Surveillance of influenza and other respiratory viruses in the UK: Winter 2016 to 2017
About Public Health England

Public Health England exists to protect and improve the nation’s health and wellbeing, and reduce health inequalities. We do this through world-class science, knowledge and intelligence, advocacy, partnerships and the delivery of specialist public health services. We are an executive agency of the Department of Health, and are a distinct delivery organisation with operational autonomy to advise and support government, local authorities and the NHS in a professionally independent manner.

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Published May 2017
PHE publications gateway number: 2017044

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Executive summary

Moderate levels of influenza activity were seen in the community in the UK in 2016 to 2017, with influenza A(H3N2) the dominant circulating virus for the majority of the season peaking in week 01 2017.

The impact of influenza A(H3N2) was predominantly seen in older adults, with a consistent pattern of outbreaks in care homes noted. In addition, admissions to hospital and ICU/HDU particularly amongst older adults were observed, although the impact on general practice was variable (moderate in England and Wales and low in Northern Ireland and Scotland). Peak admissions to hospital and ICU were lower than seen last season. Levels of excess all-cause mortality were elevated particularly in the elderly, but were lower than the 2014/15 season in which influenza A(H3N2) also dominated. The UK, as with many Northern Hemisphere countries has reported that the majority of circulating A(H3N2) circulating strains were genetically and antigenically similar to the Northern Hemisphere 2016/17 (H3N2) vaccine strain.

Influenza vaccine uptake in 2016 to 2017 in England was higher than the 2015 to 2016 season in healthcare workers (63.2%); in under 65 year olds in a pre-defined clinical risk group (48.6%) and in pregnant women (44.9%) and similar in the over 65 year olds (70.5%). In 2016 to 2017, the universal childhood influenza vaccine programme with live attenuated influenza vaccine (LAIV) was again offered to all healthy two, three and four year olds across the UK, plus to all children of school age Year 1, 2 and 3 in England and Wales. Uptake achieved in these groups was 38.9%, 41.5%, 33.9% in children two, three and four years of age and 57.6%, 55.4%, 53.3% respectively in England and 67.7%, 66.4% and 65.7% respectively in Wales in school years 1, 2 and 3. For the pilot programme for the remaining children of primary school age (5 to 11 years) in England, an overall uptake of 60.4% was achieved.

In Scotland and Northern Ireland, where vaccination is offered to all primary school children, the uptake in the 2 to <5 year olds (not yet in school) was 59% and 52.6% respectively and the uptake in all primary school children (4 to 11 year olds) was 73.0% and 78.3% respectively.

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 2016 to 2017. 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. No confirmed imported cases in the UK were detected in 2016 to 2017.
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 Public Health England’s National Infection Service (PHE NIS) on behalf of the countries of the UK, with weekly outputs published during the winter season between October (week 40) and May (week 20) the period when influenza typically circulates. This is in collaboration with teams within PHE, Health Protection Scotland, Public Health Wales and the Northern Ireland Public Health Agency, who are each responsible for producing reports for their countries. 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 influenza-related burden within the community, on the health service and in relation to excess all-cause mortality. In addition, in-season and end-of-season monitoring of seasonal influenza vaccine uptake is undertaken.

Background information on the data sources covered in this report has been previously described. The Moving Epidemic Method (MEM) is used by the European Centre for Disease Prevention and Control to standardise reporting of influenza activity across Europe. It has been adopted by the UK and is publicly presented for GP influenza-like illness (ILI) consultation rates for each UK scheme and for the proportion of samples positive for influenza through the respiratory DataMart scheme.

During the 2016-2017 season, the roll-out of a newly licensed live attenuated influenza vaccine (LAIV) has continued across the UK. In England, LAIV was offered to all two, three and four year olds through primary care and to children of school age Year 1, Year 2 & Year 3 (4-8 year olds) through schools this year.

Additional influenza vaccination activity for children was also carried out with strategies varying by country of the UK. In England, there were geographical pilots targeting

2 http://www.hps.scot.nhs.uk/resp/index.aspx
4 http://www.publichealth.hscni.net/directorate-public-health/health-protection/influenza
children of school age Year 4 to 6. In Wales, all four year olds were offered LAIV in school, whereas in Scotland and Northern Ireland, all primary school age children were offered LAIV vaccination.

PHE also carries out surveillance for novel respiratory viruses, including Middle East Respiratory Syndrome Coronavirus (MERS-CoV) which was first recognised in September 2012, and avian influenzas such as influenza A(H7N9) which emerged in Eastern China in 2013; influenza A(H5N1) which emerged in China in 2003 and influenza A(H5N6) which has been seen in China since 2013.

This report describes influenza activity experienced in the UK in the period from week 40 2016 (week ending 09/10/2016) to week 14 2017 (week ending 09/04/2017). This includes observations and commentary from the childhood vaccination programme, activity of other seasonal and novel respiratory viruses.
Observations

Community surveillance

Syndromic surveillance

In England, 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 indicators sensitive to community influenza activity eg NHS 111 cold/flu calls and GP consultations for influenza-like illness (ILI).

Syndromic surveillance indicators for GP in hours ILI consultations, GP out of hours ILI consultations and NHS 111 calls, all peaked in week 01 2017 at 18.0 per 100,000 population; 0.58% of consultations and 1.50% of all calls attributed to cold/flu respectively. Syndromic indicators for GP out of hours acute respiratory infections (ARI) consultations peaked in week 52 2016 at 25.4% of consultations.

The peaks for these indicators resemble those observed in the last notable influenza A(H3N2) season in 2014 to 2015, but occurred earlier than the peaks noted in 2015 to 2016 (Figure 1).
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Figure 1. Weekly all age (a) GP in hours consultations for influenza like illness (ILI) (b) NHS 111 cold/flu calls (c) GP out of hours consultations for ILI (d) GP out of hours consultations for acute respiratory infections (ARI) for winter 2014 to 2017, England

Syndromic indicators for sentinel emergency department attendances peaked during week 52 2016 for ARI and pneumonia consultations. This was similar to the peaks observed in 2014 to 2015.

Figure 2. Weekly all age (a) EDSSS acute respiratory infection consultations and (b) EDSSS pneumonia consultations for winter 2014 to 2017, England
In Scotland, the weekly proportion of all calls to NHS 24 which mention cold/flu, was low and peaked in 01 2017, similar to that of NHS 111 in England. The weekly proportion exceeded the historic baseline average in week 40 and 46.

