peak in positivity of 12.9% in week 7 2014, followed by influenza A(H3) circulating at a lower level with a peak of 9.8% in week 8 2014.

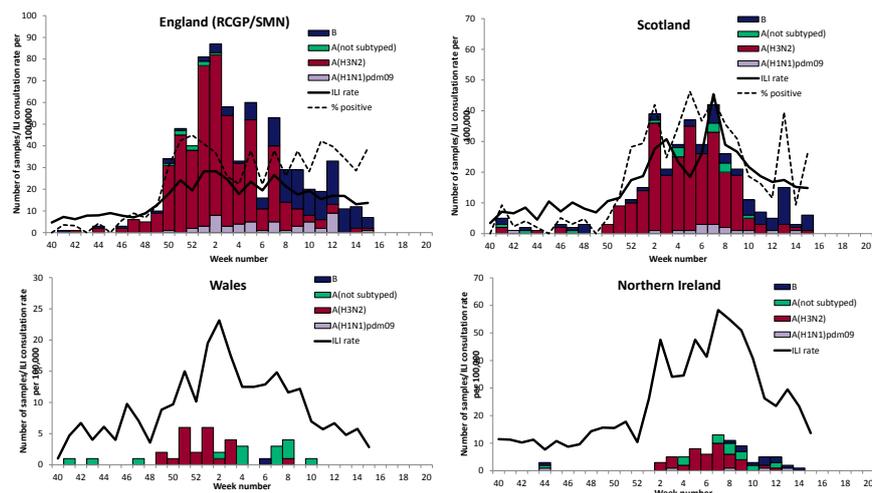
Figure 17. Weekly % positive by influenza subtype through Respiratory DataMart, 2014 to 2015, England



As seen through Respiratory DataMart, activity through GP-based sentinel swabbing schemes in England was dominated by A(H3N2), with an increasing proportion of influenza B detections from February onwards. Following a sustained increase from week 49, overall influenza positivity peaked at 44.9% in week 52 2014. Although swab numbers have declined, it has remained above 20.0% up to week 15 2015 (Figure 18).

Influenza activity monitored through the GP Sentinel scheme in Scotland peaked at 46.3% in week 5 2015 with predominance of influenza A(H3N2), followed by influenza B (peak at 31.6% in week 13 2015). The overall swab positivity increased and remained above 10% between week 51 2014 and week 15 2015 (with exception of 9.4% in week 14 2015) (Figure 18).

Figure 18. Weekly number of influenza positive sentinel virology samples by influenza subtype, % positive and ILI rate, 2014 to 2015, UK*

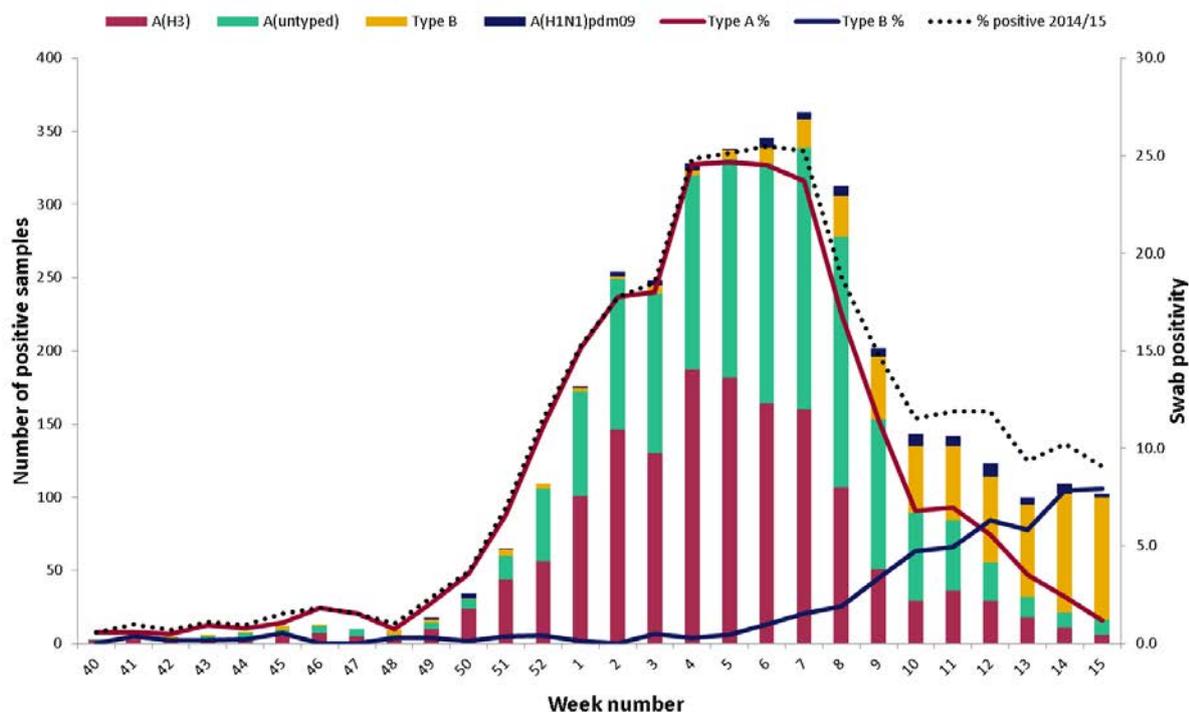


*NB. Positivity suppressed for Wales and Northern Ireland due to small weekly sample numbers

In Scotland, overall influenza positivity reported through non-sentinel sources (ECOSS) increased above 5.0% in week 51 2014, reaching its peak of 25.5% in week 6 2015. As seen in the rest of UK, influenza A(H3N2) was the dominant circulating virus peaking at 24.7% in week 5 2015 prior to an increase in influenza B (peak at 7.9% in week 15 2015) (Figure 19). This contrasts with activity in 2013 to 2014 when, in Scotland, influenza A(H1N1)pdm09 was the dominant strain and activity peaked at 13.2% in week 7 2014.

A similar virological picture was seen elsewhere across the UK, with the peak number of influenza positive specimens in Wales in weeks 51 and 1 and in Northern Ireland in week 7.

Figure 19. Weekly ECOSS influenza swab positivity (number and percentage positive) by influenza subtype, week 40 2014 to week 15 2015, Scotland



Virus characterisation

During the 2014 to 2015 season, the PHE Respiratory Virus Unit (RVU) has isolated and antigenically characterised 240 A(H3N2) influenza viruses from across the UK. The majority were antigenically similar to the A/Texas/50/2012 H3N2 Northern Hemisphere 2014 to 2015 vaccine strain, however 55 (23.0%) showed reduced reactivity in antigenic tests with A/Texas/50/2012 antiserum. These 55 isolates are antigenically similar to A/Switzerland/9715293/2013, the H3N2 virus selected for the 2015/16 Northern Hemisphere influenza vaccine. A/Switzerland/9715293/2013 is related to, but antigenically and genetically distinguishable, from the A/Texas/50/2012 vaccine virus.

A portion of 2014 to 2015 influenza A(H3N2) viruses did not grow sufficiently for antigenic characterisation. For many of these viruses, RVU performs genetic characterisation. Of 76 A(H3N2) viruses characterised genetically by RVU, some of which were not able to be antigenically characterised, the majority (80.0%) fall into a genetic subgroup (3C.2a) which has been shown to be antigenically distinguishable from the current A(H3N2) vaccine virus.

