



Public Health
England

Protecting and improving the nation's health

Surveillance of influenza and other respiratory viruses in the UK Winter 2018 to 2019

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Executive summary

In the 2018 to 2019 season, low to moderate levels of influenza activity were observed in the community with circulation of influenza A(H1N1)pdm09 followed by influenza A(H3N2) in the latter part of the season. Activity started in week 01, with the length and peak of activity in general practice varying across the UK, reaching low levels in England, Scotland and Northern Ireland and medium levels in Wales.

Influenza transmission resulted in high impact on secondary care in terms of hospitalisations and ICU admissions. The impact of A(H1N1)pdm09 was predominantly seen in the younger age groups (15-44 and 45-64 years) in both GP consultations and hospital and ICU/HDU influenza admissions. Peak admission rates of influenza to hospital and ICU were similar or slightly lower than seen in 2017 to 2018 but higher than all other seasons since 2010 to 2011. Levels of excess all-cause mortality were the lowest seen since 2013 to 2014 in England, although both Scotland and Northern Ireland observed weeks with significant excess mortality for all ages (3 weeks and 2 weeks respectively) including in the 65+ year olds (2 weeks for both).

The UK, as with many Northern Hemisphere countries found that the majority of circulating influenza A(H1N1)pdm09 and A(H3N2) strains that were characterised were genetically and antigenically similar to the Northern Hemisphere 2018 to 2019 A(H1N1)pdm09 and A(H3N2) vaccine virus strains.

Influenza vaccine uptake in 2018 to 2019 in England for the 65+ year olds was slightly lower than that seen in 2017 to 2018. The vaccine uptake in 2018 to 2019 was also lower than the 2017 to 2018 season for those aged 6 months to under 65 years of age with 1 or more underlying clinical risk factors (48.0%) and pregnant women (45.2%). Vaccine uptake for health care workers in 2018 to 2019 increased to 70.3% compared to 68.7% in 2017 to 2018. In 2018 to 2019, the universal childhood influenza vaccine programme with live attenuated influenza vaccine (LAIV) was again offered to all 2 and 3 year olds across the UK, plus to all children of school age Reception, Year 1, 2, 3, 4 and 5 in England. Uptake in 2 and 3 year olds was 44.9% and in school age children reception to school year 5 was 60.8%. In Scotland and Northern Ireland, where vaccination was offered to all primary school children, the uptake in the 2 to <5 year olds (not yet in school) was 55.8% and 47.6% respectively, a decrease from the previous season (56.9% and 50.6%, respectively). Uptake in all primary school children (4 to 11 year olds) was 72.9% in Scotland (compared to 73.0% in 2017 to 2018) and 75.9% in Northern Ireland (compared to 76.5% in 2017 to 2018). 2018 to 2019 was the first season vaccination was offered to all primary school children in Wales with an overall uptake of 69.9% and uptake in 2 and 3 year olds was 49.3%. Overall influenza vaccine effectiveness in 2018 to 2019 against a laboratory confirmed infection resulting in a primary care consultation was 44.3% (95% CI 26.8% to 57.7%).

Activity from other circulating seasonal respiratory viruses was similar overall compared 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. One imported human case of MERS-CoV infection was detected in the UK in August 2018. No onward transmission to close contacts occurred. Surveillance and public health measures established in the UK for travellers returning with severe respiratory disease from affected countries are on-going.

Background

Surveillance of influenza and other respiratory viruses in the United Kingdom (UK) is undertaken throughout the year and collated by the Influenza Surveillance Team at 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 circulates¹. This is in collaboration with teams within PHE, Health Protection Scotland², Public Health Wales³ and the Northern Ireland Public Health Agency⁴, 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 described⁵. The Moving Epidemic Method (MEM)⁶ 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 2018 to 2019 season, the roll-out of the licensed live attenuated influenza vaccine (LAIV) has continued across the UK. In England, LAIV was offered to all 2 and 3 year olds through primary care and to children of school age Reception, Year 1, Year 2, Year 3, Year 4 & Year 5 (4 to 10 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 geographically discrete pilots targeting children of school age Year 6. In England and Wales, all 4 year olds were offered LAIV in school, whereas in Scotland and Northern Ireland, all 2 to 5 year old (not yet in school) and all primary school age children were offered LAIV vaccination.

¹ Public Health England (PHE). www.gov.uk/government/collections/seasonal-influenza-guidance-data-and-analysis

² Health Protection Scotland. www.hps.scot.nhs.uk/a-to-z-of-topics/influenza/

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

⁴ Public Health Northern Ireland. www.publichealth.hscni.net/directorate-public-health/health-protection/influenza

⁵ Health 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

⁶ Vega 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.

The 2018 to 2019 season also saw the roll-out of a newly licensed adjuvanted trivalent influenza vaccine (aTIV) for all those aged 65 years and over.

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 human infection with avian influenza 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 2018 (week ending 07/10/2018) to week 15 2019 (week ending 14/04/2019). This includes observations and commentary from the childhood vaccination programme and activity of other seasonal and novel respiratory viruses.

Observations

Community surveillance

Syndromic surveillance

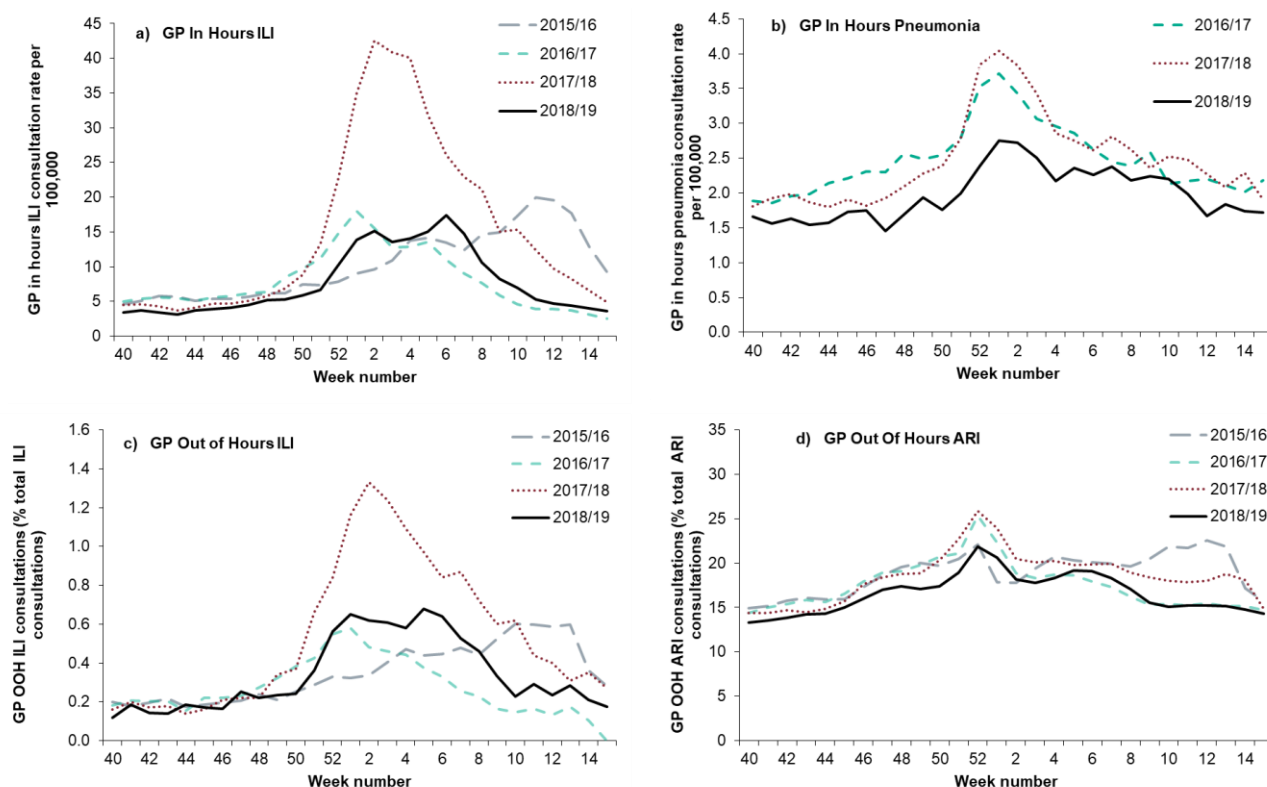
In England, national PHE real-time syndromic surveillance systems, including GP in hours and out-of-hours consultations, emergency department attendances (EDSSS) and NHS 111 calls monitor a range of indicators sensitive to community influenza activity, for example NHS 111 cold/flu calls and GP consultations for influenza-like illness (ILI)¹.

Syndromic surveillance indicators peaked around a similar time for GP in hours ILI consultations (week 06 2019) and GP out-of-hours ILI consultations (week 05 2019) at 17.4 per 100,000 population and 0.68% of consultations respectively.

The trends and peaks for these systems do not resemble those observed in the last notable influenza A(H1N1)pdm09 season in 2015 to 2016, with indicators peaking much earlier and at higher levels during the 2018 to 2019 season. Syndromic indicators for GP out-of-hours acute respiratory infections (ARI) consultations peaked in week 52 2018 at 21.8% of consultations, though slightly lower, this was similar to the peaks noted in the previous seasons (2017 to 2018 and 2016 to 2017) (Figure 1).

¹Real Time Syndromic Surveillance, PHE. www.gov.uk/government/collections/syndromic-surveillance-systems-and-analyses

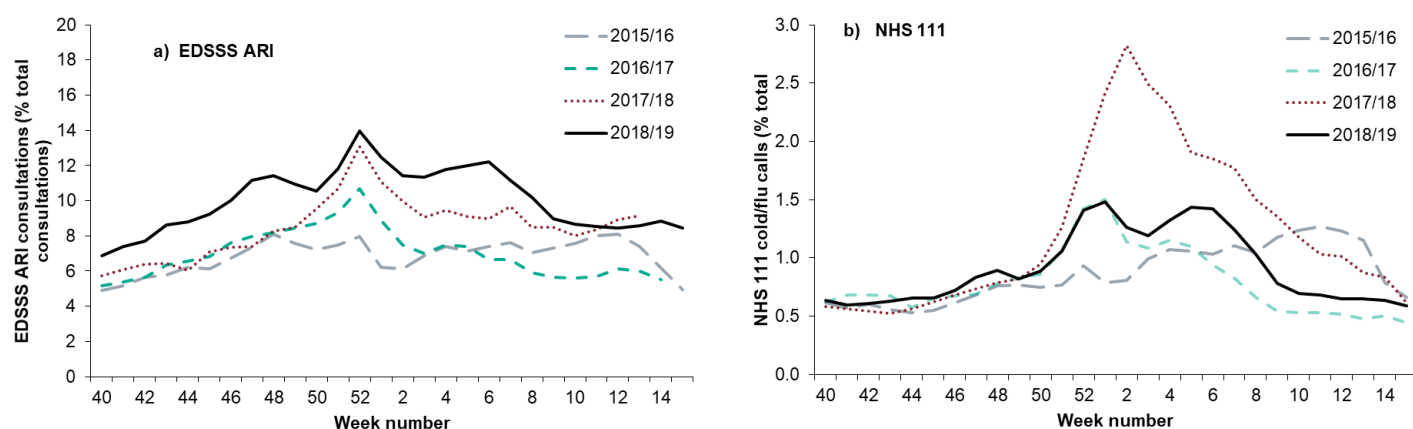
Figure 1. Weekly all age (a) GP in hours consultations for influenza like illness (ILI) (b) GP in hours consultations for pneumonia (c) GP out of hours consultations for ILI (d) GP out of hours consultations for acute respiratory infections (ARI) for winter 2015 to 2019, England



NHS 111 calls attributed to cold and flu peaked in week 01 2019 accounting for 1.5% of calls, a further similar peak was recorded in week 06. Syndromic indicators for emergency department attendances peaked during week 52 2018 for ARI. During 2018 a new data source was used for the EDSSS, originating from the Emergency Care Data Set², therefore comparisons between 2018 to 2019 and previous seasons should be interpreted with some caution (Figure 2).