**Figure 3. Proportion of calls for cold/flu (all ages) through NHS 24, Scotland, 2016 to 2017**

![Graph showing proportion of calls for cold/flu through NHS 24, Scotland, 2016 to 2017.](image)

*The historic baseline is based on NHS 24 data collected from May 2014 to May 2017.*

In Wales, the weekly proportion of all cold/flu calls made to NHS Direct Wales peaked in week 01 2017, similar to that of NHS 111 in England. For the majority of the 2016 to 2017 season in Wales, the proportion of cold/flu calls was lower than the previous two seasons.
Figure 4. Weekly proportions of calls for cold/flu (all ages) to NHS-Direct, Wales, 2014 to 2017
Outbreak reporting

Between week 40 2016 and week 14 2017, a total of 1,055 acute respiratory illness outbreaks in closed settings were reported in the UK to PHE compared to 656 in 2015 to 2016 and 687 in 2014 to 2015 (Table 1).

826 (78.3%) outbreaks occurred in care homes, 153 (14.5%) in hospitals, 60 (5.7%) in schools and 16 (1.5%) in other settings. This compares to 75% of outbreaks occurring in care homes in 2014 to 2015, the last influenza A(H3N2) dominated season.

### Table 1. Number and percentage of UK outbreaks by institution type, 2014 to 2017

<table>
<thead>
<tr>
<th>Institution Type</th>
<th>2016/17</th>
<th>2015/16</th>
<th>2014/15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1,055</td>
<td>656</td>
<td>687</td>
</tr>
<tr>
<td>Care Homes</td>
<td>826 (78.3%)</td>
<td>231 (35.2%)</td>
<td>515 (75.0%)</td>
</tr>
<tr>
<td>Hospitals</td>
<td>153 (14.5%)</td>
<td>108 (16.5%)</td>
<td>85 (12.4%)</td>
</tr>
<tr>
<td>Schools</td>
<td>60 (5.7%)</td>
<td>275 (41.9%)</td>
<td>77 (11.2%)</td>
</tr>
<tr>
<td>Other</td>
<td>16 (1.5%)</td>
<td>42 (6.4%)</td>
<td>10 (1.5%)</td>
</tr>
</tbody>
</table>

*Data for 2015/16 and 2014/15 is based on week 40 to week 20

The week of outbreak onset information was available for 793 (75.2%) outbreaks, for which the peak occurred in week 01 2017 with 103 outbreaks and the majority reported from care homes (87/103, 84.4%).

Where information on virological testing were available, the majority of outbreaks were caused by influenza A(unknown subtype) (429/617, 69.5%). 59 outbreaks were caused by influenza A(H3), 15 outbreaks were caused by influenza B and 92 outbreaks were caused by a range of other non-influenza viruses including respiratory syncytial virus (RSV), rhinovirus, human metapneumovirus (hMPV) and parainfluenza (Figure 5).
Scotland, the number of ARI outbreaks reported to Health Protection Scotland (HPS) between week 40 2016 and week 14 2017 (73) was higher than season 2015 to 2016 (18) and season 2014 to 2015 (63). There have been no influenza outbreaks reported in schools in any of the last three seasons.

The percentage of outbreaks reported in care home settings (67.1%) was lower than seen in the 2014 to 2015 season (73.0%). Hospital outbreaks accounted for 32.9% which was higher than in 2014 to 2015 (19.0%). Where laboratory confirmation was undertaken (91.8%), the majority (49.3%) of outbreaks were due to influenza A (unknown subtype). Co-infections of influenza A and other pathogens (rhinovirus, RSV, seasonal coronavirus) accounted for 15% of outbreaks, RSV accounted for 8.2% of outbreaks.

In Wales, eight ARI outbreaks were reported to the Public Health Wales Health Protection team between week 40 2016 and week 14 2017. The majority occurred in care home settings (75%). Influenza was confirmed in five of the six outbreaks tested with influenza A (unknown subtype) being the most commonly detected. The number of outbreaks reported in Wales was slightly lower than in 2015 to 2016 but similar to that observed in 2014 to 2015, which was also a season dominated by residential home outbreaks.

In Northern Ireland, 13 confirmed influenza outbreaks were reported to the Public Health Agency (three influenza A (unknown subtype, eight influenza A (H3) and two influenza B). This compares to a total of seven confirmed influenza outbreaks in 2015 to 2016 and 28 confirmed influenza outbreaks in 2014 to 2015.
**Flusurvey (internet-based surveillance)**

Flusurvey is part of a European wide initiative (including 10 European countries) run by Public Health England, providing internet-based surveillance of ILI in the UK population.

On registration, individuals complete a baseline questionnaire which includes demographic, geographic, socioeconomic (household size and composition, occupation, education, and transportation), and health (vaccination, diet, pregnancy, smoking, and underlying medical conditions) data. Subsequently, participants were sent weekly reminders to report any symptoms relating to flu that they may have experienced and their behaviour as a result of their symptoms (health-seeking behaviour).

During the 2016 to 2017 season, a total of 4,078 participants signed up of which 3,825 (93.8%) completed at least one survey contributing over 45,000 real-time flu related symptoms data with an average weekly response rate of 63.0%.

Of a total of 3,934 participants whose age was available for, 5% (201) were <18 year olds and 95% (3,823) were 18+ year olds.

In England, there were a total of 3,559 participants (3,429 in non-pilot areas; 170 in pilot areas); 244 participants from Scotland; 24 participants from Northern Ireland and 132 from Wales.

The overall number of self-reported ILI cases was 1,505 (3.5%), this is based only on participants who completed three or more weekly symptom surveys.

Using the ECDC ILI case definition of sudden onset of symptoms and at least one of; fever, malaise, headache or muscle pain and at least one of; cough, sore throat, shortness of breath; the overall crude ILI incidence was 35.2 per 1,000 population which similar to other surveillance schemes, peaked in week 01 2017. The majority of ILI incidence was observed in participants in the 20-44 year age group throughout the season, which differs to the dominant age groups observed through other surveillance schemes (Figure 6). Further analysis and report of the 2016/17 flu survey will be available on the website ([www.flusurvey.org.uk](http://www.flusurvey.org.uk)).
Figure 6: Weekly ILI incidence per 1,000 by age group reported through Flusurvey, 2016 to 2017 UK
Primary care consultations

England

Weekly rates of General Practitioner (GP) consultations for influenza-like illness (ILI) through the Royal College of General Practitioners (RCGP) scheme increased above the Moving Epidemic Method (MEM) baseline threshold of 14.3 per 100,000 in week 51 2016 peaking in week 02 2017 at 20.3 per 100,000. Rates remained at or above the threshold for six weeks until week 05 2017 in England (Figure 7).

In comparison to the last influenza A(H3N2) dominated season in the 2014 to 2015 season, the peak activity was lower but occurred during similar weeks (20.3 per 100,000 in week 02 in 2016 to 2017 compared to 28.3 per 100,000 in week 01 in 2014 to 2015). In 2016 to 2017, ILI rates have been above the baseline threshold for six weeks compared to 14 weeks in the 2014 to 2015 season.