Of 57 influenza B viruses isolated and antigenically characterised as belonging to the B/Yamagata/16/88 lineage, 52 (91.0%) showed reduced reactivity in antigenic tests with antiserum to the 2014 to 2015 Northern Hemisphere B/Yamagata-lineage trivalent and quadrivalent vaccine virus, B/Massachusetts/2/2012. These 52 isolates are antigenically

similar to B/Phuket/3073/2013, the influenza B/Yamagata lineage virus selected for 2015 2016 Northern Hemisphere influenza vaccines. B/Phuket/3073/2013 is related to, but antigenically and genetically distinguishable, from the B/Massachusetts/2/2012 vaccine virus. One influenza B virus has been isolated and antigenically characterised as belonging to the B/Victoria/2/87 lineage, similar to the influenza B/Victoria-lineage component (B/Brisbane/60/2008) of the 2014 to 2015 Northern Hemisphere quadrivalent vaccine.

All 47 influenza A(H1N1)pdm09 viruses that have been isolated and antigenically characterised are similar to the Northern Hemisphere 2014 to 2015 and 2015 to 2016 A(H1N1)pdm09 vaccine strain, A/California/7/2009.

During the 2014 to 2015 season, the West of Scotland Specialist Virology Centre (WOSSVC) has genetically characterised 149 influenza A(H3N2) viruses, 11 influenza A(H1N1)pdm09 viruses and 41 influenza B viruses. One hundred and thirteen of the 149 influenza A(H3N2) virus isolates tested (75.8%, 6 3C.3a and 107 3C.2a) are in genetic groups containing viruses that show antigenic drift from the 2014 to 2015 Northern Hemisphere vaccine virus. All 11 influenza A(H1N1)pdm09 isolates tested were similar to the A/California/07/2009 vaccine component.

One hundred and eighty four flu B viruses have been genetically typed by WOSSVC. Of these 171 (92.9%) were of the B/Yamagata lineage and 13 (7.1%) were of the B/Victoria lineage. Characterisation of 37 influenza B/Yamagata viruses by WOSSVC indicates that influenza B-Yamagata lineage viruses circulating this season are distinguishable from the Northern Hemisphere 2014 to 2015 Yamagata lineage vaccine strain (B/Massachusetts/02/2012) but are similar to the Yamagata lineage influenza B virus selected for the 2015 to 2016 Northern Hemisphere influenza vaccine (B/Phuket/3073/2013). Characterisation of four influenza B-Victoria lineage viruses indicates that influenza B-Victoria lineage viruses characterised this season are similar to the Victoria lineage influenza B virus selected for the Northern Hemisphere 2014 to 2015 and 2015 to 2016 quadrivalent vaccine; B/Brisbane/60/2008.

Globally, as reported by WHO⁸, characterisation of circulating viruses shows a similar pattern, and it is recommended that vaccines for use in the 2015 to 2016 influenza season (Northern Hemisphere winter) contain the following: an A/California/7/2009 (H1N1)pdm09-like virus; an A/Switzerland/9715293/2013 (H3N2)-like virus; a B/Phuket/3073/2013-like virus. It is recommended that quadrivalent vaccines containing two influenza B viruses contain the above three viruses and a B/Brisbane/60/2008-like virus.

⁸www.who.int/influenza/vaccines/virus/recommendations/201502_recommendation.pdf

Antiviral resistance

Since week 40 2014, 206 influenza viruses (89 A(H3N2), 89 A(H1N1)pdm09 and 28 B) have been tested for oseltamivir susceptibility in the UK by PHE RVU, and all but four H3N2 viruses are sensitive. Of the four oseltamivir resistant viruses, three with an E119V amino acid substitution in the neuraminidase gene are from neuraminidase inhibitor treated patients. These three viruses remain susceptible to zanamivir.

Eighty six A(H3N2), 24 A(H1N1)pdm09 and 28 B viruses were also tested against zanamivir and all but one H3N2 are sensitive. The zanamivir resistant virus has an R292K amino acid substitution in the neuraminidase which is known to cause resistance to oseltamivir and also reduce susceptibility to zanamivir. This sample was taken from a child who had received oseltamivir treatment.

Globally, WHO have reported very low numbers of viruses detected with reduced inhibition by neuraminidase inhibitors during the 2014 to 2015 season.

All influenza A(H1N1)pdm09 were screened genetically for H275Y resistance to oseltamivir with none being detected.

Vaccination

Seasonal influenza vaccine uptake

Between country comparisons should be made with caution given that different methods are used to monitor uptake.

In England, the uptake of seasonal influenza vaccine is monitored by PHE throughout the season based upon weekly and monthly extracts from GP information systems. Cumulative uptake on influenza vaccinations administered up to 31 January 2015 was reported from 99.9% of GP practices in England in 2014 to 2015. This showed vaccine uptake of 72.7% in 65+ year-olds (compared to 73.2% in 2013 to 2014) and 50.3% for those aged six months to under 65 years of age with one or more underlying clinical risk factors (excluding pregnant women without other risk factors and carers), compared to 52.3% in 2013 to 2014 (Table 1). The more detailed final uptake reports are now publically available.

In Scotland, the uptake of seasonal influenza vaccine is estimated by HPS throughout the season, based on automated weekly extracts from 99% of all Scottish GP practices⁹.

⁹ At the end of the season this estimate is validated based on GP claims for payment to Practitioner Services Division (PSD). Please note that the Figures provided for Scotland here are based on the HPS estimates as GP claims for payment data does not become available until later in the summer.

Cumulative uptake in 2014 to 2015 showed vaccine uptake of 76.3% (the seventh consecutive year the WHO target has been met) in 65+ year olds (compared to 76.9% in 2013 to 2014¹⁰) and 54.0% for those aged six months to under 65 year olds in one or more clinical at-risk groups (excluding pregnant women without other risk factors and carers) (compared to 57.7% in 2013 to 2014¹⁰) (Table 1).

In Wales, the uptake of seasonal influenza vaccine is monitored on a weekly basis by Public Health Wales through-out the season based on automated weekly extracts using software installed in 99.9% of all General Practice in Wales. Cumulative uptake data on influenza vaccinations administered were received from 99.9% of GP practices in Wales in 2014 to 2015. This showed vaccine uptake of 68.1% in 65+ year-olds (compared to 68.3% in 2013 to 2014) and 49.5% for those aged six months to under 65 years of age with one or more underlying clinical risk factor (excluding pregnant women without other risk factors and carers), compared to 51.1% in 2013 to 2014 (Table 1).

In Northern Ireland (NI) the uptake of seasonal influenza vaccine is monitored by the PHA of Northern Ireland. Cumulative uptake of influenza vaccination administered up to 31 March 2015 was reported from 100% of GP practices in NI in 2014 to 2015. In the population aged 65+ years uptake was 73.4% (compared to 75.4% in 2013 to 2014) and in the population of under 65 years at risk the uptake was 71.8% (compared to 76.4% in 2013 to 2014) (Table 1).

Uptake in all pregnant women in England reached 44.1% compared to 39.8% in 2013 to 2014. The equivalent uptake in NI was 56.1% compared to 58.0% in 2013 to 2014. In Scotland, the uptake in all pregnant women was 50.9% compared to the uptake (49.2%) achieved in 2013 to 2014. In Wales, uptake as measured through automatic collection of data from General Practices, increased to 45.3% in 2014 to 2015 compared 43.7% in 2013 to 2014. Public Health Wales also carries out an annual vaccination coverage survey of women giving birth in Welsh maternity units during a five day period in March, in 2014 to 2015 coverage of influenza vaccination in this group had increased to 72.4% compared to 70.5% in 2013 to 2014 (Table 1).