²NHS Digital Emergency Care Data Set. <https://digital.nhs.uk/data-and-information/data-collections-and-data-sets/data-sets/emergency-care-data-set-ecds>

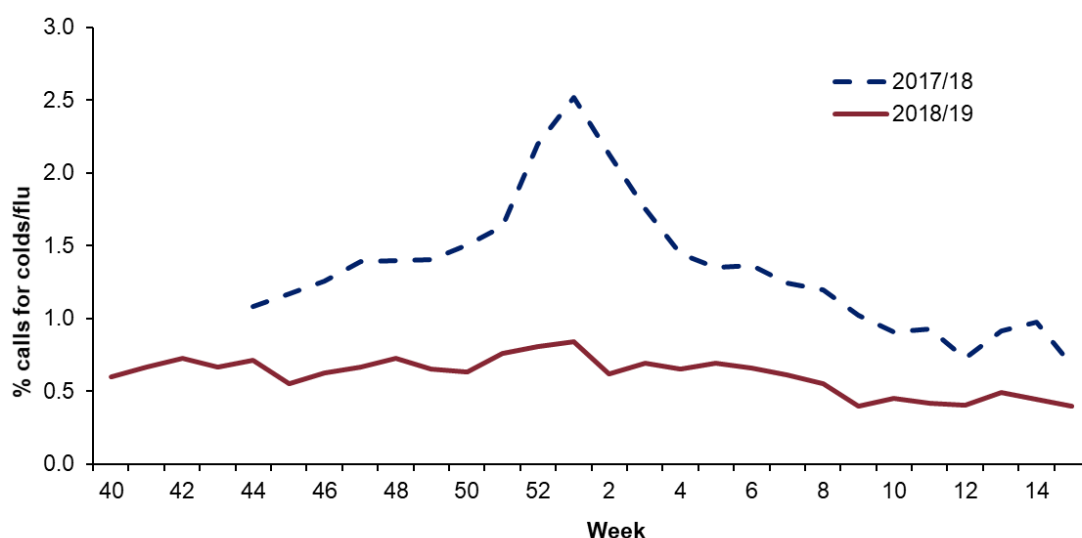
Figure 2. Weekly all age (a) EDSSS acute respiratory infection consultations* (b) England NHS 111 cold/flu calls for winter 2015 to 2019



* In April 2018, EDSSS changed over from a sentinel data collection system to a centrally coordinated data collection system using the Emergency Care Data Set. Comparison and interpretation of differences in levels between 2018/19 and previous seasons should therefore be made with caution

In Scotland, the weekly proportion of all calls to NHS 24 which mention cold/flu, was low and peaked during week 01 2019 at 0.8%, similar to that of NHS 111 in England. The proportion of cold/flu calls, peaked at the same time as observed in 2017 to 2018 season, however the proportion was lower throughout (Figure 3).

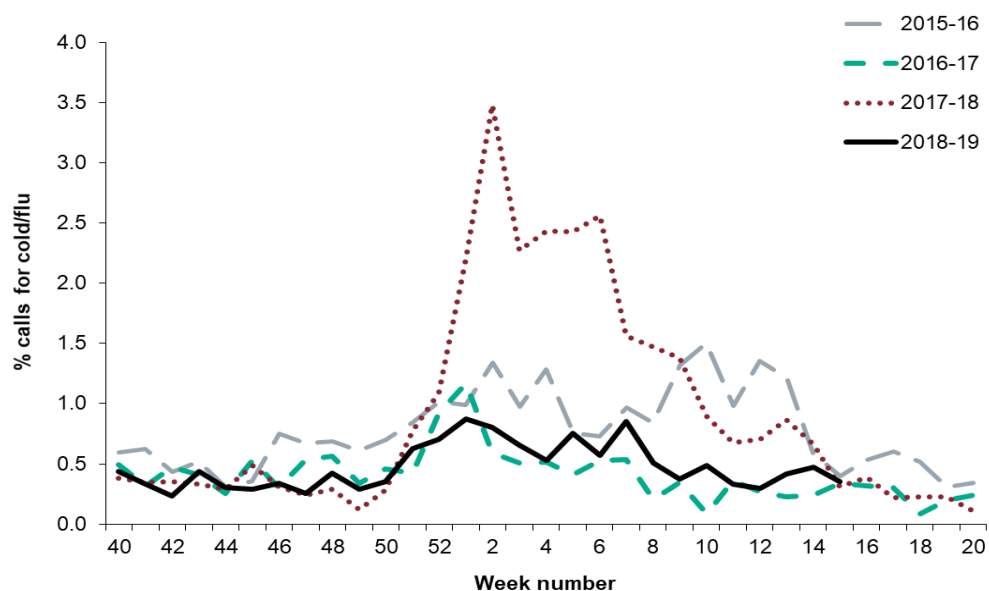
Figure 3. Proportion of calls for cold/flu (all ages) through NHS 24, Scotland, 2017 to 2019



In Wales, the weekly proportion of all cold/flu calls made to NHS Direct Wales peaked in week 01 2018, similar to that of NHS 111 in England and NHS 24 in Scotland. For much of the 2018 to 2019 season in Wales, the proportion of cold/flu calls was lower

than those observed in both the previous season (2017 to 2018) and in 2015 to 2016 when influenza A(H1N1)pdm09 was predominantly circulating (Figure 4).

Figure 4. Weekly proportions of calls for cold/flu (all ages) to NHS-Direct, Wales, 2015 to 2019



Outbreak reporting

Between week 40 2018 and week 15 2019, a total of 1,340 acute respiratory illness (ARI) outbreaks in closed settings were reported in the UK compared to 2,146 in 2017 to 2018; 1,114 in 2016 to 2017 and 656 in 2015 to 2016 (Table 1).

Of all outbreaks, 932 (69.6%) occurred in care homes, 199 (14.9%) in hospitals, 158 (11.8%) in schools and 51 (3.8%) in other settings. This is a decrease compared to outbreaks occurring in care homes in the last season (1,697 in 2017 to 2018), but an increase since the last influenza A(H1N1)pdm09 dominated season (231 in 2015 to 2016).

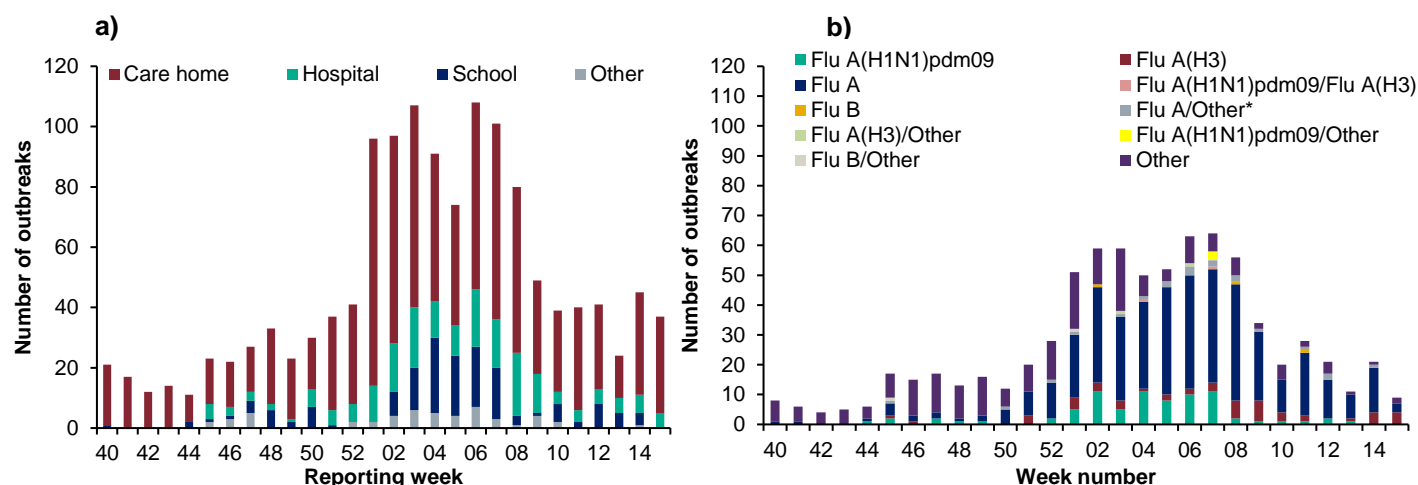
The peak number of outbreaks was observed in week 03 (107 outbreaks) and week 06 2019 (108 outbreaks) with the majority of outbreaks reported in care homes (62.6% and 57.4%, respectively).

Table 1. Number and percentage of UK outbreaks by institution type, 2015 to 2019

Outbreaks				
	2018/19	2017/18	2016/17	2015/16
Total	1,340	2,149	1,114	656
<i>Institution type</i>				
Care homes	932	1,700	875	231
Hospitals	199	230	162	108
Schools	158	160	61	275
Other	51	59	16	42

**Data for 2017/18, 2016/17 & 2017/18 is based on week 40 to week 20*

Where information on virological testing were available, the majority of outbreaks were caused by influenza A(not subtyped) (394/765; 51.5%), with a further 22 outbreaks confirmed to be associated with influenza A(not subtyped) in combination with a non-influenza virus. There were 78 outbreaks confirmed to be associated with influenza A(H1N1)pdm09 and 50 outbreaks with influenza A(H3). An additional 5 outbreaks were in combination with a non-influenza virus (3 influenza A(H1N1)pdm09 and 2 influenza A(H3)) and 1 outbreak was confirmed to be associated with both subtypes. Very few outbreaks were associated with influenza B. A large proportion of outbreaks (211/765; 27.6%) were confirmed to be associated with a range of other non-influenza viruses including respiratory syncytial virus (RSV), rhinovirus, human metapneumovirus (hMPV), seasonal coronavirus and parainfluenza (Figure 5).

Figure 5. Weekly number of outbreaks by (a) institution type and (b) virological test results where available by week of reporting, 2018 to 2019 UK

*includes 2 outbreaks where Flu A (not subtyped), A(H1N1)pdm09 and other respiratory viruses were identified

In England a total number of 1,214 ARI outbreaks were reported to Public Health England between week 40 2018 and week 15 2019 compared to 1,871 in the 2017 to 2018 season (week 40 to week 20). The majority of outbreaks were from care home settings (73.3%) similar to the previous season. School outbreaks accounted for 12.1% of all outbreaks compared to 8.2% in the 2017 to 2018 season. Hospital outbreaks accounted for 10.5% of outbreaks; slightly higher than in 2017 to 2018 (9.0%). An increase in the Other settings category of 4.0% of all outbreaks compared to 2.9% in 2017 to 2018 was also noted. Regionally, the majority of outbreaks occurred in the South West region (16.4%) followed by the South East and North West regions (15.2% and 14.6% respectively).

In Scotland, the number of ARI outbreaks reported to Health Protection Scotland (HPS) between week 40 2018 and week 15 2019 was 48, which is lower than previous seasons (132 in 2017 to 2018 and 78 in 2016 to 2017). The majority of these outbreaks were reported from hospital settings (52.1%), unlike previous seasons in which the majority of outbreaks were observed in care home settings. For the 2018 to 2019 season, care home outbreaks made up 39.6% of the total reported outbreaks for Scotland. Of the 48 outbreaks reported, 21 were confirmed to be associated with influenza of which all were influenza A. From those 15 were not subtyped, 4 were influenza A(H1N1)pdm09 and 2 were influenza A(H3).

In Wales, there were 62 outbreaks of ARI reported to the Public Health Wales Health Protection teams between week 40 2018 and week 15 2019, compared to 88 during the 2017 to 2018 season. The majority were reported from hospital settings (69.4%), followed by care home (16.1%), school and nursery settings (12.9%) and community or other settings (1.6%). There was at least 1 case with confirmed influenza in 45 (72.6%) of the outbreaks reported this season, of which 33 were confirmed influenza A, with no outbreaks confirmed as influenza B. From the outbreaks with confirmed influenza A

cases, 36.4% were not subtyped, 30.3% were influenza A(H1N1)pdm09 and 33.3% were influenza A(H3).

In Northern Ireland, there were a total of 16 ARI outbreaks reported to the Public Health Agency between week 40 2018 and week 15 2019; compared to a total of 58 ARI outbreaks in the 2017 to 2018 season and 15 in the 2016 to 2017 season. Thirteen (86.7%) outbreaks were reported from care homes and 3 (18.8%) from hospitals. Virological results were available for 12 confirmed respiratory outbreaks of which 8 were influenza A not subtyped, 1 was influenza B and 3 were RSV.

Medical Officers of Schools Association (MOSA) and PHE scheme

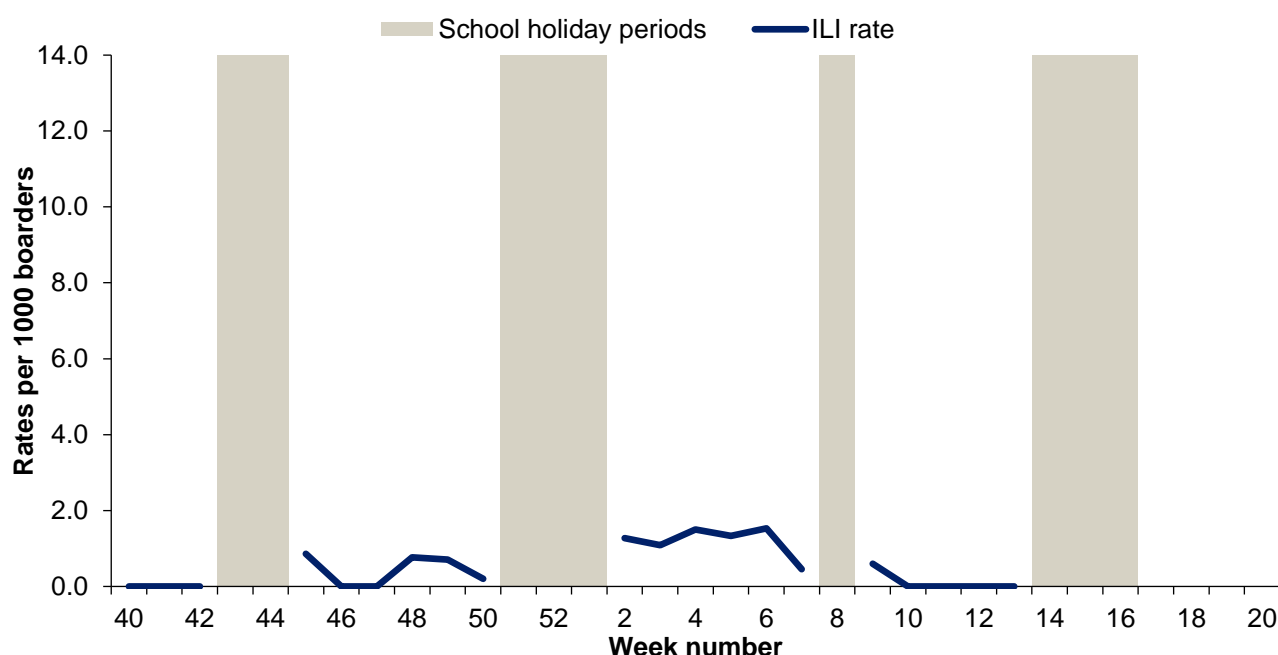
The Medical Officers of Schools Association (MOSA) was founded in 1884 and involves a network of more than 200 predominantly private and boarding schools around the United Kingdom^{3,4}.