By age group, activity peaked at medium, levels in older adults, with the highest levels seen in the 75+ year olds (32.1 per 100,000 in week 51 2016), <1 year olds (28.0 per 100,000 in week 01 2017) and 45-64 year olds (26.0 per 100,000 in week 02 2017). This coincides with previously seen observations of influenza A(H3N2) predominately affecting older adults.

Figure 7. Weekly all age GP influenza-like illness rates for 2016 to 2017 and past seasons, and peak rates by age group in 2016 to 2017, England (RCGP)
Scotland

Weekly GP consultations for ILI remained below the MEM threshold of 36.1 per 100,000 throughout the season in Scotland. ILI rates peaked in week 02 2017 at 22.8 per 100,000 (Figure 8).

Overall seasonal ILI activity was less intense compared to the last influenza A(H3N2) dominated season in 2014 to 2015 (22.8 per 100,000 in the 2016 to 2017 compared to 45.5 per 100,000 in the 2014 to 2015).

By age group, the highest levels of activity were seen in 45 – 64 year olds (28.9 per 100,000), 65-74 year olds (23.6 per 100,000) and 75+ year olds (38.1 per 100,000) in week 02 2017 respectively. Overall throughout the current season the lowest rates of influenza activity were seen among the youngest ages (in particular the 1-4 year olds).

**Figure 8. Weekly all age GP influenza-like illness rates for 2016 to 2017 and past seasons, and peak rates by age group in 2016 to 2017, Scotland**

Wales

Weekly GP consultations for ILI in Wales increased above the MEM threshold of 10.4 per 100,000 in week 49 2016 and peaked in week 01 2017 at 24.7 per 100,000. Rates remained at or above the threshold for 11 weeks until week 07 2017 (Figure 9).

In comparison to the last influenza A(H3N2) dominated season in 2014 to 2015, the peak activity was slightly higher (24.7 per 100,000 in 2016 to 2017 compared to 23.1 per 100,000 in 2014 to 2015). In 2016 to 2017, ILI rates have been above the baseline threshold for 11 weeks compared to 13 weeks in the 2014 to 2015 season.
By age group, the highest levels of activity were seen in the 65-74 year olds (43.3 per 100,000), 75+ year olds (34.0 per 100,000) and <1 year olds (34.3 per 100,000) in weeks 01 2017, 02 2017 and 03 2017 respectively.

Figure 9. Weekly all age GP influenza-like illness rates for 2016 to 2017 and past seasons, and peak rates by age group in 2016 to 2017, Wales

Northern Ireland

Weekly GP consultations for ILI in Northern Ireland remained below the MEM threshold of 47.9 per 100,000 throughout the season. The ILI rate peaked in week 02 2017 at 33.0 per 100,000 in 2016 to 2017. This compared to a peak of 58.3 per 100,000 in week 07 in 2014 to 2015, the last influenza A(H3N2) dominated season (Figure 10). ILI rates did not breach the threshold in 2016 to 2017 compared to breaching the threshold for two weeks in the 2014 to 2015 season.

By age group, the highest levels of activity were seen in the <1 year olds (57.2 per 100,000), 75+ year olds (52.8 per 100,000) and 1-4 year olds (51.1 per 100,000) in weeks 13 2017, 52 2016 and 46 2016 respectively. The lowest levels of activity were seen in the 5-14 year olds (16.4 per 100,000).
Figure 10. Weekly all age GP influenza-like illness rates for 2016 to 2017 and past seasons, and peak rates by age group in 2016 to 2017, Northern Ireland
Secondary care surveillance

Influenza surveillance in secondary care is carried out through the UK Severe Influenza Surveillance Systems (USISS), which were established after the 2009 influenza pandemic. There are two schemes established:

The USISS sentinel hospital scheme, which is a sentinel network of acute trusts in England who report weekly laboratory confirmed influenza hospital admissions.

The USISS mandatory ICU scheme, which is a national mandatory collection which collects the weekly number of laboratory confirmed influenza cases admitted to Intensive Care Units (ICU) and High Dependency Units (HDU) and number of confirmed influenza deaths in ICU/HDU across the UK.

USISS Sentinel

Through the USISS sentinel scheme, a total of 1,531 hospitalised confirmed influenza cases (cumulative rate of 0.88 per 100,000 catchment population) were reported from 22 participating sentinel NHS acute trusts across England from week 40 2016 to week 14 2017. This compares to a total of 2,781 cases (cumulative rate of 0.91 per 100,000) from 26 participating trusts in 2015 to 2016 and a total of 1,738 cases (cumulative rate 0.48 per 100,000 from 28 participating trusts in 2014 to 2015.

Amongst cases reported, influenza A(H3N2) was the dominant subtype reported up to week 14 2017. The number and rate of hospital admissions peaked in week 05 2017 (161 admissions, 2.6 per 100,000 population trust catchment area).

This peak was higher than the 2014 to 2015 season, where the peak was at 1.9 per 100,000 in week 02 2015), but lower than the peak seen in 2015 to 2016, where the peak was at 3.4 per 100,000 in week 12 2016) (Figure 11).
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Figure 11. Weekly number of influenza confirmed admissions to hospital through the USISS sentinel scheme in England, with crude hospitalisation rate, 2016 to 2017

Figure 12. Cumulative influenza confirmed hospital admissions by age group and influenza type, through the USISS sentinel scheme, week 40 2016 to week 14 2017

Figure 13 represents the weekly total number of influenza confirmed hospital admissions reported through the USISS sentinel scheme in England for the period from 2010 to 2017.

During 2016 to 2017, more detailed data were collected on hospitalised cases in children under the age of 17 years of age. A total of 94 influenza confirmed hospitalised cases were reported, of whom 69 were influenza A(H3N2) (73.4%), 13 were influenza
A(not subtyped) (13.8%) and 11 influenza B (11.7%). 28.7% of these cases were reported to have an underlying risk factor.

**Figure 13. Weekly number of influenza confirmed hospital admissions to hospital through the USISS sentinel scheme with crude hospitalisation rate for all ages, 2010 to 2017**

![Weekly number of influenza confirmed hospital admissions to hospital through the USISS sentinel scheme with crude hospitalisation rate for all ages, 2010 to 2017](image)

**USISS Mandatory**

Through the USISS mandatory scheme, a total of 1,064 ICU/HDU admissions of confirmed influenza were reported across the UK from week 40 2016 to week 14 2017, including 133 deaths. In England, the total number of influenza confirmed admissions to ICU/HDU was 953 (rate of 0.07 per 100,000 population) and 107 deaths during the same period (Figure 14).