Uptake by frontline healthcare workers in England was 54.9% from 100% of trusts. This is consistent with last season's uptake of 54.8%. In NI uptake in frontline healthcare workers was 22.6% compared to 24.0% in 2013 to 2014. In Scotland, provisional uptake in healthcare workers was 36.3%; this compares with 34.7% in 2013 to 2014. In Wales, uptake reached 44.3% compared to 41.7% in 2013 to 2014 (Table 1).

¹⁰The vaccine uptake for season 2013 to 2014 was validated based on GP claims for payment to Practitioner Services Division (PSD).

Table 1. Seasonal influenza vaccination uptake by target group, UK, 2013 to 2014 and 2014 to 2015 seasons

Target Group	England		Scotland		Wales		Northern Ireland		
	2013 to 2014	2014 to 2015	2013 to 2014	2014 to 2015	2013 to 2014	2014 to 2015	2013 to 2014	2014 to 2015	
65+ years	73.2	72.7	77.0	76.3	68.3	68.1	75.4	73.4	
<65 years at risk	52.3	50.3	60.5	54.0	51.1	49.5	76.4	71.8	
Pregnant	No risk	38.2	42.5	47.9	49.5	42.2	43.5	-	-
	At risk	59.0	61.5	65.0	65.0	60.2	62.0	-	-
	All	39.8	44.1	49.2	50.9	43.7	45.3	58.0	56.1
Healthcare workers	54.8	54.9	34.7	36.3	41.7	44.3	24.0	22.6	

Live attenuated influenza vaccine (LAIV) programme for children:

England

The estimated uptake of influenza vaccine for all children two, three and four years of age in 2014 to 2015 until 31 January 2015 in England was 38.5%, 41.3% and 32.9% respectively. More details of the uptake at regional and CCG level are available in the end of season report.

The 2014 to 2015 season also saw the extension of the school-age vaccination programme to 14 pilot areas across England, targeting a) primary school children aged 4 to 11 years, b) secondary school children aged 11 to 13 years or c) both groups. The pilot areas primarily delivered the programme through schools with the exception of two areas which used a pharmacy based model and one local authority following a community GP delivery model (Table 2).

An estimated 381,969 primary and secondary school children aged 4 to 13 years in these 14 pilot areas received at least one dose of influenza vaccine, during the period 1 September 2014 to 31 January 2015. With an estimated total target population of 718,071, this results in an overall uptake of 53.2%. Reported uptake varied by pilot site (Tables 1 and 2). Overall uptake in primary school children (4 to 11 years) was reported to be 56.8% (ranging by pilot area from 32.3% to 63.1%) compared to the 2013 to 2014 season (52.5%, ranging from 31.8 to 71.5%). Overall uptake in secondary school children (11 to 13 years) was 49.8% (ranging by pilot area from 21.2% to 62.0%). Overall uptake in

community pharmacy and GP delivery pilot sites was notably lower than school-based delivery pilots (Tables 1 and 2).

The uptake for the period 1 September 2014 to 31 January 2015 by year-group ranged from 55.3% in Year Group 1 (five to six years) to 48.6% in year group 8 (12 to 13 years), with an overall pattern of decreasing uptake with increasing age (Figure 20). Overall uptake was highest in Year Group 1 (age five to six, 59.7%) and Year Group 2 (age six to seven, 59.4%).

Table 2. Estimated proportion of primary school age children resident in pilot areas who were vaccinated with influenza vaccine by pilot area, England, 1 September 2014 to 31 January 2015

Pilot Site		Estimated total number of children ¹	No. that have received 1 or more doses of LAIV or TIV since 1 September 2014	% Total Uptake
Essex		148,383	91,225	61.5
Greater Manchester		15,584	9,837	63.1
Leicestershire and Lincolnshire		74,408	44,228	59.4
London	Havering	21,102	11,869	56.2
	Special Schools	1,852	795	42.9
Northumberland, Tyne, and Wear		50,479	27,684	54.8
Cumbria*		35,154	11,356	32.3
Total		346,962	196,994	56.8

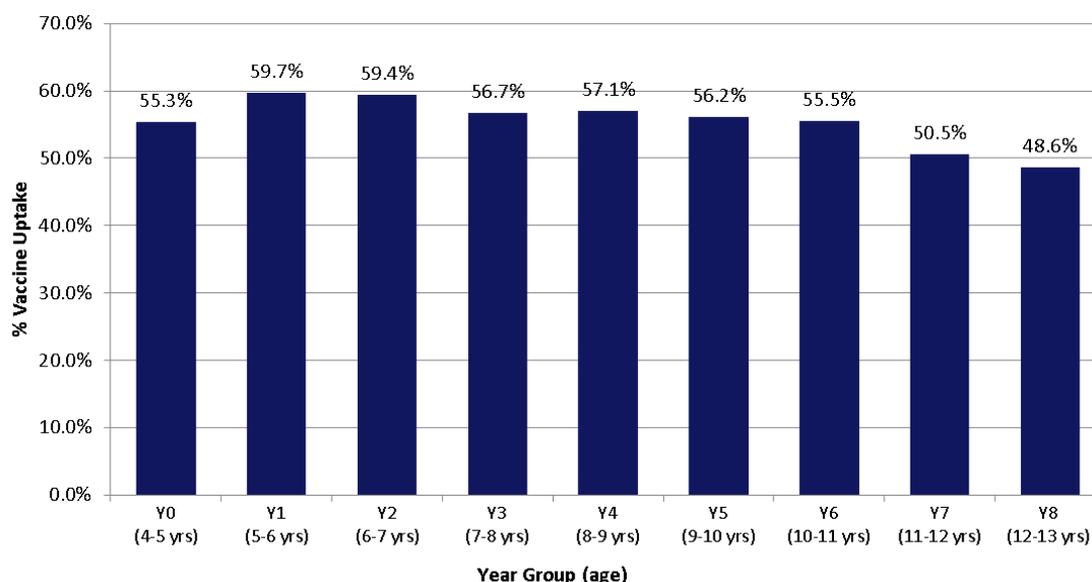
*Cumbria-pharmacy model

Table 3. Estimated proportion of secondary school age children resident in pilot areas who were vaccinated with influenza vaccine by pilot area, England, 1 September 2014 to 31 January 2015

Pilot site		Estimated total number of children ¹	No. that have received 1 or more doses of LAIV or TIV since 1 September 2014	% Total uptake
Arden, Herefordshire and Worcestershire ¹		35,269	7,485	21.2
Birmingham and the Black Country		60,024	26,437	44.0
East Anglia		49,565	29,906	60.3
Essex		8,367	5,190	62.0
Greater Manchester		8,898	4,910	55.2
Lancashire		21,588	11,348	52.6
Leicestershire and Lincolnshire		39,023	23,644	60.6
London	Havering	3,155	1,510	47.9
	Special Schools	652	267	41.0
North Yorkshire and Humber		34,286	20,599	60.1
Shropshire and Staffordshire		33,006	18,686	56.6
South Yorkshire and Bassetlaw		25,879	14,131	54.6
West Yorkshire ²	School-based	35,560	17,004	47.8
	Community-model	15,837	3,858	24.4
Total		371,109	184,975	49.8

¹Arden, Herefordshire and Worcestershire-pharmacy model²Community based delivery model present in Leeds

Figure 20. Total cumulative uptake of influenza vaccine in pilot sites by year group, England, 1 September 2014 to 31 January 2015*