Following the re-introduction of influenza A(H1N1) in 1978, which spread widely amongst children and younger people, Public Health England (PHE) and the Medical Officers of Schools Association (MOSA) developed a surveillance scheme to monitor respiratory illness in children attending MOSA (a network of private and boarding schools) schools in England. Since September 1983, the scheme has formed part of the routine surveillance activities of PHE.

Participating MOSA schools complete a general annual online survey, including questions on influenza vaccine policies for students, weekly surveys reporting how many boarders developed influenza-like-illness (ILI) as well as other respiratory related illnesses and a vaccine uptake survey by school year.

In 2018 to 2019, 22 MOSA schools agreed to participate in the scheme. Participating schools included a total of 6,661 boarders, with 97.2% of boarders from secondary schools. Figure 6 represents the weekly ILI rates observed through the scheme this season. ILI rates peaked in week 06 2019 at 1.5 per 1,000 boarders.

Figure 6. Weekly ILI rates per 1,000 boarders observed through participating MOSA schools in England, 2018 to 2019



³ MOSA-PHE scheme. www.gov.uk/guidance/sources-of-uk-flu-data-influenza-surveillance-in-the-uk#clinical-surveillance-through-primary-care

⁴ MOSA website. www.mosa.org.uk/

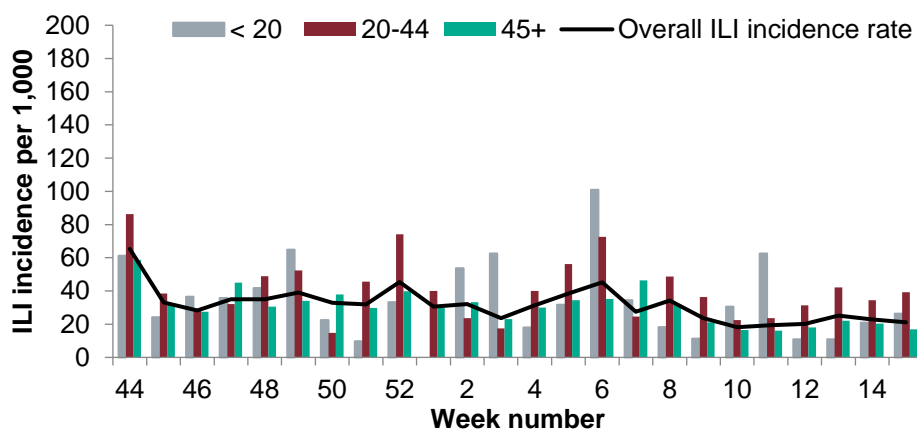
Flusurvey (internet based surveillance)

Flusurvey is part of a European wide initiative (including 11 European countries) run by Public Health England, providing internet-based surveillance of ILI in the UK population. On registration, individuals aged 18+ 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 are sent weekly reminders to report any symptoms relating to flu that they may have experienced and their health-seeking behaviour as a result of their symptoms. During the 2018 to 2019 season, participants were recruited in the first 6 weeks of the survey period (week 44 to week 50).

A total of 4,065 participants were recruited of which 3,717 (91.4%) completed at least 1 survey contributing over 53,399 real-time flu related symptoms data, with an average weekly response rate of 59.6%. Data on age was available for 4,010 participants; 95% (3,807) were 18+ year olds. The majority (3,531; 88.3%) of participants were resident in England; 244 participants were from Scotland; 27 participants were from Northern Ireland and 152 from Wales.

Based only on participants who completed 3 or more weekly symptom surveys and using the ECDC ILI case definition of sudden onset of symptoms and at least 1 of; fever, malaise, headache or muscle pain and at least 1 of; cough, sore throat, shortness of breath, the overall number of self-reported ILI cases was 1,651 (3.1%). Self-reported ILI trends showed 2 peaks at week 52 and week 6 with the highest ILI incidence observed in participants in the <20year age group (Figure 7). Further analysis and report of the 2018 to 2019 flu survey will be available on the website in the summer (www.flusurvey.net).

Figure 7. Weekly ILI incidence per 1,000 by age group reported through Flusurvey, 2018 to 2019 UK



Google influenza like illness (ILI) searches (internet-based surveillance)

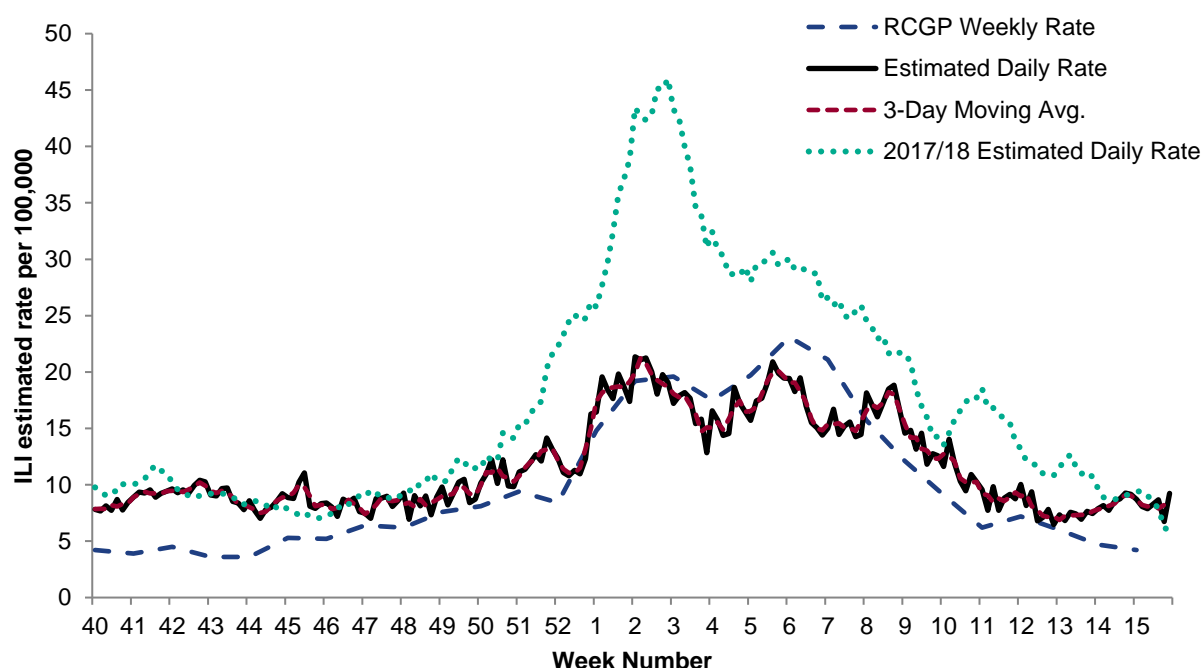
PHE have been collaborating with University College London (UCL) to assess the use of internet based search queries as a surveillance method for ILI, throughout England. This is part of work on early-warning surveillance systems for influenza, through the EPSRC IRC project i-sense ⁵.

Combining natural language processing and machine learning techniques, a non-linear Gaussian process model was developed by UCL^{6,7} to produce real time estimates of ILI. The supervised model, trained on historical data from the Royal College of General Practitioners (RCGP) scheme⁸ (2005 to 2006 to 2016 to 2017 seasons at national level), produces daily ILI estimates based on the proportion of ILI related search queries within a 10%-15% sample of all queries issued, which was extracted daily from Google's Health Trends Application Programming Interface (API).

Estimated rates of ILI started to increase in week 51 2018, before peaking during week 02 2019 and another peak in week 05 (Figure 8). This observed peak was 1 week earlier than that seen through the RCGP ILI consultation data which peaked week 06 2019.

Due to the nature of daily data and its fluctuations in estimating rates based on searches, a 3-day moving average was applied to visualise the underlying trend.

Figure 8. Daily estimated ILI Google search query rates (and 3-day moving average) and RCGP ILI consultation rates per 100,000 population, 2018 to 2019



*The RCGP weekly ILI rate is plotted on the Sunday of each week.

⁵ i.sense website. www.i-sense.org.uk/

⁶ Lamos V *et al.* Enhancing feature selection using word embeddings: the case of flu surveillance. Proceedings of the 26th International Conference on the World Wide Web, April 03-07, 2017, Perth Australia.

⁷ Lamos V *et al.* Advances in nowcasting influenza-like illness rates using search query logs. Scientific Reports. 2015 3;5. doi:10.1038/srep12760

⁸ Royal College of General Practitioners Research and Surveillance Centre: www.rcgp.org.uk/clinical-and-research/our-programmes/research-and-surveillance-centre.aspx

Primary care consultations

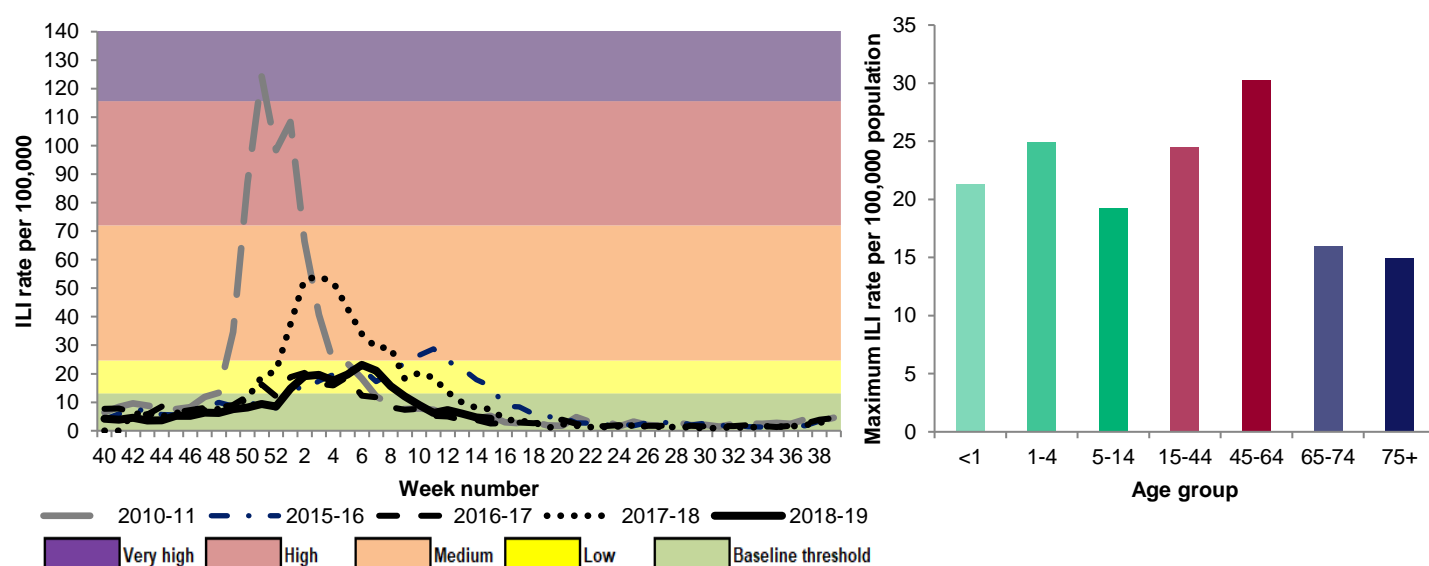
England

Weekly rates of General Practitioner (GP) consultations for influenza-like illness (ILI) through the Royal College of General Practitioners (RCGP) scheme⁹ increased above the Moving Epidemic Method (MEM) baseline threshold for the 2018 to 2019 season of 13.1 per 100,000 in week 01 2019 and then peaked in week 06 2019 at 23.1 per 100,000. Rates remained at or above the threshold for 8 weeks until week 08 2019 in England (Figure 9).