The cumulative number of cases and deaths were lower compared to 2015 to 2016 (2,173 cases (rate of 0.14 per 100,000) and 166 deaths), and to the 2014 to 2015 season (1,261 cases (rate of 0.08 per 100,000) and 107 deaths) in England.

ICU/HDU case numbers and admission rates peaked in week 01 2017 (104 cases and a rate of 0.20 per 100,000).

Of the 1,064 ICU/HDU admissions, the majority were due to influenza A(1,006, 95.0%), with the remainder due to influenza B (58, 5.0%). Of the influenza A admissions, 585 (55.0%) were due to A(not subtyped), 331 (31.0%) were influenza A(H3N2) and 90 (8%) were reported to be influenza A(H1N1)pdm09 (Figure 15).

ICU/HDU admissions occurred in all age groups. Those aged 65+ years made up 44.0% of all cases and 30.0% of all cases were seen in the 45-64 year olds (Figure 15).
In the previous season, the largest proportion of admissions occurred in those in the 45-64 and 15-44 year olds.

**Figure 14 Weekly number of influenza confirmed admissions to ICU/HDU through the USISS mandatory scheme in England, with crude ICU/HDU admission rate, 2016 to 2017**
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Figure 15. Cumulative ICU/HDU influenza confirmed admissions by age group and influenza type in the UK, through the USISS mandatory scheme, week 40 2016 to week 14 2017

Figure 16. Weekly number of influenza confirmed ICU/HDU admissions to hospital through the USISS mandatory scheme with crude hospitalisation rate for all ages, 2011 to 2017

In Scotland, 72 laboratory confirmed cases (rate of 1.34 per 100,000 resident population) required intensive care management from week 40 2016 to week 14 2017, with peak activity in week 52 2016. The majority of cases were due to influenza A untyped (55.6%) or influenza A(H3N2) (25.0%) with a small percentage due to influenza B (19.4%).
The largest number of cases was observed in the 65+ year olds (44.4%) and 45-64 year olds (29.2%) and the lowest number of cases was seen in the 1-4 year olds (2.8%) (Figure 17). This is similar to the proportion seen in the 2014 to 2015 season, the case fatality rate (ie proportion of ICU cases which have died) of 25.0% (18/72) is in keeping with the previous five seasons (ranging from 23.7% to 35.6%).

In Wales, 78 patients (rate of 2.52 per 100,000 resident population) in ICU were confirmed with influenza between week 40 2016 and week 14 2017 with peak activity in week 52 (Figure 18). Influenza A(H3N2) accounted for 97.4% of these confirmed cases and 2.6% were due to influenza B. Of the patients confirmed with influenza in ICU, 60.3% were aged 65+ years.

*The data presented above relates to Level 3 care data only*
In Northern Ireland, there were 44 patients (rate of 2.37 per 100,000 resident population) in ICU with laboratory confirmed influenza between week 40 2016 and week 14 2017, with peak activity in week 52. Influenza A(H3N2) accounted for 72.7% of these confirmed cases, influenza A(unknown subtype) accounted for 18.2% and 9.1% were due to influenza B. The majority of cases (45.5%) were in the 65+ years age group. Eight deaths (18.2%) were also reported in the ICU/HDU patients with laboratory confirmed influenza.

**Figure 19. Weekly number of laboratory confirmed influenza ICU cases in Northern Ireland, up to week 14 2017 and the cumulative number of ICU admissions by age group and influenza type up to week 14 2017, Northern Ireland**
USISS Severe Respiratory Failures Centre (SRF)

This surveillance system collects data on every patient accepted by a SRF Centre, whether for ExtraCorporeal Membrane Oxygenation (ECMO) or other advanced respiratory support, and whether or not the primary cause is known to be infection-related. There are six SRFs in the UK (five in England and one in Scotland).

For the 2016 to 2017 season, of the 80 SRF admissions reported by the six SRFs between week 40 2016 and week 14 2017, four were laboratory confirmed influenza admissions reported to the six SRFs, including one influenza A(H3N2) and three influenza A(unknown subtype). This compares to a total of 73 influenza confirmed admissions in 2015 to 2016, when the dominant circulating sub-type was A(H1N1)pdm09 and a total of 14 influenza confirmed admissions reported in 2014 to 2015 when the dominant circulating subtype was also influenza A(H3N2).

Microbiological surveillance

Respiratory DataMart, England

Influenza A and B positivity were monitored through the respiratory DataMart surveillance scheme in England for the season of 2016 to 2017, with the overall influenza positivity increasing above the MEM baseline threshold of 8.6% in week 49 2016. Influenza A(H3) was the dominant circulating virus throughout the season.

Overall influenza A positivity peaked at 29.2% in week 01 2017 with the highest age-specific activity seen in the 65+ year olds and 15-44 year olds (peak positivity of 38.7% and 32.4% respectively, in week 01 2017). Influenza A(H3) positivity peaked at 25.4% in week 01 2017. This is similar to the activity seen in the 2014 to 2015 season where the peak positivity was 32.4%. Influenza A(H1N1)pdm09 also circulated at low levels in 2016 to 2017. Very low levels of influenza B have been noted throughout the 2016 to 2017 season.
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Figure 20. Weekly number of influenza A and B detections through Respiratory Datamart in England, with overall % positivity, 2016 to 2017

It is evident that the overall positivity for 2016 to 2017 is similar to the last notable influenza A(H3N2) season in 2014 to 2015.

ECOSS, Scotland

In Scotland, overall influenza positivity reported through non-sentinel sources (ECOSS) rose above 10% in week 51 2016, and reached a peak of 17.1% in week 01 2017. As seen in the rest of UK, influenza A(H3) was the dominant circulating virus, however Scotland has seen an increase in the number of detections and positivity of influenza B from week 10 2017 (Figure 22).
Sentinel GP-based swabbing scheme

GP-based sentinel swabbing schemes in the UK were dominated by influenza A(H3N2) as per the other surveillance schemes, however Scotland observed more influenza B activity than other countries.

In England, influenza activity through the RCGP/SMN schemes increased from week 50 2016 and remained above 20.0% positivity until week 09 2017, mainly dominated by influenza A(H3N2). Overall influenza positivity peaked at 41.8% in week 52 2016 (Figure 23).

Influenza activity monitored through the GP Sentinel Scheme in Scotland peaked at 37.0% positivity in week 04 2017 with predominance of influenza A(H3N2) in weeks 50 2016 to 07 2017 (peak positivity seen in week 03); with influenza B predominance in weeks 08 to 14 2017 (peak positivity seen in week 10). The overall swab positivity for influenza increased and remained above 20% between week 52 2016 and week 10 2017 (Figure 23).
In Wales, similar to England, the peak number of influenza positive specimens were influenza A(H3N2) with the highest number seen in week 06 2017.