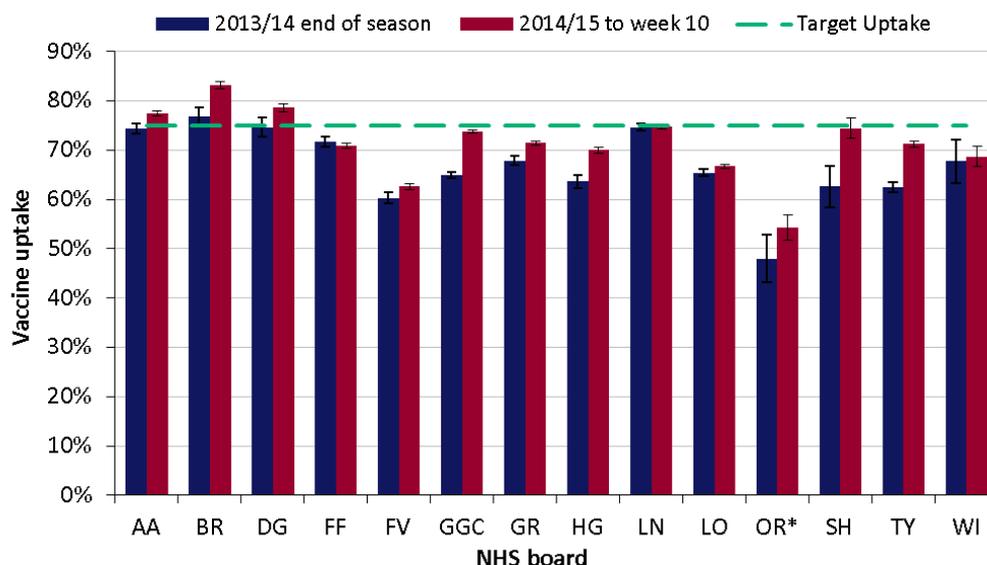
*Data from East Riding, North Lincolnshire, and York, Shropshire and Telford not included as year groups 7 and 8 were combined.

Scotland

The estimated uptake in preschool children (two to under five years of age, not yet in school) vaccinated in the GP setting was 56.4%. This resulted from an estimated target population of 149,821, from which an estimated 84,484 received at least one dose of influenza vaccine.

In 2014 to 2015 the offer of influenza vaccine was rolled out to all primary school aged children in Scotland. An estimated 284,255 primary school children aged 4 to 11 years enrolled in primary schools in Scotland received at least one dose of influenza vaccine. With an estimated total target population for the school based programme of 396,118, resulting in an uptake of 71.8%. This is 4.6 percentage points higher than the vaccine uptake achieved during the primary school pilots conducted in 2013 to 2014 (67.2% uptake), which had included approximately a quarter of the Scottish primary school aged population across all NHS boards. The uptake data for the school based influenza programme does not include data for NHS Orkney, which was the only one of the 14 Scottish boards who delivered an entirely GP based programme for primary school aged children and achieved an estimated uptake of 54.3% based on aggregate level GP extracts. Reported uptake of the primary school programme varied by NHS board (Figure 21).

Figure 21. Mean influenza vaccine uptake by NHS board for the primary school roll out in 2014 to 2015 to week 10 2015 (end of season), compared to the end of season mean uptake for the school pilots in 2013 to 2014 in Scotland (* NHS Orkney delivers influenza vaccination for primary school aged children in the GP setting, vaccine uptake based on estimates from GP extracts for primary school aged children)



Northern Ireland

In 2014 to 2015 the childhood influenza vaccination programme was extended to include all pre-school children aged two to four years old and all primary school aged children. The former group were offered vaccination through primary care, with the latter group offered vaccination through school health teams. The vaccination uptake rate in 2014 to 2015 for pre-school children aged two to four years old was 54.4%, similar to the uptake rate for children aged two and three years old in 2013 to 2014 (55.5%). The vaccination uptake rate for children in primary school (aged approximately 4 to 11 years old) was 79.7%.

Wales

The estimated uptake of influenza vaccine for all children two, three and four years of age during the 2014 to 2015 season in Wales was 38.7%, 39.3% and 32.5% respectively. Uptake in children aged two to four years as a whole was 36.8%. In Wales during 2014 to 2015 all children in school Year 7 (11 to 12 year olds) were also eligible for LAIV. School nursing services conducted vaccination sessions for 32,051 children attending 309 secondary schools in Wales. Uptake in this group was 74.3% in 2014 to 2015 compared to 68.7% in 2013 to 2014.

Seasonal influenza vaccine effectiveness (VE)

A mid-season study was undertaken to estimate the effectiveness of the 2014 to 2015 influenza vaccine in preventing medical consultation in primary care with a laboratory confirmed ILI across the UK¹¹. During the period 1 October 2014 to 17 January 2015, a total of 2279 persons were swabbed, of these 1298 could be included in the analysis. During this period, overall adjusted vaccine effectiveness in preventing influenza A confirmed infection was 2.3 (95% CI -48.5, 36.1). The majority of influenza A infections were due to A(H3N2), with a VE of 0.60 (-52.4, 35.1) in preventing A(H3N2) infection.

Our observation of an absence of significant effectiveness in preventing medically-attended laboratory-confirmed influenza in primary care due to A(H3N2) are congruent with the findings reported from the US¹² who report low effectiveness of 22% (95% confidence interval (CI): 5–35) and from Canada¹³ who report a VE of -8% (95% CI: -50 to 23) against laboratory-confirmed, medically-attended influenza A(H3N2) virus infection in primary care. The observation of low or non-significant effectiveness in 2014 to 2015 in the UK correlates with the direct mismatch seen between the vaccine virus and circulating A(H3N2) strains. Vaccine mismatch due to circulation of drifted strains does occasionally occur, with this being the lowest estimate of influenza VE reported by the UK over the past decade. It is also important to highlight the uncertainty of our estimate for the mid-season analysis. An end-of-season vaccine effectiveness analysis is planned and will be published in summer 2015.

Programme Impact

With the rollout of the new LAIV programme for children across the UK, influenza surveillance systems have been adapted to be able to report the impact of the programme on disease incidence in pilot and non-pilot areas in England starting in 2013. The end-of-season results for the 2013 to 2014 season, the first year of the LAIV programme in England have been published. They showed that although influenza activity was low that year, a consistent, though not statistically significant, decrease in cumulative disease incidence and influenza positivity across a range of influenza surveillance indicators was seen in pilot relative to non-pilot areas in both targeted and non-targeted age groups. Differences in influenza activity across the countries of the UK also seem to be apparent this season, with GP consultation rates above baseline for longer periods in England and Wales compared to Scotland and Northern Ireland (Pages 13 to 14).