In comparison to the last influenza A(H1N1)pdm09 dominated season in 2015 to 2016, the peak activity was lower and occurred earlier in the season (23.1 per 100,000 in week 06 in 2018 to 2019 compared to 28.7 per 100,000 in week 11 in 2015 to 2016). The number of weeks where the ILI rate was above baseline threshold in 2018 to 2019 was also fewer than that observed in the 2015 to 2016 season (8 weeks vs 15 weeks). The peak activity in 2018 to 2019 was much lower compared to the previous season in 2017 to 2018 (54.1 per 100,000 in week 03 2018).

By age group, activity peaked at the highest levels in the 45-64 year olds (30.3 per 100,000 in week 06 2019), 1-4 year olds (24.9 per 100,000 in week 05 2019) and 15-44 year olds (24.5 per 100,000 in week 06 2019).

Figure 9. Weekly all age GP influenza-like illness rates for 2018 to 2019 and past seasons, and peak rates by age group in 2018 to 2019, England (RCGP)



⁹ Clinical surveillance through primary care.

www.gov.uk/guidance/sources-of-uk-flu-data-influenza-surveillance-in-the-uk#clinical-surveillance-through-primary-care

Scotland

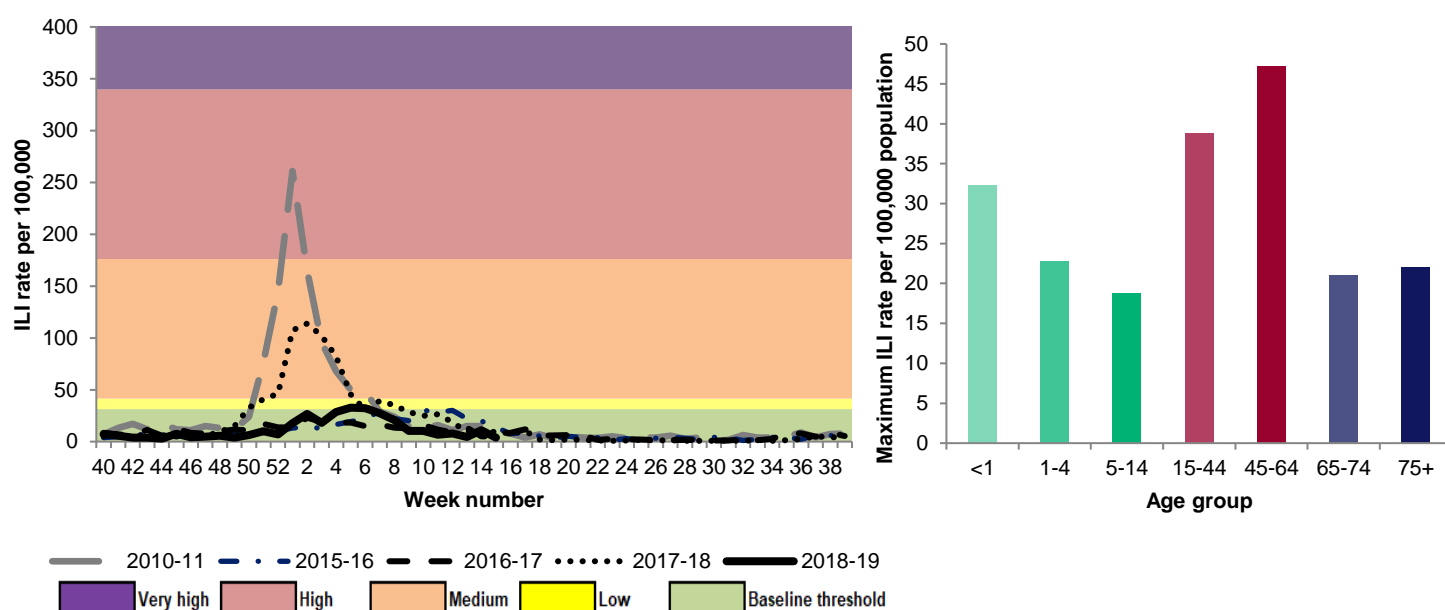
Weekly GP consultations for ILI increased above the baseline MEM threshold of 31.3 per 100,000 in week 05 2019 and peaked the same week. Rates remained above the baseline threshold for 2 weeks until week 06 2019 (Figure 10).

Overall seasonal ILI activity had similar intensity to the last influenza A(H1N1)pdm09 dominated season in 2015 to 2016 (peak of 30.2 per 100,000 in 2015 to 2016 compared to 32.7 in 2018 to 2019), however it peaked earlier (week 05 2019 compared to week 10 2016). When compared to the last influenza A(H3N2) dominated season in

2017 to 2018, the peak activity was much lower (peak of 113.9 per 100,000 in 2017 to 2018).

By age group, the highest levels of activity were seen in 45-64 year olds (47.2 per 100,000) and 15-44 year olds (38.8 per 100,000). Overall throughout the current season the lowest rates of influenza activity were seen in age groups 1-4, 5-14, 65-74 and 75+, where rates ranged from 18.8 per 100,000 to 22.8 per 100,000.

Figure 10. Weekly all age GP influenza-like illness rates for 2018 to 2019 and past seasons, and peak rates by age group in 2018 to 2019, Scotland



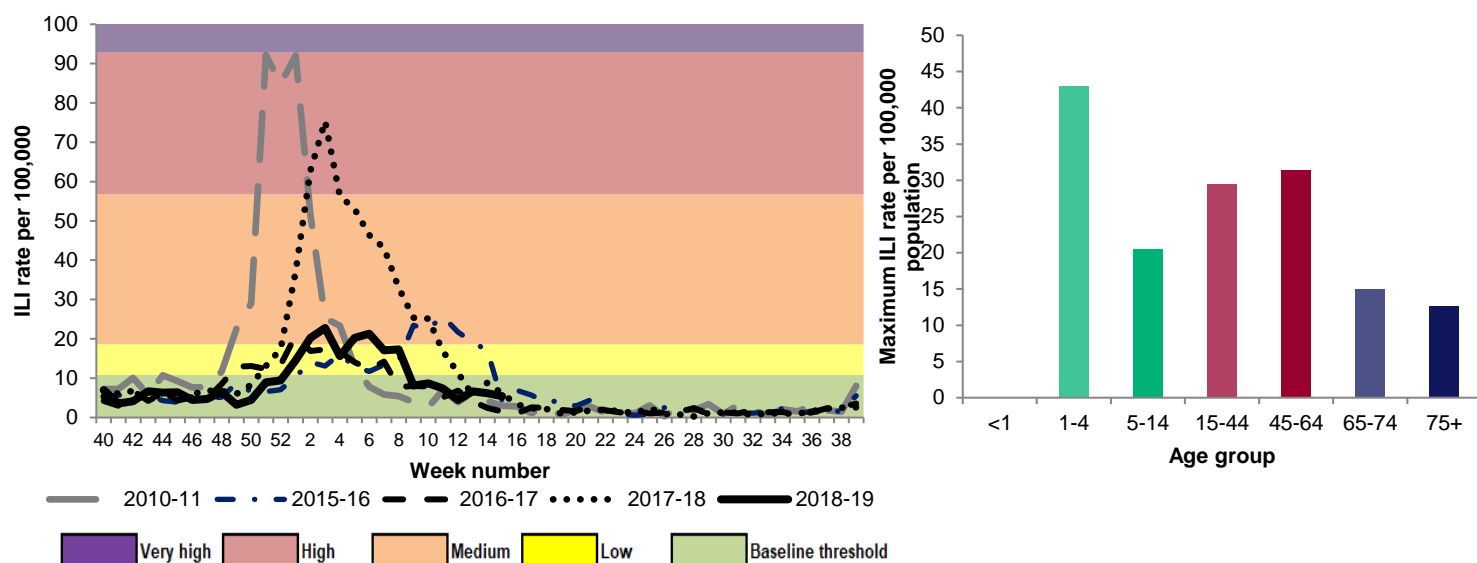
Wales

Weekly GP consultations for ILI in Wales increased above the MEM threshold of 10.8 per 100,000 in week 01 2018 and peaked in week 03 2019 at 22.8 per 100,000. Rates remained at or above the threshold for 8 weeks until week 08 2019 and reached medium intensity threshold levels (Figure 11).

In comparison to the last influenza A(H1N1)pdm09 dominated season in 2015 to 2016 the peak activity was similar (22.8 per 100,000 in 2018 to 2019 compared to 25.7 per 100,000 in 2015 to 2016). Compared to last season, the peak activity was lower (75.4 per 100,000 in 2017 to 2018).

By age group, the highest levels of activity were seen in the 1-4 year olds (43.0 per 100,000) and 45-64 year olds (31.4 per 100,000).

Figure 11. Weekly all age GP influenza-like illness rates for 2018 to 2019 and past seasons, and peak rates by age group in 2018 to 2019, Wales



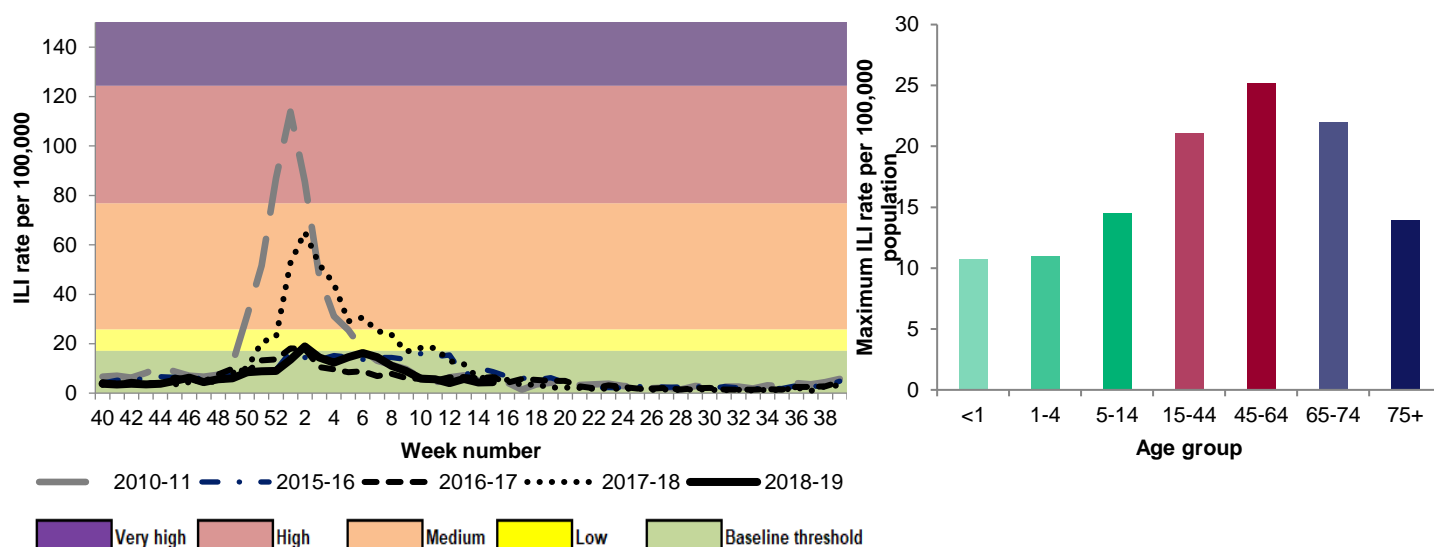
Northern Ireland

Weekly GP consultations for ILI in Northern Ireland increased above the baseline MEM threshold of 17.1 per 100,000 for 1 week in week 02 2019, peaking at 18.9 per 100,000. This compared to a peak of 16.7 per 100,000 in week 01 in 2015 to 2016, the last influenza A(H1N1)pdm09 season and 65.2 per 100,000 in week 02 in 2017 to 2018 the last influenza A(H3N2) dominated season (Figure 12).

By age group, the highest levels of activity were seen in the 45-64 year olds (25.2 per 100,000) and 65-74 year olds (22.0 per 100,000) in week 02 2019 and 07 2019 respectively (Figure 12).

¹⁰ Public Health Agency – Northern Ireland, Influenza bulletins. www.publichealth.hscni.net/publications/influenza-weekly-surveillance-bulletin-northern-ireland-201819

Figure 12. Weekly all age GP influenza-like illness rates for 2018 to 2019 and past seasons, and peak rates by age group in 2018 to 2019, 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 2 schemes established:

- the USISS sentinel hospital scheme, which is a sentinel network of acute trusts in England who report weekly aggregate numbers on laboratory confirmed influenza hospital admissions at all levels of care
- 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

For the 2018 to 2019 season, the MEM method has been applied to the USISS schemes (using the previous 7 seasons' rates of admission) to calculate thresholds to show the impact of influenza activity throughout the season¹¹.

USISS Sentinel

Through the USISS sentinel scheme, a total of 5,505 hospitalised confirmed influenza cases (mean weekly incidence of 2.10 per 100,000 trust catchment population) were reported from 24 participating sentinel NHS acute trusts across England from week 40 2018 to week 15 2019. This compares to a total of 10,107 cases (mean weekly

¹¹ UK Severe Influenza Surveillance Schemes. www.gov.uk/guidance/sources-of-uk-flu-data-influenza-surveillance-in-the-uk#disease-severity-and-mortality-data

incidence of 3.14 per 100,000 trust catchment population) from 25 participating trusts in 2017 to 2018 and a total of 1,575 cases (mean weekly incidence of 0.77 per 100,000 trust catchment population) from 25 participating trusts in 2016 to 2017 and a total of 2,781 cases (mean weekly incidence of 0.90 per 100,000 trust catchment population) from 26 participating trusts in 2015 to 2016 (Figure 13).