In Northern Ireland the peak was seen in week 01 2017 and was mainly due to influenza A(H3N2), however a small increase in influenza B specimens from week 06 2017 has been noted.
Virus characterisation

PHE characterises the properties of influenza viruses through one or more tests, including genome sequencing (genetic analysis) and haemagglutination inhibition (HI) assays (antigenic analysis). These data are used to compare how similar the currently circulating influenza viruses are to the strains included in seasonal influenza vaccines, and to monitor for changes in circulating influenza viruses. The interpretation of genetic and antigenic data sources is complex due to a number of factors, for example, not all viruses can be cultivated in sufficient quantity for antigenic characterisation, so that viruses with sequence information may not be able to be antigenically characterised as well. Occasionally, this can lead to a biased view of the properties of circulating viruses, as the viruses which can be recovered and analysed antigenically, may not be fully representative of majority variants, and genetic characterisation data does not always predict the antigenic characterisation.

Since the start of the 2016/17 winter influenza season in week 40 2016, the PHE Respiratory Virus Unit has characterised four A(H1N1)pdm09 influenza viruses; one both genetically and antigenically and three antigenically. The A(H1N1)pdm09 virus genetically characterised belongs in the genetic subgroup 6B.1, which was the predominant genetic subgroup in the 2015/16 season. The three viruses antigenically analysed are similar to the A/California/7/2009 Northern Hemisphere 2016/17 (H1N1)pdm09 vaccine strain.

Genetic characterisation of 416 A(H3N2) influenza viruses since week 40 showed that they all belong to genetic subclade 3C.2a , with 220 belonging to a cluster within this genetic subclade designated as 3C.2a1. The Northern Hemisphere 2016/17 influenza A(H3N2) vaccine strain (A/HongKong/4801/2014) belongs in genetic subclade 3C.2a. This season’s A(H3N2) viruses are difficult to cultivate, and only 24 influenza A(H3N2) viruses have been isolated and antigenically characterised since week 40 2016, representing a minority of the detections, indicating the bias in antigenic data. The viruses antigenically analysed are similar to the A/HongKong/4801/2014 Northern Hemisphere 2016/17 A(H3N2) vaccine strain. Of the 24 antigenically characterised viruses, eight isolates have also been genetically characterised, with all belonging in genetic group 3C.2a, and six also belonging in the recently emerged 3C.2a1 cluster.

Sixty two influenza B viruses have been analysed genetically since week 40/2015; 58 have been characterised as belonging to the B/Yamagata/16/88-lineage and four belonging to the B/Victoria/2/1987-lineage. Eighteen influenza B viruses have been isolated and antigenically characterised since week 40 2016; 13 viruses were characterised as belonging to the B/Yamagata/16/88-lineage and were antigenically similar to B/Phuket/3073/2013, the influenza B/Yamagata lineage component of 2016/17 Northern Hemisphere quadrivalent vaccine. Five viruses were characterised as belonging to the B/Victoria/2/87-lineage and were antigenically similar to
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B/Brisbane/60/2008, the influenza B/Victoria-lineage component of 2016/17 Northern Hemisphere trivalent and quadrivalent vaccines.

**Antiviral resistance**

Influenza positive samples are screened for mutations in the virus neuraminidase gene known to confer oseltamivir and/or zanamivir resistance. Additionally, testing of influenza A (H1N1)pdm09, A(H3N2), and influenza B virus isolates for neuraminidase inhibitor susceptibility (oseltamivir and zanamivir) is performed at PHE, RVU using a functional assay. The data summarized below combine the results of both testing methods. The samples tested are routinely obtained for surveillance purposes, but diagnostic testing of patients suspected to be infected with neuraminidase inhibitor-resistant virus is also performed.

Since week 40 2016, 305 influenza A(H3N2) have been tested for oseltamivir susceptibility; 300 are fully susceptible. Of the 305, 286 were also tested for zanamivir susceptibility with 280 being fully susceptible. Four A(H3N2) viruses have been detected with an R292K amino acid substitution, which causes resistance to oseltamivir and a reduction in susceptibility to zanamivir, and one A(H3N2) virus with an E119V amino acid substitution was detected, causing resistance to oseltamivir but not tested for zanamivir susceptibility. All four R292K cases and the E119V case have been identified in patients with underlying medical conditions with some prior exposure to oseltamivir. Nine influenza A(H1N1)pdm09 and 17 influenza B (Yamagata) viruses have been tested for oseltamivir and zanamivir susceptibility and all were fully susceptible.
Vaccination

Seasonal influenza vaccine uptake in adults

Although, all countries of the UK use standardised specifications to extract uptake data from IT information systems in primary care, there some specific differences when comparisons should be made cautiously.

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 2017 was reported from 98.1% (7,296/7,436) of GP practices in England in 2016 to 2017. This showed a vaccine uptake of 70.5% in 65+ year-olds (compared to 71.0% in 2015 to 2016) and 48.6% 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 45.1% in 2015 to 2016 (Table 2). Uptake in pregnant women up to 31 January 2017 was 44.9%, compared to 42.3% in 2015 to 2016. The more detailed final uptake reports are now publically available.

In Scotland, the uptake of seasonal influenza vaccine is estimated by Health Protection Scotland (HPS) throughout the season, also based on automated weekly extracts from 99% of all Scottish GP practices. As such, vaccine uptake reported here should be regarded as provisional.

Cumulative uptake in 2016 to 2017 showed vaccine uptake of 72.8% in 65+ year olds (compared to 74.5% in 2015 to 2016). Uptake amongst 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) was 44.9% (compared to 48.0% in 2015 to 2016). Uptake in pregnant women up to 31 January 2017 was 50.3%, compared to 51.2% in 2015 to 2016.

In Wales, the uptake of seasonal influenza vaccine is monitored on a weekly basis by Public Health Wales throughout the season based on automated weekly extracts of Read coded data using software installed in all General Practices in Wales.

Cumulative uptake data on influenza vaccinations administered were received from 99.9% of GP practices in Wales in 2016 to 2017. This showed a vaccine uptake of 66.7% in 65+ year olds (compared to 66.6% in 2015 to 2016) and 46.9% 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, morbidly obese patients and carers), compared to 46.8% in 2015 to 2016.

Overall uptake in pregnant women was 75.9% compared to 47.8% in 2015 to 2016.
In Wales, vaccine coverage in pregnant women is measured differently using a survey of pregnant women giving birth each year during January. Data are also automatically collected from general practices for women with pregnancy related Read-codes, these data report uptakes of 58.3% in pregnant women at risk and 45.7% in healthy pregnant women, however the validity of these data is unknown.