¹¹ Pebody et al. Effectiveness of trivalent seasonal influenza vaccine in preventing laboratory-confirmed influenza in primary care in the United Kingdom: 2014 to 2015 mid-season results. *Eurosurveillance* 2015

¹² Flannery B, Clippard J, Zimmerman RK, Nowalk MP, Jackson ML, Jackson LA, et al. Early estimates of seasonal influenza vaccine effectiveness - United States, January 2015. *MMWR Morb Mortal Wkly Rep.* 2015;64(1):10-5. PMID:25590680

¹³ Skowronski DM, Chambers C, Sabaiduc S, De Serres G, Dickinson JA, Winter AL, et al. Interim estimates of 2014/15 vaccine effectiveness against influenza A(H3N2) from Canada's Sentinel Physician Surveillance Network, January 2015. *Euro Surveill.* 2015;20(4):21022

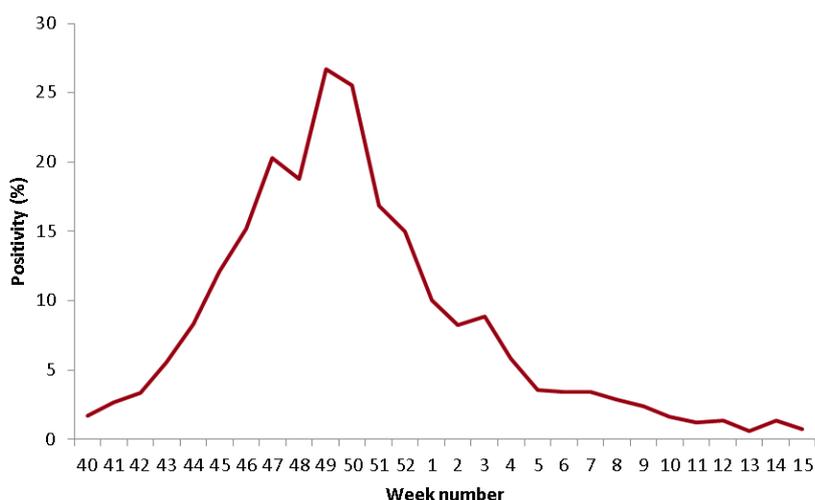
A report will be published in summer 2015 describing the observations of the possible impact of vaccinating primary and secondary school age children in 2014 to 2015 on influenza activity in these areas.

Other respiratory viruses

Respiratory syncytial virus (RSV) reported through respiratory DataMart surveillance system peaked in week 49 2014 at 26.7% positivity, with circulation above 10.0% between weeks 45 2014 and 1 2015 (Figure 22). This peak is one week earlier than the peak seen in 2013 to 2014 (32.2% in week 50 2013). The peak period was also shorter than that seen in 2013 to 2014 (between week 45 2013 and week 4 2014).

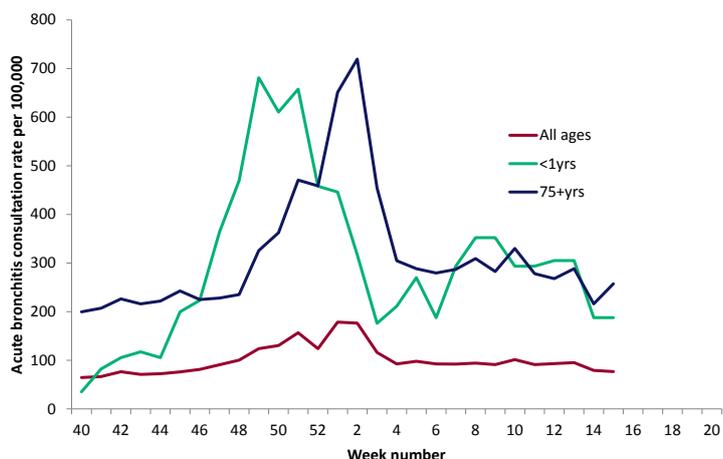
The highest positivity was seen in children aged less than five years of age, with a peak of 48.2% in week 49 2014. The lowest peak positivity was seen in those 15 to 44 year olds (8.7% in week 50 2014).

Figure 22. RSV positivity (%) by week in DataMart, England, 2014 to 2015



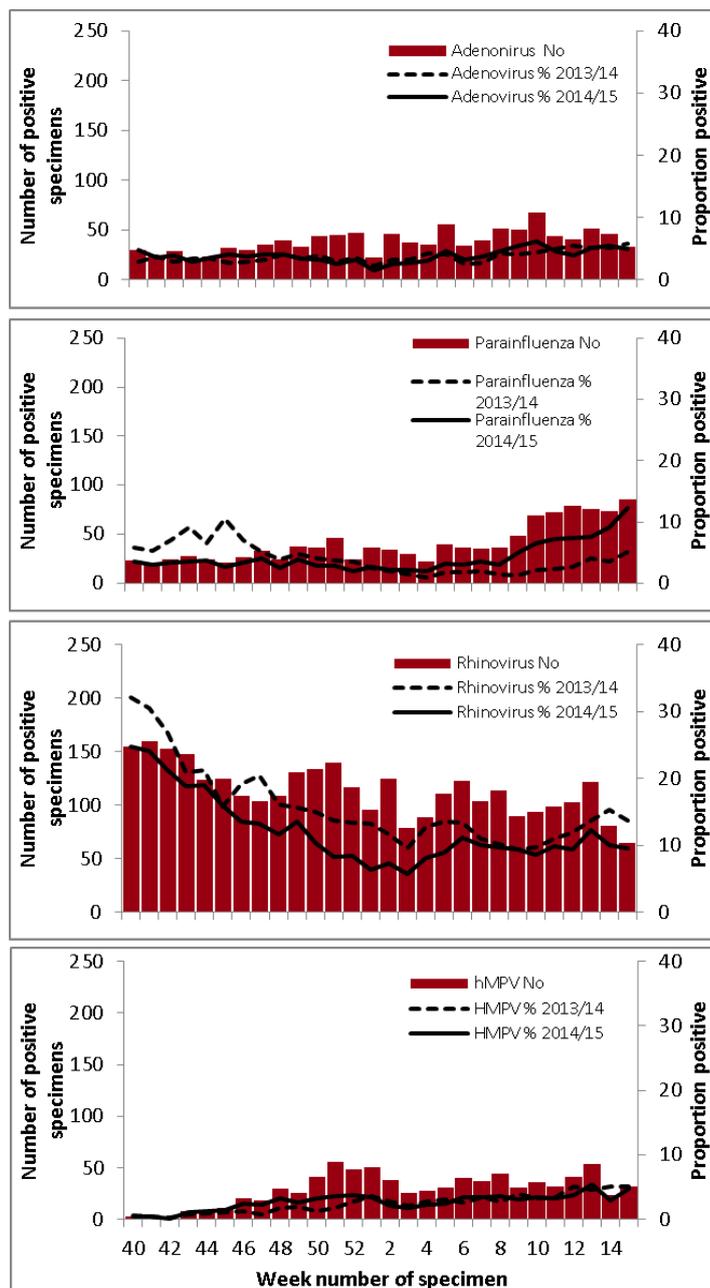
RSV activity in young children coincided with acute bronchitis GP consultation rates. RCGP GP acute bronchitis rates in under one year-olds peaked at 681.1 per 100,000 in week 49 2014, while rates in 75+ year-olds peaked at 719.3 per 100,000 in week 2 2015. The overall acute bronchitis consultation rate peaked at 178.6 per 100,000 in week 1 2015 (Figure 23).

Figure 23. Weekly acute bronchitis consultation rates overall, in under one year-olds and 75+ year-olds through the RCGP scheme, England and Wales, 2014 to 2015



Of the other respiratory viruses monitored through respiratory DataMart, the highest activity was seen with rhinovirus (Figure 24) at the beginning and end of the influenza season, but with activity low during the winter months when influenza was circulating. Parainfluenza activity started to increase from week 9 2015 and continued to show an increased trend by the end of the period of observation in week 15 2015. A slightly increased activity for human metapneumovirus (hMPV) was seen between week 50 2014 and week 2 2015. There was then a further increase in weeks 12 and 13 2015. Low levels of activity for adenovirus were observed all year round with no clear seasonality seen in 2014 to 2015.