The number and rate of hospital admissions peaked in week 06 2019 at high impact (692 admissions, 6.87 per 100,000 trust catchment population). Amongst cases reported, influenza A unknown was the dominant subtype reported up to week 15 2019 (2,836, 51.5%), with the highest number of cases observed in the 65+ year olds (1,674, 30.4%) (Figure 14). The cumulative rate of influenza admission was highest in the under 5 year olds for influenza A(H3N2) and influenza A(not subtyped) and in the over 65s for influenza A(not subtyped) and A(H1N1)pdm09. For influenza A(H1N1)pdm09 the age groups with the highest rates were the over 65s (17.7 per 100,000) closely followed by under 5 year olds (16.4 per 100,000) (Figure 15).

This peak was lower than the 2017 to 2018 season, where the peak was in week 02 2018 with 1,009 admissions and a rate of 9.20 per 100,000 trust catchment population but higher than the peaks in the previous 2 seasons (Figure 16).

Figure 13. Weekly number of influenza confirmed admissions to hospital through the USISS sentinel scheme in England, with crude hospitalisation rate, week 40 2018 to week 15 2019

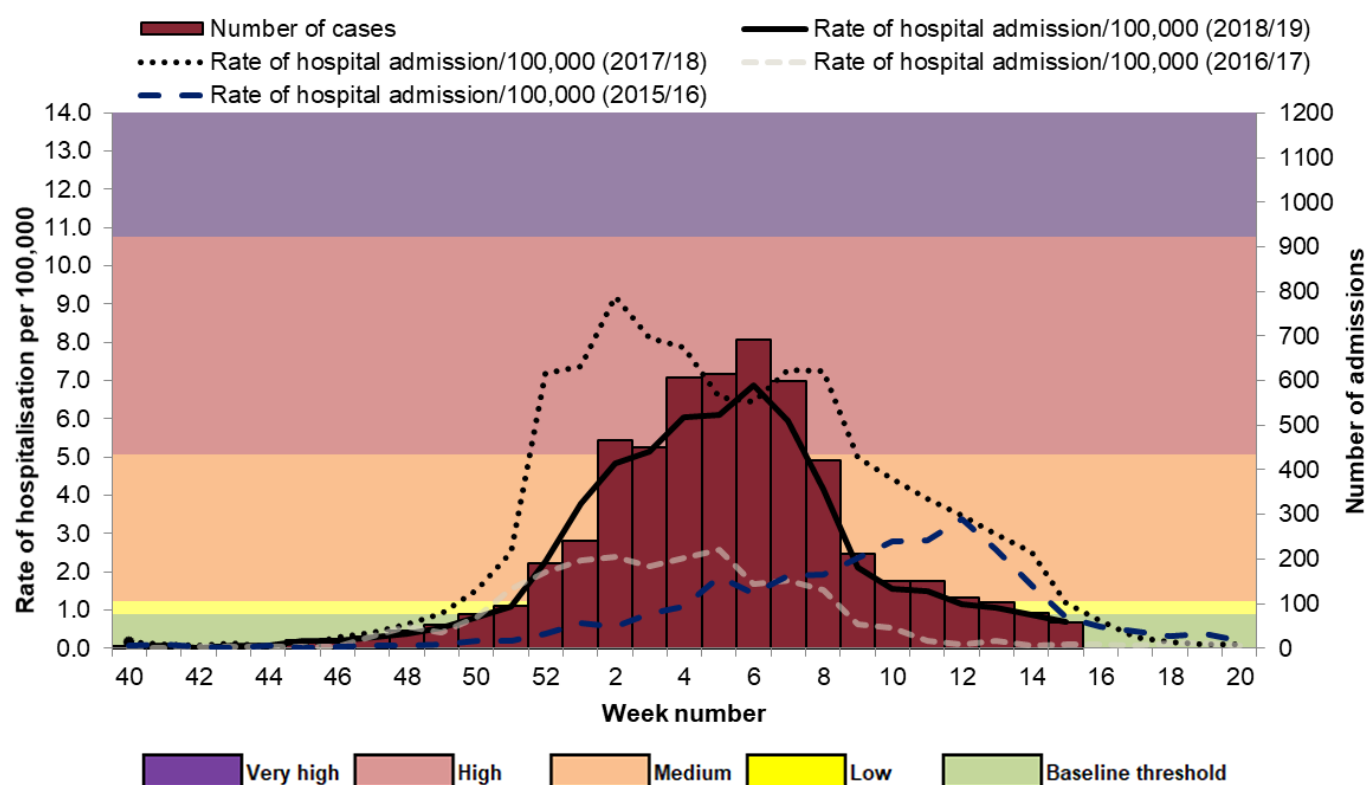


Figure 14. Cumulative influenza confirmed hospital admissions by age group and influenza type, through the USISS sentinel scheme, week 40 2018 to week 15 2019

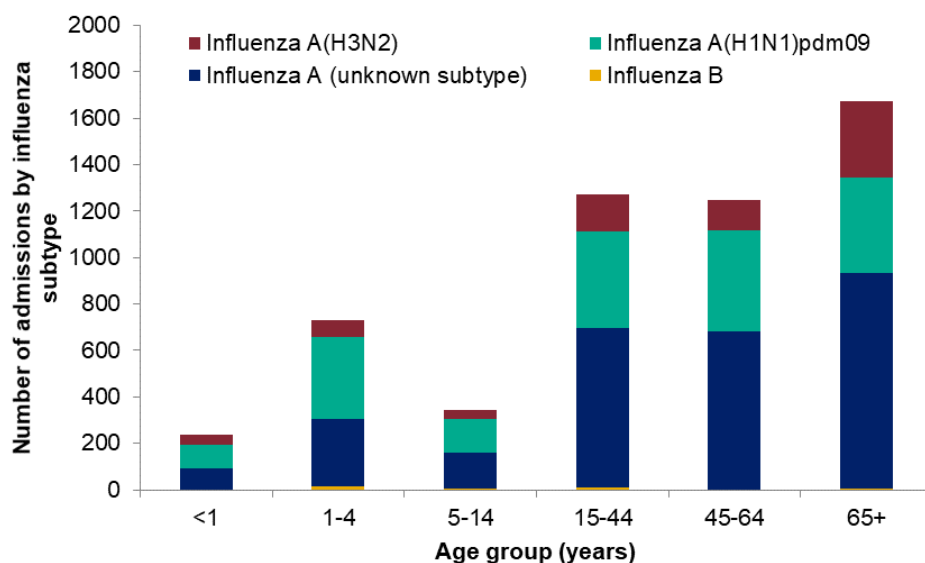


Figure 15. Cumulative rate of influenza confirmed hospital admissions per 100,000 trust catchment population by age group and influenza type in England, through the USISS sentinel scheme, week 40 2018 to week 15 2019

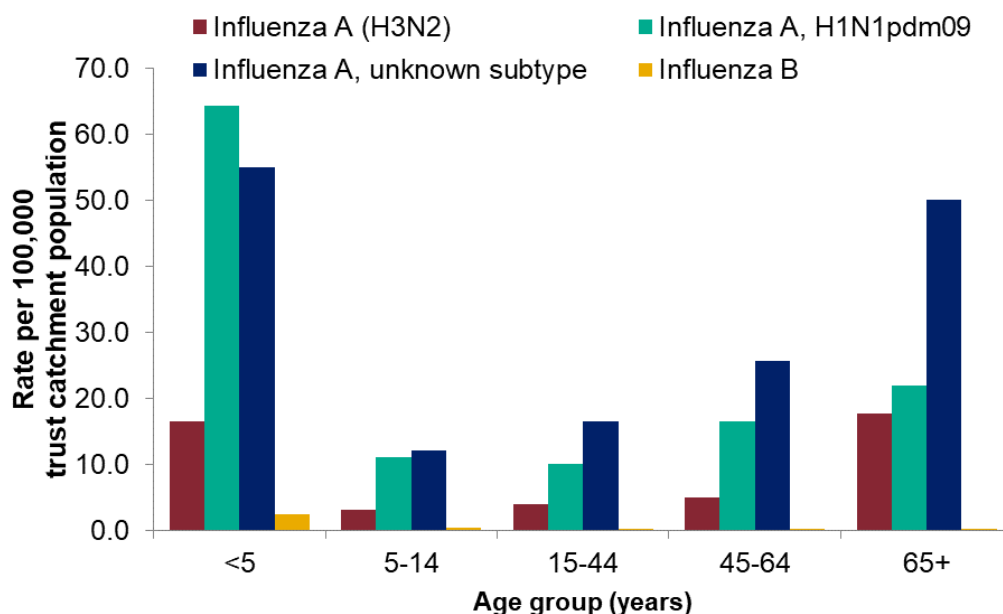
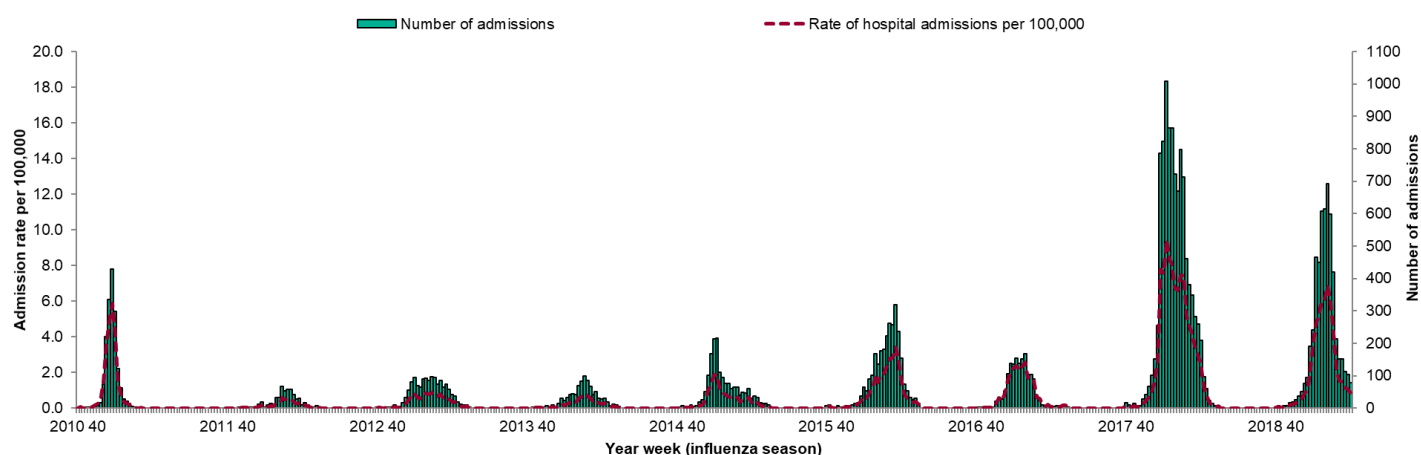


Figure 16 represents the weekly total number of influenza confirmed hospital admissions and rate of admissions reported through the USISS sentinel scheme in England for the period from 2010 to 2019.

Figure 16. Weekly number of influenza confirmed hospital admissions to hospital through the USISS sentinel scheme with crude hospitalisation rate for all ages, 2010 to 2019



USISS Mandatory

Through the USISS mandatory scheme, a total of 3,157 ICU/HDU admissions of confirmed influenza were reported across the UK from week 40 2018 to week 15 2019, including 312 deaths, based on combined data from England, Scotland and Northern Ireland. In England, the total number of influenza confirmed admissions to ICU/HDU was 2,924 from 140 NHS acute trusts (mean weekly incidence of 0.21 per 100,000 trust population) with 273 influenza deaths in ICU during the same period (Figure 17).

The cumulative number of cases and deaths were slightly lower compared to the 2017 to 2018 season (3,245 cases (mean weekly incidence of 0.20 per 100,000) and 330 deaths) but higher than the 2016 to 2017 season (992 cases (mean weekly incidence of 0.06 per 100,000) and 112 deaths) in England (Figure 17). The case fatality rate (proportion of ICU/HDU influenza cases which have died due to influenza) was 9.3% (273/2,924) based on data from week 40 2018 to week 15 2019. This compares with a case-fatality rate of 10.2% (330/3,245) in the previous 2017 to 2018 season.

ICU/HDU case numbers and admission rates in England peaked in week 05 2018 with 287 cases observed for that week and a rate of 0.57 per 100,000 above the high impact threshold (Figure 17). Of the 2,924 ICU/HDU admissions in England, the majority were due to influenza A (2,898; 99.1%), with the remainder due to influenza B (26; 0.9%). Of the influenza A admissions, 1,860 (64.2%) were due to A(not subtyped), 834 (28.8%) were influenza A(H1N1)pdm09 and 204 (7.0%) were reported to be influenza A(H3N2) (Figure 18).