In Northern Ireland, the uptake of seasonal influenza vaccine is monitored by the Public Health Agency (PHA) of Northern Ireland. Cumulative uptake of influenza vaccination administered up to 31 March 2017 was reported from 99.7% of GP practices in NI in 2016 to 2017. In the population aged 65+ years uptake was 71.9% (compared to 74.4% in 2015 to 2016) and in the population of under 65 years at risk the uptake was 57.1% (compared to 59.9% in 2015 to 2016). Uptake in pregnant women up to 31 March 2017 was 58.6% compared to 55.1% in 2015 to 2016.

Uptake by frontline healthcare workers in England was 63.2% from 100% of Trusts. This has increased from 50.6% in 2015 to 2016. In Scotland, provisional uptake figures in healthcare workers across all territorial health boards was 33.7%; this compares with 33.2% in 2015 to 2016. In Wales, uptake reached 49.1% compared to 47.2% in 2015 to 2016. In Northern Ireland, uptake in frontline healthcare workers was 29.0% compared to 24.6% in 2015 to 2016.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>65+ years</td>
<td>70.5</td>
<td>72.8</td>
<td>66.7</td>
<td>71.9</td>
</tr>
<tr>
<td>&lt;65 years at risk</td>
<td>48.6</td>
<td>44.9</td>
<td>46.9</td>
<td>57.1</td>
</tr>
<tr>
<td>Pregnant</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No risk</td>
<td>36.9</td>
<td>49.3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>At Risk</td>
<td>41.5</td>
<td>66.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>All</td>
<td>44.9</td>
<td>63.3</td>
<td>75.9</td>
<td>58.6</td>
</tr>
<tr>
<td>Healthcare Workers</td>
<td>63.2</td>
<td>33.7</td>
<td>49.1</td>
<td>29.0</td>
</tr>
</tbody>
</table>

Table 2. Influenza vaccine uptake in 65+ year olds, 6 months to under 65 years, pregnant women and healthcare workers, 2016 to 2017, UK

Live attenuated influenza vaccine (LAIV) programme for children

England

The Imform survey was used to monitor influenza vaccine uptake in two, three and four year olds in primary care in England. The uptake for all GP-registered two year olds was 38.9% compared to 35.4% in 2015 to 2016; 41.5% compared to 37.7% in three year olds in 2015 to 2016 in England; and 33.9% in four year olds compared to 30.0% in 2015 to 2016. This was reported from 97.4% of GP practices in England.

The seasonal influenza vaccine programme for children school year 1,2 and 3 (5 years rising to 8 years of age) was mainly delivered via a school-based programme, although
in a few areas vaccinations was delivered through general practice. Vaccine uptake was monitored through manual returns by local teams for their responsible population.

An estimated 1,123,227 children of school years 1, 2 and 3 age (aged 5 rising to 8 years) in England received at least one dose of influenza vaccine during the period 1 September 2016 to 31 January 2017. With an estimated total target population of 2,026,180, this resulted in an overall uptake of 55.4%. Total uptake in children of school years 1,2 and 3 age was 57.6%, 55.4% and 53.3% respectively. Uptake by region ranged from 58.9% to 44.0% with the highest uptake reported in the Midlands and East of England and the lowest uptake reported in London (Table 2). A more detailed PHE report on influenza vaccine uptake in England in primary school age children is publically available8.

Table 3. Estimated number and proportion of children of school years 1, 2 and 3 age who were vaccinated with influenza vaccine by local NHS England team from 1 September 2016 to 31 January 2017

<table>
<thead>
<tr>
<th>Local NHS England team</th>
<th>No. of children eligible for vaccination</th>
<th>No. of children vaccinated with at least 1 dose of influenza vaccine</th>
<th>Vaccine uptake (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>587,565</td>
<td>322,790</td>
<td>56.9</td>
</tr>
<tr>
<td>Cumbria &amp; North East</td>
<td>109,357</td>
<td>63,864</td>
<td>56.8</td>
</tr>
<tr>
<td>Lancashire &amp; Greater Manchester</td>
<td>166,971</td>
<td>63,407</td>
<td>50.0</td>
</tr>
<tr>
<td>Yorkshire &amp; Humber</td>
<td>205,222</td>
<td>123,159</td>
<td>60.0</td>
</tr>
<tr>
<td>Cheshire &amp; Merseyside</td>
<td>86,815</td>
<td>52,360</td>
<td>60.3</td>
</tr>
<tr>
<td>Midlands &amp; East</td>
<td>625,091</td>
<td>368,094</td>
<td>58.9</td>
</tr>
<tr>
<td>North Midlands</td>
<td>128,256</td>
<td>77,826</td>
<td>60.7</td>
</tr>
<tr>
<td>Central Midlands</td>
<td>178,177</td>
<td>103,820</td>
<td>58.3</td>
</tr>
<tr>
<td>West Midlands</td>
<td>164,934</td>
<td>91,002</td>
<td>55.2</td>
</tr>
<tr>
<td>East</td>
<td>153,724</td>
<td>95,446</td>
<td>62.1</td>
</tr>
<tr>
<td>London</td>
<td>327,711</td>
<td>144,345</td>
<td>44.0</td>
</tr>
<tr>
<td>London</td>
<td>327,711</td>
<td>144,345</td>
<td>44.0</td>
</tr>
<tr>
<td>South</td>
<td>505,813</td>
<td>287,998</td>
<td>56.9</td>
</tr>
<tr>
<td>South Central</td>
<td>138,074</td>
<td>79,816</td>
<td>57.1</td>
</tr>
<tr>
<td>South West</td>
<td>106,933</td>
<td>59,785</td>
<td>55.9</td>
</tr>
<tr>
<td>Wessex</td>
<td>93,042</td>
<td>61,255</td>
<td>65.8</td>
</tr>
<tr>
<td>South East</td>
<td>170,764</td>
<td>87,142</td>
<td>51.0</td>
</tr>
<tr>
<td>Total</td>
<td>2,026,180</td>
<td>1,123,227</td>
<td>55.4</td>
</tr>
</tbody>
</table>

8 Data for Bassetlaw, an LA district of Nottinghamshire UA, was collected independently. Bassetlaw uptake figures are reported under Yorkshire and Humber NHS England team.

Uptake by year group by LA ranged from to 77.1% to 28.1% for children of school year 1 age, 75.1% to 23.9% for children of school year 2 age, and from 72.6% to 23.3% in school year 3 age.

The 2016 to 2017 season also saw the continuation of the primary school-age vaccination programme in five pilot areas in England that have been piloting the programme since 2013 to 2014. Influenza vaccine was offered to all primary school age children aged 5-11 years (school years 1 to 6) through a school based delivery model. An estimated 172,175 primary school children aged 5-11 years in five pilot areas

8 https://www.gov.uk/government/collections/vaccine-uptake#seasonal-flu-vaccine-uptake:-figures
received at least one dose of influenza vaccine during the period 1 September 2016 to 31 January 2017 (Figure 24). With an estimated total target population of 285,735, this results in an overall uptake of 60.4% (ranging by pilot site from 44.5% to 73.4%) compared to 57.9% in children aged 5-11 years in the 2015 to 2016 season (ranging from 43.6% to 72.0%).