Figure 24. Number and proportion of samples positive for adenovirus, parainfluenza, rhinovirus and human metapneumovirus through the DataMart scheme, England, 2014 to 2015



In Scotland, the most common non-influenza respiratory pathogens circulating in the 2014 to 2015 season (up to week 15 2015) as detected through the GP sentinel scheme were rhinovirus (234 positive samples, 41.3% of non-influenza positive samples) and RSV (105 positive samples, 18.6% of non-influenza positive samples). The peak number of positive detections for rhinovirus occurred in week 47 2014 and week 50 2014, respectively.

Low levels of seasonal coronavirus, parainfluenza, adenovirus, hMPV and Mycoplasma pneumoniae were observed throughout the season in samples from the GP sentinel scheme with the exception of a peak of seasonal coronavirus in week 5 2015.

The pattern of non-influenza respiratory pathogens detected through non-sentinel sources¹⁴ (ECOSS) for 2014 to 2015 season (up to week 15 2015), was similar to that seen in sentinel samples and in season 2013 to 2014. Rhinovirus was the most detected non-influenza pathogen (2652 (29.5%) positive samples) followed by RSV (2539 (28.3%) positive samples) and adenovirus (1476 (16.4%) positive samples). The other non-influenza pathogens (parainfluenza, hMPV, seasonal coronavirus and *Mycoplasma pneumoniae*) were only detected in a lower proportion of non-influenza positive samples (7.7%, 7.6%, 6.9% and 3.5%, respectively).

Similar to the pattern over time observed in sentinel samples, the peak number of rhinovirus and RSV samples detected through non-sentinel sources, occurred in week 48 2014 and week 51 2014, respectively. The levels of rhinovirus and RSV were similar to those seen in previous seasons. The levels of adenovirus, hMPV and parainfluenza were similar to those seen in previous seasons and showed an increase towards the later part of the season (peak at weeks 13 and 15 2015). The levels of seasonal coronavirus were higher than previous seasons and showed a later peak at week 7 2015, similar to that seen in sentinel samples.

In Wales, the most common non-influenza respiratory pathogens circulating in the 2014 to 2015 season (up to week 16 2015) as detected through the GP surveillance scheme were: rhinovirus (10 positive samples, 24% of non-influenza positive samples) and RSV, Adenovirus and *Mycoplasma pneumoniae* (six positive samples each, 15% of non-influenza positive samples each). The peak of non-influenza positive detections occurred during week 5 2015 when there were a combined total of 11 detections for coronavirus, human metapneumovirus, *Mycoplasma pneumoniae*, parainfluenza and rhinovirus.

In contrast, the most commonly detected non-influenza respiratory pathogens from hospital and non-sentinel sources in Wales (up to week 16 2015) were RSV (479 positive samples, 43% of non-influenza positive samples), rhinovirus (392 positive samples, 35% of non-influenza positive samples), human metapneumovirus (84 positive samples, 8% of non-influenza positive samples), adenovirus (51 positive samples, 4% of non-influenza positive samples) and *Mycoplasma pneumoniae* (29 positive samples, 3% of non-influenza positive samples). The peak of non-influenza positive detections in hospital and non-sentinel samples occurred during week 50 2014 and was largely due to RSV and rhinovirus.

¹⁴ In ECOSS, the denominator data is not available for non-influenza pathogens, therefore, we calculate the weekly proportion of non-influenza positives for each pathogen using the weekly total of non-influenza positives as denominator.

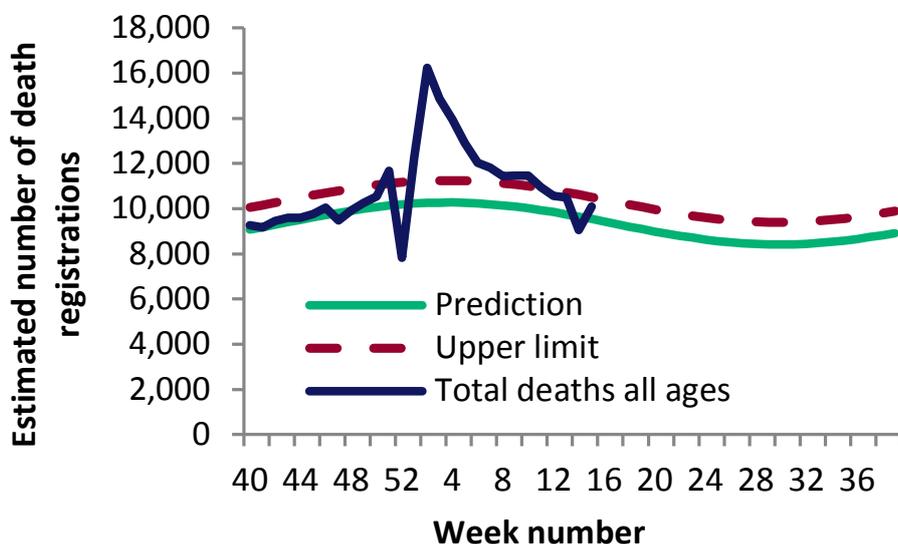
Excess all-cause mortality surveillance

Mortality by week of death registration

The Office for National Statistics (ONS) provides estimated numbers of weekly all-cause registered deaths in England and Wales ¹⁵. PHE uses this data to statistically estimate through Serfling regression the expected number of weekly death registrations for a given week in the year. Allowing for variation, we can then determine if the number of deaths is higher than expected, resulting in excess all-cause mortality.

In contrast to 2013 to 2014 when the number of excess deaths was low, a large peak in excess death registrations was seen, with an increase above the upper limit for 12 weeks (week 51 2014 and weeks 1-11 2015)(Figure 25). A total of 16,415 excess all-age death registrations were estimated to have occurred in 2014 to 2015 which is significantly higher than seen during the past nine seasons (Table 4) including the last season of significant A(H3N2) activity in 2008 to 2009.

Figure 25. Weekly number of estimated all-age all-cause ONS death registrations by week of registration, England and Wales, 2014 to 2015



¹⁵www.ons.gov.uk/ons/rel/vsob2/weekly-provisional-figures-on-deaths-registered-in-england-and-wales/index.html

Table 4. Number and proportion of excess death registrations in England and Wales in influenza seasons from 2005 to 2006 to 2014 to 2015*

Season	Excess above threshold (95% CI)	Total number of deaths	% deaths in excess
2005 to 2006	629 (437 to 855)	323,299	0.2
2006 to 2007	220 (103 to 444)	315,611	0.1
2007 to 2008	728 (578 to 878)	318,149	0.2
2008 to 2009	10,438 (9,977 to 10,964)	327,334	3.2
2009 to 2010	3,264 (3,039 to 3,489)	315,931	1.0
2010 to 2011	3,561 (3,185 to 3,937)	317,876	1.1
2011 to 2012	6 (0 to 153)	315,330	0.0
2012 to 2013	3,107 (2,573 to 3,749)	333,821	0.9
2013 to 2014	577 (427 to 727)	312,218	0.2
2014 to 2015	16,415 (15,588 to 17,241)	306,243	5.4