ICU/HDU admissions occurred in all age groups. Those aged 45-64 years made up 39.8% of all cases and 19.8% of all cases were seen in the 15-44 year olds (Figure 17). In the previous season in which there was co-circulation of influenza B and influenza A(H3N2), the largest proportion of admissions occurred in those in the 65+ and 45-64 year olds. The cumulative rate of influenza admission was highest in all age groups for admissions with influenza A(not subtyped); by subtype this was highest for A(H1N1)pdm09 in 45-64 year olds (2.7/100,000) and in 75+ year olds for A(H3N2) (1.0/100,000) (Figure 19).

Within England, regional variation in the rate of confirmed influenza admissions to ICU/HDU was assessed using NHS England Local Team boundaries. The rate of ICU/HDU influenza admissions ranged from 2.4 per 100,000 per trust catchment population in Lancashire to 14.1 per 100,000 in Central Midlands in 2018 to 2019 (Figure 20).

Figure 17. Weekly number of influenza confirmed admissions to ICU/HDU through the USISS mandatory scheme in England, with crude ICU/HDU admission rate, week 40 2018 to week 15 2019

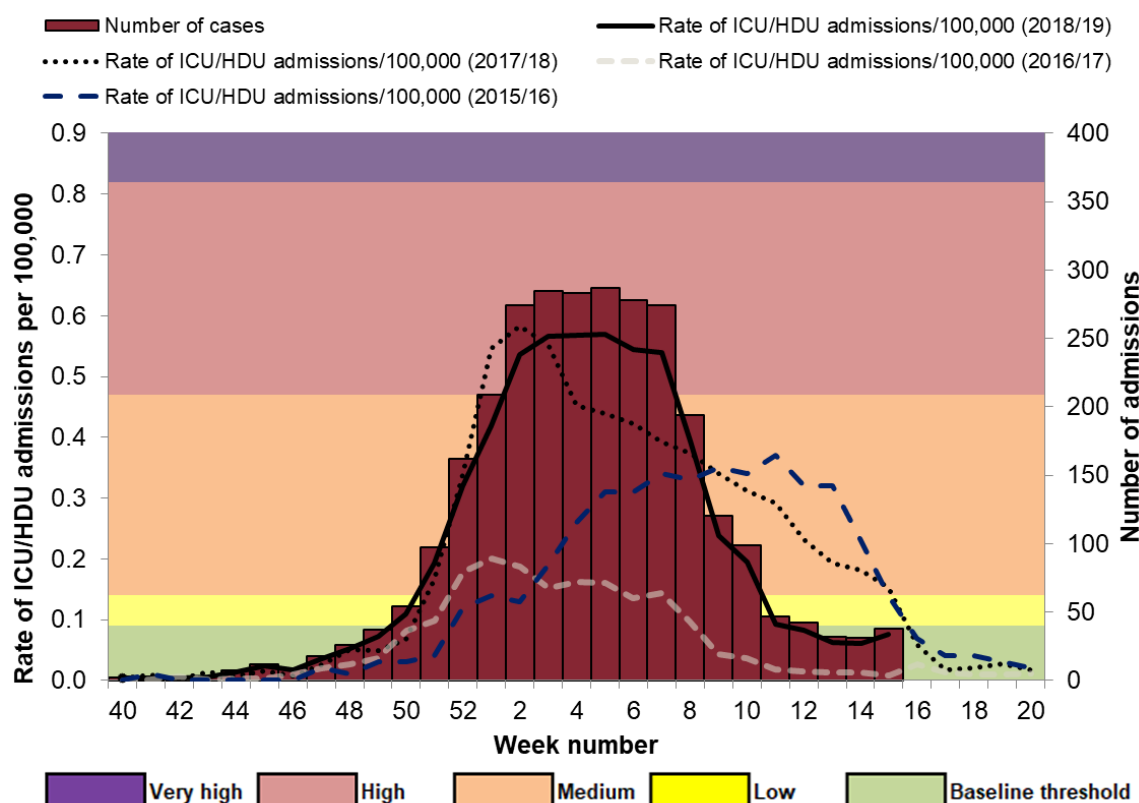


Figure 18. Cumulative ICU/HDU influenza confirmed admissions by age group and influenza type in England, through the USISS mandatory scheme, week 40 2018 to week 15 2019

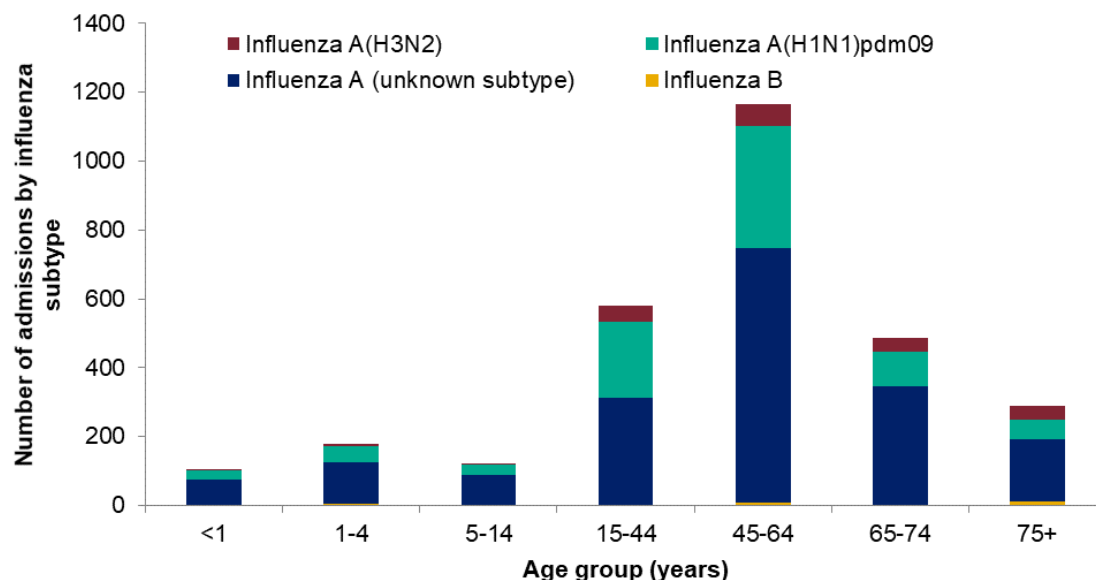


Figure 19. Cumulative rate of influenza confirmed admission to ICU/HDU per 100,000 trust catchment population by age group and influenza type in England, through the USISS mandatory scheme, week 40 2018 to week 15 2019

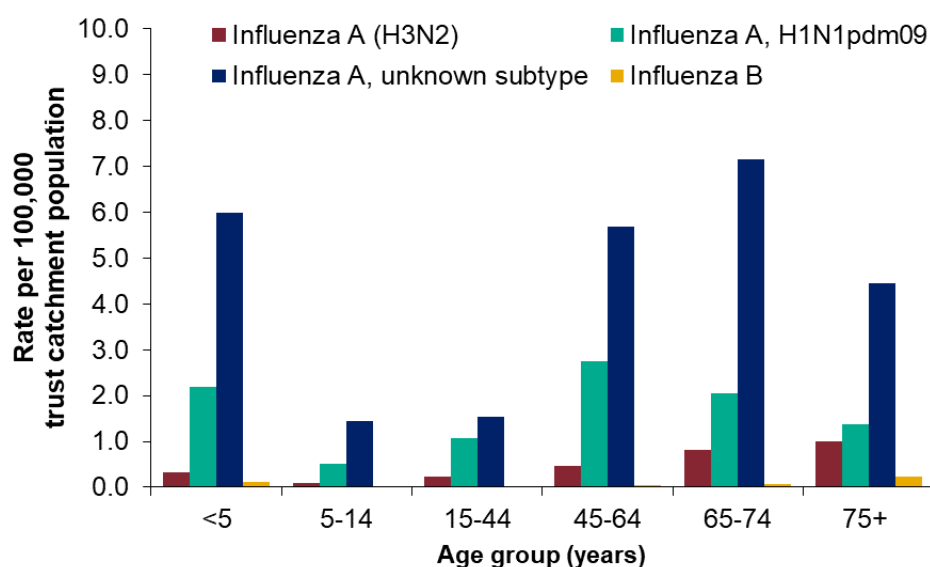


Figure 20. Overall rate of confirmed influenza ICU/HDU admissions through the USSS mandatory scheme by NHS England Local Teams, England, week 40 2018 to week 15 2019

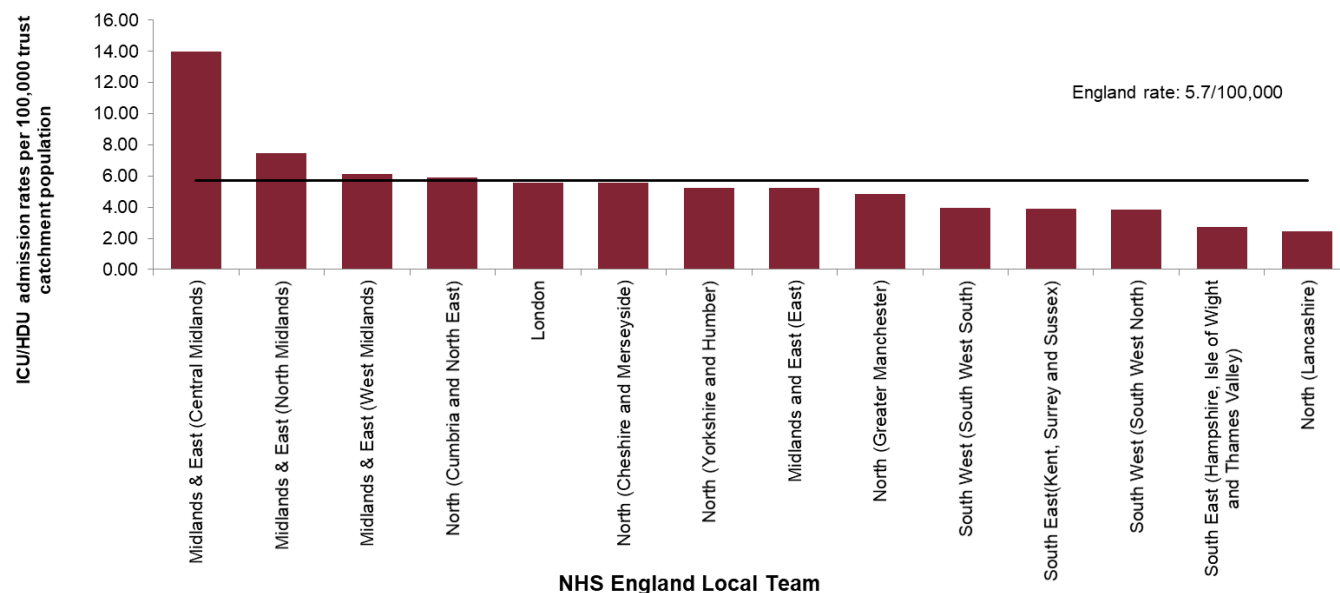
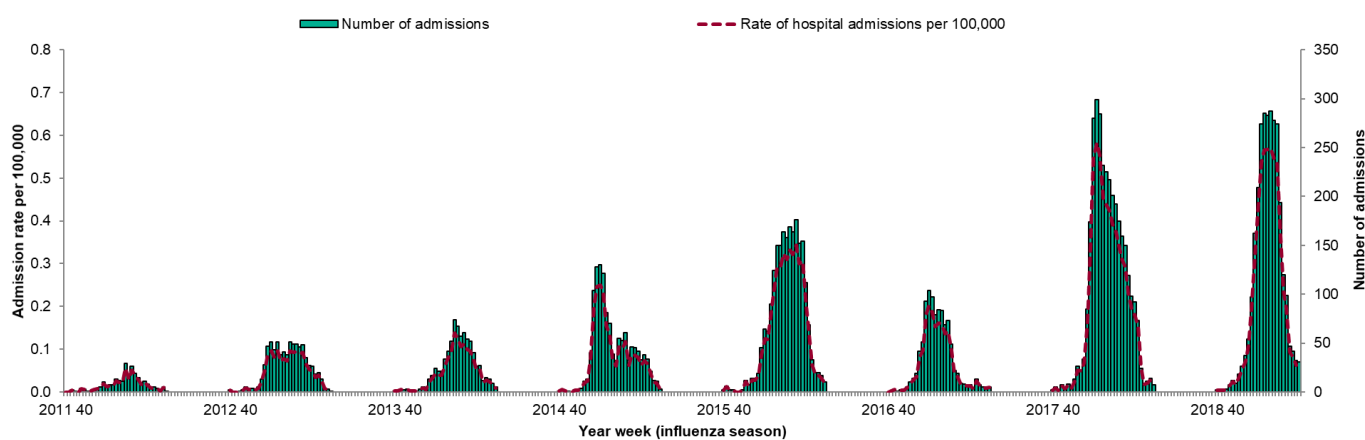


Figure 21 represents the weekly total number of influenza confirmed ICU/HDU admissions and influenza confirmed rate reported through the USSS mandatory scheme in England for the period from 2011 to 2019.