Figure 24. Estimated proportion of primary school age children (aged 5-11 yrs) who were vaccinated with influenza vaccine by pilot area, England, 1 September 2016 to January 31 2017

Vaccine uptake for the period 1 September 2016 to 31 January 2017 in pilot areas by year group ranged from 63.0% in school year 1 (aged 5 years) to 57.2% in school year 6 (aged 10 years), with an overall pattern of decreasing uptake with increasing age (Figure 25). A 2.4% increase in vaccine uptake was observed since 2015 to 2016.
Figure 25. Estimated proportion of primary school age children (aged 5-11 yrs) who were vaccinated with influenza vaccine by year group in pilot areas, England, 2014 to 2017

Scotland

The estimated uptake in preschool children (2 to under 5 year olds, not yet in school) vaccinated in the GP setting was 59.0% in 2016 to 2017 (compared to 57.1% in 2015 to 2016).

In 2016 to 2017, the offer of influenza vaccine was made to all primary school aged children in Scotland with an estimated 299,341 children aged 4-11 years who received at least one dose of influenza vaccine. With an estimated total target population for the school based programme of 410,336, this resulted in an uptake of 73.0% at the end of the season. This is similar to the vaccine uptake achieved during the primary school programme in 2015 to 2016 (71.8% uptake). These uptake figures are based on aggregate school level data collated in season and are likely to be an underestimate, as the estimated uptake from many NHS boards does not include data from additional children vaccinated in general practice.

Reported uptake of the primary school programme varied by NHS board (Figure 13). Uptake in 2016 to 2017 was similar to 2015 to 2016 in all NHS boards.
Wales

In Wales, national uptake of influenza vaccine increased in children in 2016 to 2017. Immunisations for two and three year olds were delivered through general practices in Wales. Uptake of influenza vaccine for children aged two years was 45.4% (compared to 45.9% in 2015 to 2016), for three year olds it was 45.1% (compared to 43.2% in 2015 to 2016). Children aged four, five, six and seven years, received their vaccinations in school immunisation sessions and uptake was 67.7%, 67.7%, 66.4% and 65.7% in each of these groups respectively. For the group as a whole, uptake was 66.9%.

Northern Ireland

In 2016 to 2017 the childhood influenza vaccination programme continued 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 2016 to 2017 for pre-school children aged two to four years old was 52.6% (compared to 50.5%...
in 2015/16). The vaccination uptake rate for children in primary school (aged approximately 4 to 11 years old) was 78.3% (compared to 76.8% in 2015/16).

Other respiratory viruses

Respiratory syncytial virus (RSV) reported through DataMart Surveillance system peaked in week 48 2016 at 23.6% positivity, with circulation above 10.0% between week 44 2016 and 52 2016 (Figure 27). This peak was observed slightly earlier than the peaks seen in the last two seasons, 26.2% in 2014 to 2015 peaking in week 49 2014 and 27.0% in 2015 to 2016 peaking in week 49 2015.

The highest positivity was seen in children aged less than five year of age, with a peak of 50.4% in week 47 2016, similar to the peak in 2014 to 2015 (49.3%, in week 49 2014).

The lowest age-specific peak positivity was noted in the 15-44 year olds, with a peak of 9.7% in week 50 2016, compared to 6.8% in week 49 2015 and 8.4% in week 50 2014.

Figure 27. RSV number of positive samples and positivity (%) by week in Respiratory Datamart, 2014 to 2017, England
The overall RCGP GP acute bronchitis rate peaked at 148.3 per 100,000 in week 01 2017. The rate in under one year olds peaked slightly earlier than previous seasons in week 48 2016 at 961.0 per 100,000, whereas the rate for 75+ year olds peaked in the same week as the overall rate (week 01 2017) at 526.1 per 100,000 (Figure 28).

**Figure 28. Weekly acute bronchitis consultation rates overall, in under one year olds and 75+ year olds through the RCGP scheme, 2016 to 2017, England**

Of the other respiratory viruses monitored through the respiratory DataMart system, the highest activity was seen with rhinovirus at the beginning of the season but activity was low during the winter months when influenza was circulating.

Parainfluenza activity started to increase from week 06 2017 and similarly to rhinovirus was low during the months when influenza was circulating, with activity increasing towards the end of the influenza season from week 10 2017, which has been noted in the previous season. Human metopneumovirus (hMPV) showed increased levels between week 46 2016 to week 02 2017 and has been decreasing since. Low levels of adenovirus were observed throughout the season and no clear seasonality was seen (Figure 29).
In Scotland, the most common non-influenza respiratory pathogens circulating in the 2016 to 2017 season (up to week 14 2017) as detected through the GP Sentinel Scheme were rhinovirus (362 positive samples, 44.4% of non-influenza positive samples), coronavirus (96 positive samples, 11.8% of non-influenza positive samples) and RSV (145 positive samples, 17.8% of non-influenza positive samples). The peak number of positive detections for rhinovirus, RSV and coronavirus collected through the GP Sentinel Scheme occurred in weeks 42 and 43, week 49 and week 5 respectively.

The pattern of non-influenza respiratory pathogens detected through non-sentinel sources (ECOSS) for 2016 to 2017 season (up to week 14 2017), was similar to that seen in the 2015 to 2016. Rhinovirus was the most commonly detected non-influenza pathogen (3640, 23.4% positive samples) followed by RSV (3,192, 20.5% positive samples), adenovirus (1527, 9.8% positive samples) and coronavirus (1152, 7.4% positive samples). The other non-influenza pathogens (parainfluenza, hMPV and Mycoplasma pneumoniae) were detected in a lower proportion of positive samples (6.0%, 4.3% and 4.6%, respectively).

In Wales, the most common non-influenza respiratory pathogens circulating in 2016 to 2017 season (up to week 14 of 2017) as detected through the GP surveillance scheme were: rhinovirus (21 positive samples, 25% of non-influenza positive samples), RSV (16 samples, 19% of non-influenza positive samples) coronavirus (14 samples, 17% of non-influenza positive samples), parainfluenza (eight samples, 17% of non-influenza positive samples), adenovirus (seven samples, 10% of non-influenza positive samples), bocavirus (two samples, 2% of non-influenza positive samples) and enterovirus and mycoplasma (one sample each, 1% of non-influenza positive samples each).
The most commonly detected non-influenza respiratory pathogens from hospital and non-sentinel sources in Wales (up to week 14 of 2017) were rhinovirus (897 positive samples, 38% of non-influenza positive samples), RSV (653 positive samples, 28% of non-influenza positive samples), human metapneumovirus (271 positive samples each, 11% of non-influenza positive samples each), parainfluenza (198 positive samples, 8% of non-influenza positive samples) adenovirus (162 samples, 7% of non-influenza positive samples), enterovirus (139 positive samples, 6% of non-influenza positive samples) and mycoplasma pneumoniae (38 samples, 2% of non-influenza positive samples). The peak of non-influenza positive detections in hospital and non-sentinel samples occurred during week 47 of 2016 and was largely due to RSV and rhinovirus.