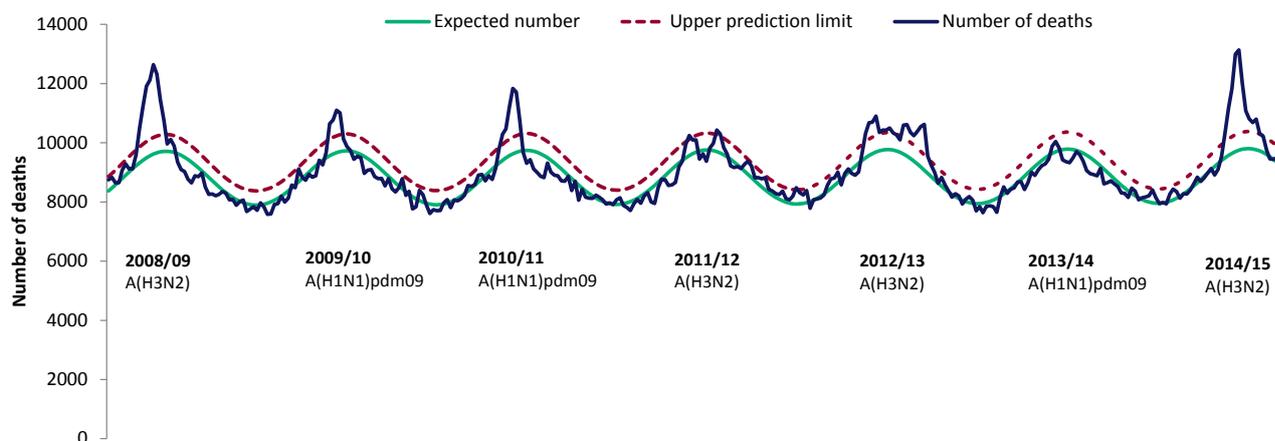
*NB. Seasons correspond to week 40 to 20 except for 2014 to 2015 which corresponds from week 40 to 15.

Mortality by week of death

Standardised reporting through the EuroMOMO mortality monitoring algorithm¹⁶ occurs across a European network and enables a direct comparison between excess mortality estimation in countries within the UK. The number of deaths is corrected by reporting delay and excess determined by week of death, avoiding the impact of bank holidays as illustrated above. During 2014 to 2015, significant excess mortality was seen across England predominantly in 65+ year olds from week 50 2014 to week 7 2015, peaking in week 2 2015. The magnitude of excess was the largest seen in recent seasons, with a higher peak than in 2008 to 2009, the last notable A(H3N2) season (Figure 26). In other age groups, significant excess was seen in under five year olds in week 2 2015 and in 15 to 64 year olds in weeks 51 2014 to 2 2015.

¹⁶www.euromomo.eu

Figure 26. Weekly observed and expected number of all-age all-cause deaths, England, 2008 to 2009 to 2014 to 2015*



*Each season is labelled with the dominant circulating influenza A subtype

Modelled estimates using the EuroMOMO model showed that Scotland also had more deaths than is normal for the time of year. Significant excess was seen in weeks 51 2014 to 9 2015. It is not possible to include the figures themselves in this report because the weekly numbers of deaths registered in Scotland are National Statistics which will not be published by National Records of Scotland until 10 June (for January to March 2015) and 17 June (for April and May 2015).

Elsewhere across the UK, significant excess all-age mortality was seen through the EuroMOMO model during the winter period in Wales in weeks 42 2014 and 1 to 3 2015, and in Northern Ireland in weeks 3 to 4 and 8 to 9 2015.

This significant increase in weekly mortality in the elderly was not restricted to the UK, with an increase seen from December 2014 up to February 2015 across 14 European countries through the EuroMOMO model¹⁷. This surveillance is undertaken on all-cause mortality and so the cause of the significant increase cannot be determined through this analysis. However it was noted that the rise coincided with an increased proportion of influenza detections in the European influenza surveillance schemes, with a main predominance of influenza A(H3N2) viruses seen throughout Europe. However it was also noted that cold snaps and other respiratory infections may also have contributed to the observation of increased excess mortality.

¹⁷www.eurosurveillance.org/images/dynamic/EE/V20N18/art21114.pdf

Emerging respiratory viruses

Human MERS-CoV infections

Since WHO first reported cases of Middle Eastern Respiratory Syndrome Coronavirus (MERS-CoV) in September 2012 (17), a total of 1110 laboratory-confirmed cases of infection with MERS-CoV have been reported globally up to 29 April 2015, including 422 deaths (case fatality ratio of 38%). Most cases have either occurred in the Middle East or have direct links to a primary case infected in the Middle East. Local secondary transmission following importation has been reported from the UK, France, and Tunisia.

From April to May 2014, there was a large spike in the number of cases reported from Saudi Arabia. This increase appears to have been driven by outbreaks in hospitals and infections in healthcare workers. The IHR Emergency Committee regarding MERS-CoV last met in February 2015. The Committee noted that MERS-CoV cases continue to occur, and the epidemiological pattern is characterised by sporadic cases and clusters of cases in communities and in healthcare settings, mostly in Saudi Arabia, but with no evidence of sustained human-to-human transmission. A small number of exported cases have been reported in travellers. There were no reported cases related to the Hajj. The Committee further noted that although significant efforts have been made to strengthen infection prevention and control measures, transmission in healthcare settings is still occurring¹⁸.

PHE continues to monitor potential cases in travellers returning from the Middle East with severe respiratory disease, with individuals tested for MERS-CoV if they met the suspect case definition¹⁹. Up to April 2015, 224 suspected cases amongst returning travellers have been identified in the UK and tested for MERS-CoV, with two positive imported cases detected in 2013. A further two secondary cases with non-sustained transmission in the UK were linked to the second UK case in Spring 2013. No positive cases have been reported in the UK since February 2013. In April and May 2014, two laboratory confirmed cases transited through London Heathrow Airport on separate flights to the USA. Contact tracing of flight contacts did not identify any further cases²⁰.

PHE remains vigilant, closely monitoring developments in countries where new cases emerge and continues to liaise with international colleagues to assess whether recommendations need to change in relation to MERS-CoV. The risk of infection to UK residents in the UK remains very low, although the risk of infection to UK residents in the affected areas is slightly higher, but is still considered to be low. There does remain a risk

¹⁸ www.who.int/mediacentre/news/statements/2015/8th-mers-emergency-committee/en/

¹⁹ <https://www.gov.uk/government/publications/mers-cov-public-health-investigation-and-management-of-possible-cases>

²⁰ Parry-Ford F, Boddington N, Pebody R, Phin N, on behalf of the Incident Management Team. Public health response to two incidents of confirmed MERS-CoV cases travelling on flights through London Heathrow Airport in 2014 – lessons learnt. Euro Surveill. 2015;20(18):pii=21114. Available online: www.eurosurveillance.org/images/dynamic/EE/V20N18/art21114.pdf

of imported cases from affected countries; however, this risk remains low. For further PHE information on management and guidance of possible cases, please see information online²¹.

Human influenza A(H7N9) infections

The first human infection with avian influenza A(H7N9) was reported in China in March 2013 and up to 15 April 2015, 651 cases have been reported, including 225 deaths giving an overall case fatality ratio of 34.6%. The majority of cases have been reported from China (426) with other exported cases reported in Hong Kong (13), Taiwan (four), Malaysia (one) and Canada (two). Most cases are associated with contact with infected live poultry or their environments, and particularly as a result of visiting live animal markets. Only a few small clusters with possible human-to-human transmission have occurred among family members. There has been no evidence of sustained human-to-human transmission to date despite extensive contact tracing activity²². There appears to be a seasonal pattern, with peaks tending to occur between December and March and lower activity during the rest of the year. This coincides with several weeks of celebrations related to the Chinese Lunar New Year and associated increases in travel to and from China, mass gatherings, and greater interactions between people and poultry. For further updates, please see the WHO website and for PHE advice on clinical management, please see information available online²³.