Figure 21. Weekly number of influenza confirmed ICU/HDU admissions to hospital in England through the USSS mandatory scheme with crude hospitalisation rate for all ages, 2011 to 2019 (up to week 15)

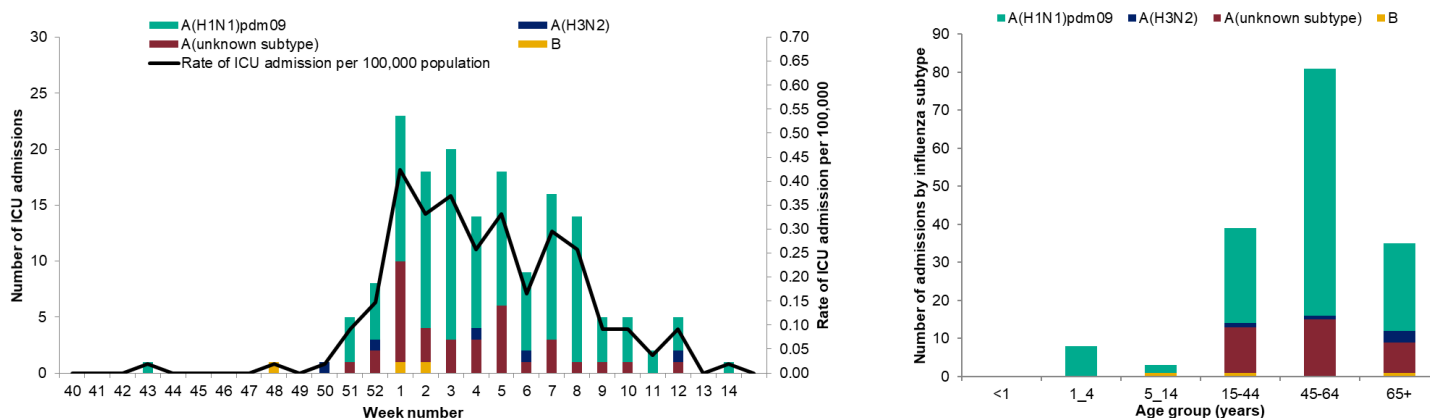


In Scotland there were slightly fewer laboratory confirmed cases requiring intensive care management (ICU admissions) reported from week 40 2018 to week 15 2019 (166 admissions, cumulative rate of 3.06 per 100,000 population) compared to similar period in 2015 to 2016 (174 admissions, cumulative rate of 3.21 per 100,000 population), the last season influenza A(H1N1)pdm09 was the dominant virus circulating. Compared to the 2017 to 2018 season the number of laboratory confirmed cases and rate of ICU admissions was similar (162 admissions, cumulative rate of 3.00 per 100,000 population). The peak activity was in week 01 2019 and the majority of cases were due to influenza A(H1N1)pdm09 (56.5%) followed by influenza A(not subtyped) (39.1%).

The largest number of cases was observed in the 45-64 year olds (48.8%) followed by the 15-44 year olds (23.5%) and the 65+ year olds (21.1%). No cases were seen in those aged less than 1 year (Figure 22).

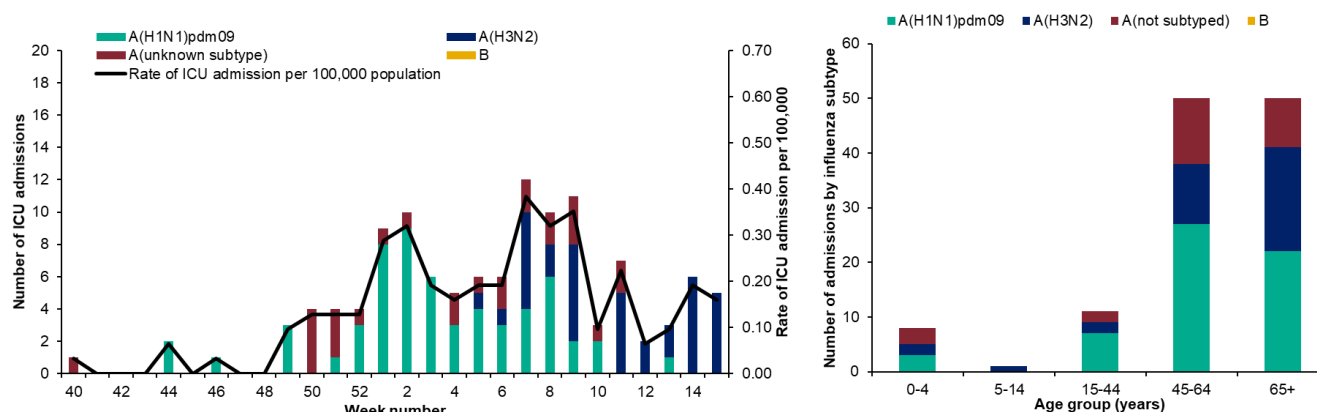
The case fatality rate (ie proportion of ICU influenza cases which have died due to influenza) of 19.9% (33/166) is slightly lower than seen in previous seasons 2017 to 2018 (24.4%, 40/164), 2016 to 2017 (26.9%, 23/89) and 2015 to 2016 (26.5%, 50/189).

Figure 22. Weekly number of laboratory confirmed influenza ICU cases with crude rate of ICU admissions in Scotland, with crude ICU admission rate up to week 15 2019 and the cumulative number of ICU admissions by age group and influenza type up to week 15 2019, Scotland



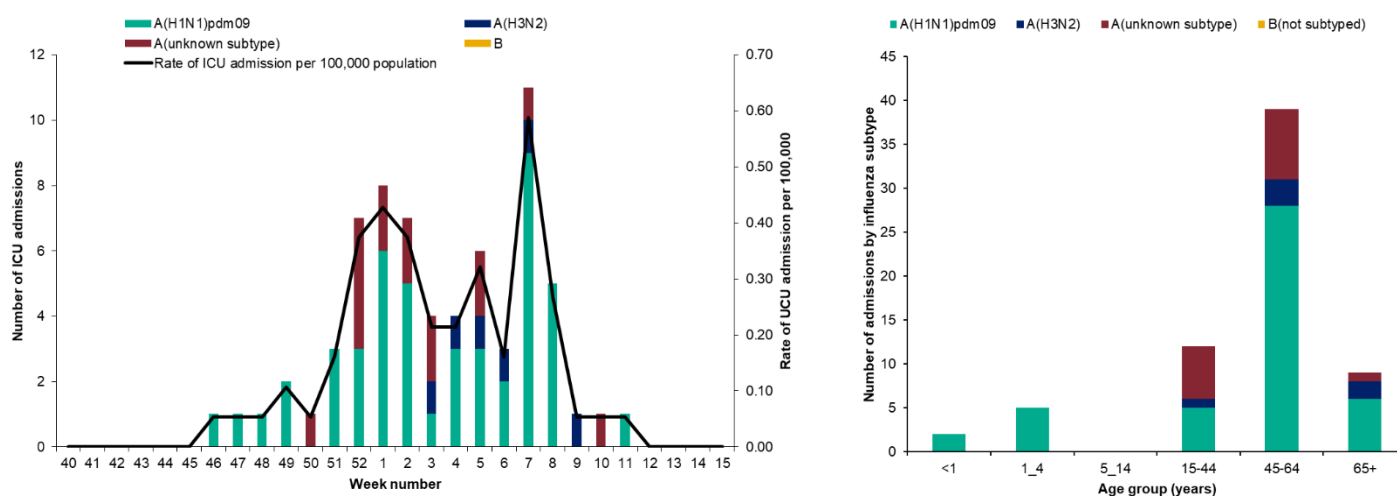
In Wales, 120 patients (cumulative rate of 3.8 per 100,000 resident population) in ICU were confirmed with influenza between week 40 2018 and week 15 2019 with peak activity in week 07 2019 (Figure 23). Influenza A(H1N1)pdm09 accounted for 48.3% of these confirmed cases and 30.0% were due to influenza A(H3N2). Of the patients confirmed with influenza in ICU, 42.5% were aged 45-64 and 40.8% were aged 65+ years.

Figure 23. Weekly number of laboratory confirmed influenza ICU cases with crude rate of ICU admissions in Wales and the cumulative proportion of ICU admissions by age group up to week 15 2018, Wales



In Northern Ireland, there were 67 patients (cumulative rate of 3.58 per 100,000 resident population) in ICU with laboratory confirmed influenza between week 40 2018 and week 15 2019, with peak activity in week 07 2019. Influenza A(H1N1)pdm09 accounted for the majority (68.7%) of these confirmed cases followed by influenza A(unknown subtype) (9.0%), there were no influenza B cases seen. By age group, the majority of cases (58.2%) were in those aged 45-64 years old, no cases were seen in those aged 5-14 years old. Seven deaths (10.4% of ICU cases) were also reported in the ICU/HDU patients with laboratory confirmed influenza (Figure 24).

Figure 24. Weekly number of laboratory confirmed influenza ICU cases in Northern Ireland and the cumulative number of ICU admissions by age group and influenza type up to week 15 2019, 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 6 SRFs in the UK (5 in England and 1 in Scotland).

For the 2018 to 2019 season, of the 206 SRF admissions reported by 5 SRFs between week 40 2018 and week 15 2019, 96 were laboratory confirmed influenza admissions, including 79 influenza A(H1N1)pdm09, 6 influenza A(H3N2) and 11 influenza A(unknown subtype). This compares to a total of 73 influenza confirmed admissions in 2015 to 2016, the last influenza A(H1N1)pdm09 dominated season and a total of 60 influenza confirmed admissions in 2017 to 2018, when influenza A(H3N2) dominated.

Microbiological surveillance

Respiratory DataMart, England

Influenza A and B positivity were monitored through the respiratory DataMart surveillance scheme in England for the season of 2018 to 2019, with the overall influenza positivity increasing above the MEM baseline threshold of 9.2% in week 51 2018. Influenza A(H1N1)pdm09 was the dominant circulating virus in the 2018 to 2019 season followed by influenza A(H3); with influenza A(H1N1)pdm09 circulating in the early part of the season and influenza A(H3) circulating toward the latter part of the season.

Overall influenza positivity peaked at 28.6% in week 06 2019, with the majority of positive samples associated with influenza A which peaked in the same week at 28.4%. Influenza A(H1N1)pdm09 positivity peaked at 11.1% in week 06 2019, this peak was later and lower than seen in 2015 to 2016 season in which A(H1N1)pdm09 peaked at 17.7% in week 04 2016. The highest age-specific positivity of A(H1N1)pdm09 was in the 15-44 year olds at 16.9% in week 06 2019. Influenza A(H3) positivity peaked at 8.6% in week 07 2019. This peak was later and lower than that seen in the 2017 to 2018 season where a peak of 9.9% was seen in week 52 2017. The number of influenza B detections remained at very low levels throughout the season with overall positivity peaking in week 45 2018 at 0.5% (Figure 25).

Figure 25. Weekly number of influenza A and B detections through Respiratory Datamart in England, with overall % positivity, 2018 to 2019