**Excess all-cause mortality surveillance**

The UK uses the European monitoring of excess mortality (EuroMOMO) algorithm to estimate weekly all-cause excess mortality. This algorithm allows for direct comparison between excess mortality estimation in the countries of 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 2016 to 2017, up to week 14 2016, significant excess mortality was seen in England predominantly in all ages and in 65+ year olds between week 52 2016 and week 5 2017 for six weeks (Figures 30). In other age groups, significant excess was seen in 15-64 year olds (Table 4).

**Figure 30. Excess mortality in all-cause deaths in all ages and 65+ year olds by week of death, EuroMOMO, England up to week 14 2017**

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9 http://www.euromomo.eu/
Figure 31. Weekly observed and expected number of all-age all-cause deaths, with the dominant circulating strain influenza A type, England, 2010 to 2017

Across the devolved administrations of the UK, modelled estimates using the EuroMOMO model showed significant excess in all age and 65+ year olds in all countries and some excess in the younger age groups in Wales and Scotland were observed (Table 4).

Table 4. Weeks with excess mortality observed in 2016 to 2017 in the UK

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>Weeks with excess in 2016 to 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>England</td>
</tr>
<tr>
<td>All ages</td>
<td>52-05</td>
</tr>
<tr>
<td>&lt;5</td>
<td>-</td>
</tr>
<tr>
<td>5-14</td>
<td>-</td>
</tr>
<tr>
<td>15-64</td>
<td>52-02</td>
</tr>
<tr>
<td>65+</td>
<td>45, 51-05</td>
</tr>
</tbody>
</table>
Emerging respiratory viruses

Human MERS-CoV infections

Since WHO first reported cases of Middle Eastern Respiratory Syndrome Coronavirus (MERS-CoV) in September 2012, a total of 1,952 laboratory confirmed cases have been reported globally up to 26 April 2017 in 27 countries. This includes at least 693 fatal cases (case fatality ratio of 36%). Most cases have either occurred in the Middle East or have direct links to a primary case infected in the Middle East. A feature of MERS-CoV, is its ability to cause large outbreaks within healthcare settings. Local secondary transmission following importation has been reported from the UK, France, Tunisia and the Republic of Korea.

MERS-CoV infection was originally confirmed in four cases with two imported cases to the UK detected in September 2012 and January 2013, respectively. The two secondary cases with non-sustained transmission in the UK were linked to the second imported UK case in January 2013. 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 definition. No positive cases have been reported in the UK since February 2013. Since the start of the MERS-CoV global outbreak up to 26 April 2017, 958 suspected cases amongst returning travellers have been identified in the UK and tested negative for MERS-CoV. However, 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 casesREF.

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 of imported cases from affected countries; however, this risk remains low10. For further PHE information on management and guidance of possible cases, please see information online11.

Human influenza A(H7N9) infections

The first three human infections with avian influenza A(H7N9) was reported in China through WHO in April 201312. Up to 26 April 2016, 1,393 cases have been reported, including at least 534 deaths giving an overall case fatality ratio of 38.3%.

12 http://www.who.int/csr/don/2013_04_01/en/
To date, 623 cases of avian influenza A(H7N9) have been reported during the 5th Wave (03 October 2016 onwards). This represents a large increase in the number of cases reported during a single wave, and is almost twice as high as the highest total reported from any previous wave of infection. There has also been an expansion in the geographical spread of cases. However, there is no evidence of increased transmission, or severity of illness in humans. PHE will continue to monitor the situation closely. For further updates, please see the WHO website [13] and for PHE advice on clinical management, please see information available online [14].

**Human influenza A(H5N1) and influenza A(H5N6) infections**

Since 2003, 858 cases of avian influenza A(H5N1) have been reported including 453 deaths, giving an overall case fatality rate of 52.8%. Cases have been reported from 16 countries. From 01 January 2016 to 26 April 2017, 12 cases have been reported from Egypt. As of 26 April 2017, a total of 17 human influenza A(H5N6) cases have been reported since February 2014.

Most human cases were exposed to A(H5) viruses through contact with infected poultry or contaminated environments, including live poultry markets. Since the viruses continue to be detected in animals and environments, further human cases can be expected. Even though small clusters of A(H5N1) virus infections have been reported previously including those involving healthcare workers, current epidemiological and virological evidence suggests that this and other A(H5) viruses have not acquired the ability to undergo sustained transmission among humans, thus the likelihood is low. Should infected individuals from affected areas travel internationally, their infection may be detected in another country during travel or after arrival. If this were to occur, further community level spread is considered unlikely as evidence suggests these viruses have not acquired the ability to transmit easily among humans [15].

Conclusions

Moderate levels of influenza activity were seen in the community in the UK in 2016 to 2017, with influenza A(H3N2) the predominant virus circulating throughout the season. The health impact was predominantly seen in older adults, with increased numbers of care homes outbreaks and excess mortality seen particularly in the 65+ year olds, although less than that observed in the 2014/15 season, when A(H3N2) was also the dominant circulating strain. The impact on general practice varied across the UK (moderate to high in England and Wales but low in Scotland and Northern Ireland). The number and rates of admissions of influenza to hospital and ICU/HDU were elevated though lower than the past two seasons.

Influenza vaccine uptake in 2016 to 2017 varied across the UK in all targeted groups. In England, the uptake rates were slightly higher than the previous season in the <65 year olds at risk, pregnant women and healthcare workers and remained similar to last season for 65+ year olds. In Scotland and Wales, uptake in these targeted groups were slightly lower than the previous season. In Northern Ireland, vaccine uptake figures in pregnant women, healthy children and frontline healthcare workers were slightly higher than the previous season; in <65 year olds at risk and 65+ year olds the uptake rates were slightly lower.

The childhood LAIV programme which was first implemented in 2013 to 2014, is now in its fourth season in 2016 to 2017, targeting two to four year olds in primary care and all children of school year 1, 2 and 3 age across the UK. Uptake levels were generally higher for the new programme compared to the previous seasons. 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 novel respiratory viruses, including the two which emerged in 2012 to 2013: MERS-CoV and influenza A(H7N9), both of which have high reported case fatality ratios, and where there is risk of importation to the UK.
Acknowledgments

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