Human influenza A(H5N1) infections

Since 2003 to 31 March 2015, 826 cases of avian influenza A(H5N1) have been reported including 440 deaths, giving an overall case fatality rate of 53.3%. Cases have been reported from 16 countries.

During 2015 there has been an apparent spike in human infections with avian influenza A(H5N1), with 125 cases reported from January 2015 to 31 March 2015 in Egypt. This is the highest ever annual total reported from any one country. Most human cases have been reported from rural areas of central Egypt, along the Nile River and in the Nile Delta. This overlaps with areas where there has been an increase in the number of outbreaks of highly pathogenic avian influenza (HPAI) A(H5N1) detected in poultry. During 2015, cases have also been reported from China (3) and Indonesia (2). The majority of cases report contact with backyard poultry, and there is no evidence of sustained human-to-human transmission. There have been no significant changes in the virus identified. The increase in human cases is likely to be due to a combination of factors including: increased

²¹<https://www.gov.uk/government/collections/middle-east-respiratory-syndrome-coronavirus-mers-cov-clinical-management-and-guidance>

²²www.who.int/influenza/human_animal_interface/influenza_h7n9/RiskAssessment_H7N9_23Feb20115.pdf?ua=1

²³<https://www.gov.uk/government/collections/avian-influenza-guidance-data-and-analysis>

circulation of avian influenza A(H5N1) in poultry, increases in small poultry flocks and backyard farming, a lower public health awareness of the risks, and seasonal factors^{24 25}.

Enterovirus D68

From mid-August to 15 January 2015, CDC or state public health laboratories confirmed a total of 1,153 persons in 49 states and the District of Columbia with respiratory illness caused by EV-D68. Almost all of the confirmed cases were among children, many whom had asthma or a history of wheezing. Additionally there were cases testing positive for EV-D68 who developed acute flaccid myelitis, these findings strengthen the contention that acute flaccid myelitis is a rare yet severe clinical manifestation of EV-D68 infection in susceptible hosts^{26 27}.

ECDC published a rapid risk assessment; based on information currently available to ECDC, the risk of increased severe cases of EV-D68 in EU/EEA countries is assessed as moderate, in light of reports of such cases and because the circulation of this strain in the population seems to be geographically widespread in the EU²⁸.

The UK has an enhanced enterovirus surveillance system established as part of poliovirus elimination. Samples from individuals who present with neurological symptoms (such as acute flaccid paralysis or meningitis) and in whom enterovirus is detected should be sent for sub-typing at the reference laboratory. From 2012 to 1 September 2014, a total of 12 EV-D68 cases had been diagnosed, mainly in children. Following the reports from North America, guidance was developed highlighting that EV-D68 should be considered as a possible cause of disease in children with severe acute respiratory infections and/or with unexplained neurological symptoms, when all other respiratory virus screens are negative and if a rhinovirus/enterovirus positive PCR is initially detected. Although no unexplained clusters of severe respiratory or neurological disease have been reported, since September 2014 to date, a total of 53 sporadic cases have been detected in children and

²⁴ www.who.int/influenza/human_animal_interface/Influenza_Summary_IRA_HA_interface_31_March_2015.pdf?ua=1

²⁵

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/420965/H5N1_RA_2015_v3.pdf

²⁶ Greninger AL, Naccache SN, Messacar K, Clayton A, Yu G, Somasekar S, et al. A novel outbreak enterovirus D68 strain associated with acute flaccid myelitis cases in the USA (2012-14): a retrospective cohort study. *The Lancet Infectious diseases*. 2015

²⁷ Farrell JJ, Ikladios O, Wylie KM, O'Rourke LM, Lowery KS, Cromwell JS, et al. Enterovirus d68-associated acute respiratory distress syndrome in adult, United States, 2014. *Emerging infectious diseases*. 2015;21(5):914-6.

²⁸ European Centre for Disease Prevention and Control. Enterovirus 68 detected in the USA, Canada and Europe Second update, 25 November 2014 <http://ecdc.europa.eu/en/publications/Publications/Enterovirus-68-detected-in-the-USA-Canada-Europe-second-update-25-November-2014.pdf> 2014 [cited 2015 27 April 2015].

adults. From the information available to date, the majority seem to have presented with respiratory symptoms, with at least two children presenting with neurological symptoms.

In Scotland additional enhanced surveillance of EV-D68 testing was undertaken. Over the period, July to October/November 2014, 65 individuals have been laboratory confirmed on testing of respiratory samples as positive for EV-D68 (out of 1583 entero/rhinovirus positive respiratory samples). The clinical symptoms described have ranged from mild cough/cold to severe respiratory illness (in preterm), with no patients developing neurological complications. No enterovirus positive CSF samples tested during this time period were typed as EV-D68.

Conclusions

Moderate levels of influenza activity were seen in the community in the UK in 2014 to 2015, with influenza A(H3N2) the predominant virus circulating for the majority of the season, with influenza B circulating towards the end of the season. The health impact was predominantly seen in the elderly, with numerous outbreaks in care homes and levels of excess mortality significantly higher than the last notable significant H3N2 season of 2008 to 2009. Admissions to hospital and intensive care were observed, with peak ICU/HDU numbers higher than seen in the previous few seasons, but lower than the recent notable season of 2010 to 2011, which affected mainly younger adults.

Despite attempts to increase coverage, influenza vaccine uptake in 2014 to 2015 across the UK was similar to recent seasons in the elderly and in healthcare workers, though slightly lower in under 65 year olds in a pre-defined clinical risk group. Encouragingly, an increase was seen in uptake in pregnant women in some UK countries compared to 2013 to 2014. The observation of the low mid-season vaccine effectiveness this season is likely to reflect the antigenic and genetic mismatch between circulating A(H3N2) viruses and the 2014 to 2015 Northern Hemisphere vaccine strain. The importance of ensuring high uptake in target groups of the national influenza vaccination programme remains.

The childhood LAIV programme which was implemented in 2013 to 2014 continued in 2014 to 2015, targeting two to four year olds in primary care across the UK. A range of different target groups in school age children were targeted across the countries of the UK. Uptake levels were generally similar if not higher for the new programme compared to the first year in 2013 to 2014. There are promising initial observations through established surveillance systems of the population impact of the programme after the first season. Further work and observations from this and future seasons will be critical to evaluate this programme and to inform its optimal rollout to children.

Activity from other typical circulating respiratory viruses, including RSV, rhinovirus, adenovirus, parainfluenza and hMPV, was overall similar to that seen in the previous few seasons. Surveillance continues within the UK for the two novel respiratory viruses which emerged in 2012 to 2013: MERS-CoV and influenza A(H7N9), both of which have high reported case fatality ratios. Monitoring for A(H5N1) continues as well, particularly in the light of the increase in cases seen in Egypt this year. Monitoring of returning travellers with severe respiratory illness from affected countries will continue while the risk persists. 2014 also saw the apparent emergence of EV-D68 in North America associated with reports of severe respiratory illness and acute neurological disease. The UK has also observed some sporadic cases of respiratory and neurological illness associated with this pathogen.

Acknowledgements

Compiled by the Respiratory Diseases department, Centre for Infectious Disease Surveillance and Control, Public Health England

With contributions from:

Royal College of General Practitioners

Health Protection Scotland

Public Health, Wales

Public Health Agency, Northern Ireland

Real-time Syndromic Surveillance Team, Public Health England

Flusurvey, London School of Hygiene & Tropical Medicine

RVU, VRD, MS Colindale, Public Health England