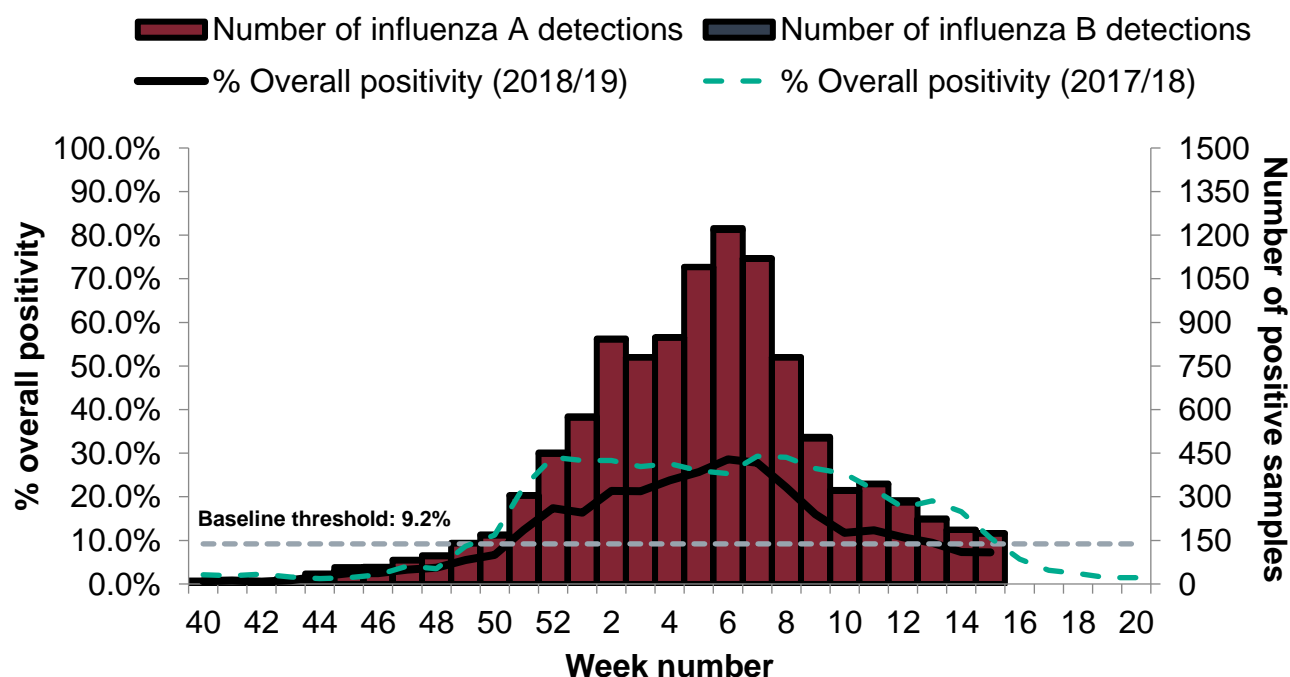
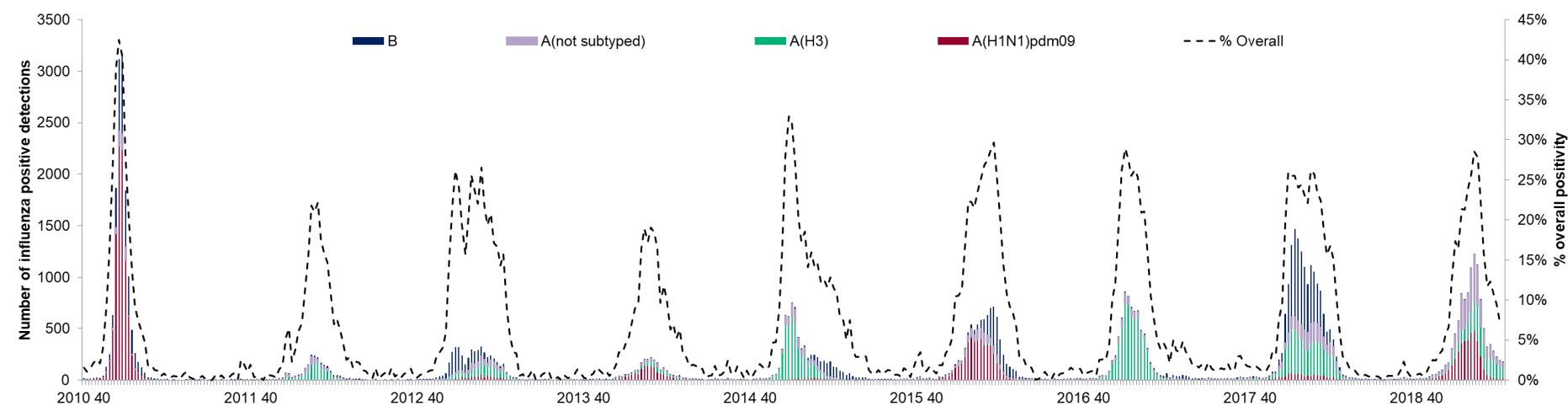


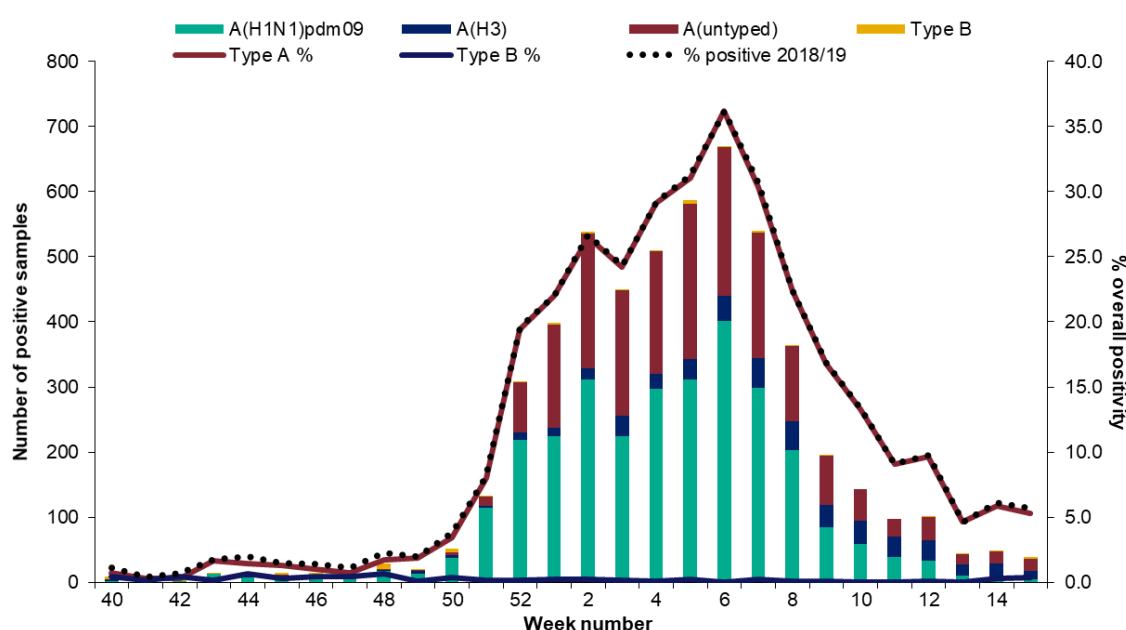
Figure 26. Weekly number of influenza detections by subtype through Respiratory Datamart in England, with overall % positivity, 2010 to 2019



ECOSS, Scotland

In Scotland, overall influenza positivity reported through non-sentinel sources (ECOSS) rose above the MEM baseline threshold of 6.3% in week 51 2018, and reached a peak of 36.2% in week 06 2019. As seen elsewhere in the UK, influenza A(H1N1)pdm09 was the dominant circulating virus in Scotland, peaking in week 06 2019 (Figure 27).

Figure 27. Weekly ECOSS influenza positivity (number and percentage positive) by influenza subtype from week 40 2017 to week 15 2019, Scotland



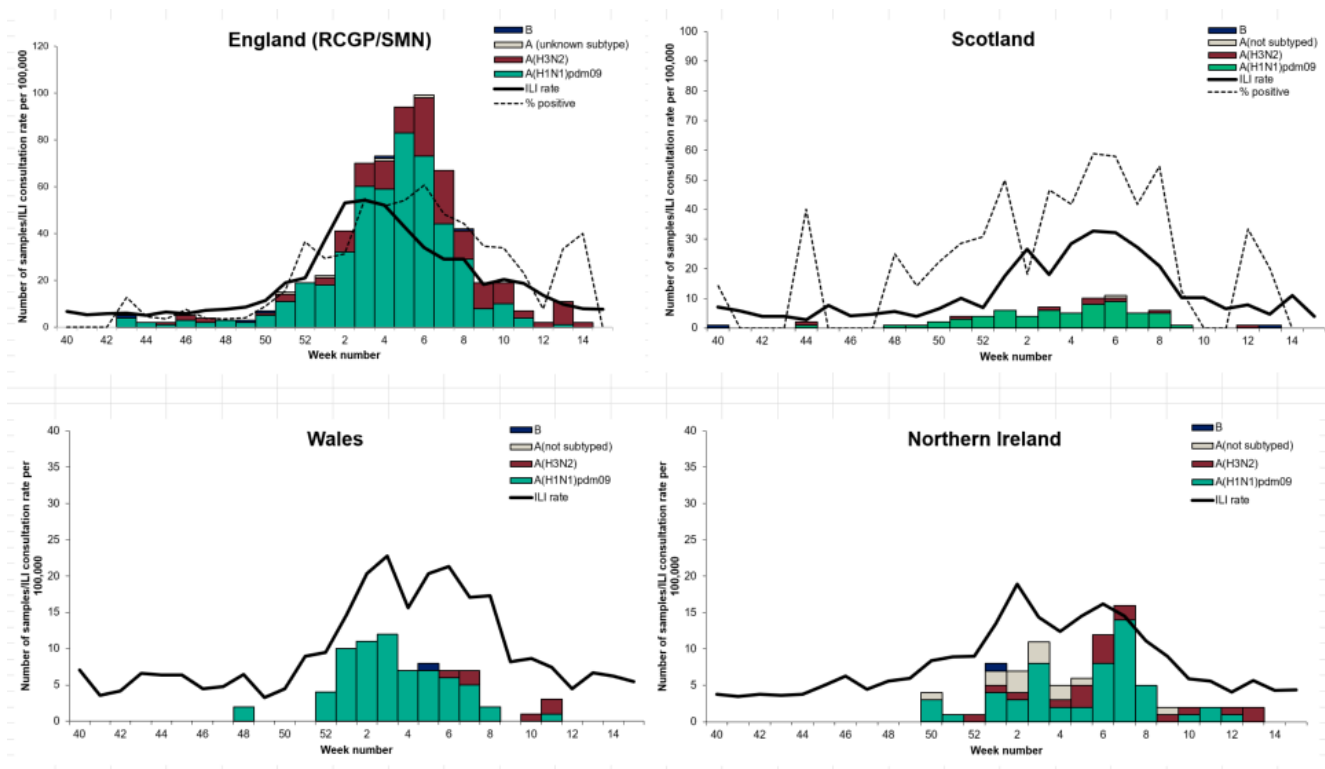
Sentinel GP-based swabbing scheme

GP-based sentinel swabbing schemes in the UK were dominated by influenza A(H1N1)pdm09 followed by influenza A(H3N2) in line with observations from other influenza surveillance schemes (Figure 28).

In England, influenza activity through the RCGP/SMN schemes increased from week 51 2018 and remained above 20.0% positivity until week 11 2019. Overall influenza positivity peaked at 60.7% in week 06 2019 (Figure 28).

Influenza activity monitored through the GP Sentinel Scheme in Scotland peaked at 58.8% positivity in week 05 2019 with predominance of influenza A(H1N1)pdm09 in weeks 48 2018 to 08 2019 with the peak number of positive specimens seen in week 06 2019 (Figure 28).

Figure 28. Weekly number of influenza positive sentinel virology samples by influenza type,% positive and ILI rate, 2018 to 2019, UK



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

In Wales, the majority of influenza positive specimens were influenza A(H1N1)pdm09 with the peak number of positive specimens seen in week 03 2019.

In Northern Ireland the peak number of influenza positive specimens was seen in week 07 2019 and was mainly due to influenza A(H1N1)pdm09.

Virus characterisation

PHE characterises the properties of influenza viruses through 1 or more tests, including genome sequencing ¹² (genetic analysis) and haemagglutination inhibition ¹³ (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 week 40 2018, the PHE Respiratory Virus Unit (RVU) has characterised 959 influenza A(H1N1)pdm09 viruses (Table 2). Genetic characterisation of 922 influenza A(H1N1)pdm09 viruses detected since week 40 shows that they all belong in the genetic subgroup 6B.1, which was the predominant genetic subgroup in the 2017/18 season. Two-hundred and eighty-three A(H1N1)pdm09 viruses have been antigenically characterised and are similar to the A/Michigan/45/2015-like Northern Hemisphere 2018/19 (H1N1)pdm09 vaccine strain.

Genetic characterisation of 226 A(H3N2) influenza viruses detected, showed that they all belonged to genetic subclade 3C.2a, with 218 belonging to a cluster within this genetic subclade designated as 3C.2a1. Eleven viruses belonging to the genetic subclade 3C.3a have been identified. The Northern Hemisphere 2018/19 influenza A(H3N2) vaccine strain A/Singapore/INFIMH-16-0019/2016 belongs in genetic subclade 3C.2a1.

Of 3 influenza B viruses characterised, 2 influenza B viruses have been characterised where sequencing of the haemagglutinin (HA) gene shows they belong within genetic clade 1A of the B/Victoria lineage. One of them clusters in a subgroup characterised by deletion of 2 amino acids in the HA. The N.Hemisphere 2018/19 B/Victoria-lineage quadrivalent and trivalent vaccine component virus (a B/Colorado/06/2017-like virus), is a double deletion subgroup virus. The other influenza B virus has been characterised genetically as belonging to genetic clade 3 of the B/Yamagata lineage and antigenically as similar to the B/Phuket/3073/2013 B/Yamagata lineage vaccine component in the N.Hemisphere 2018/19 quadrivalent vaccine.

¹² CDC genome sequencing. www.cdc.gov/flu/professionals/laboratory/genetic-characterization.htm

¹³ CDC Antigenic information. www.cdc.gov/flu/professionals/laboratory/antigenic.htm

Table 2. Viruses characterised by the PHE Reference Laboratory, from week 40 2018 to week 15 2019

Virus	No. viruses characterised			
	Genetic and antigenic	Genetic only	Antigenic only	Total
A(H1N1)pdm09	246	676	37	959
A(H3N2)	0	237	0	237
B/Yamagata-lineage	1	0	0	1
B/Victoria-lineage	0	2	0	2

Antiviral resistance

Neuraminidase inhibitor (NI) susceptibility (oseltamivir and zanamivir) is determined by phenotypic testing of virus isolates and genotypic testing of clinical samples positive for influenza A(H1N1)pdm09, A(H3N2), and influenza B viruses at the PHE RVU. Three other laboratories also perform screening for the H275Y amino acid substitution in influenza A(H1N1)pdm09 positive clinical samples. The data summarized below combine the results of both RVU and these other laboratories, with resistant cases reported if confirmed by RVU. The samples tested are routinely obtained for surveillance purposes, but diagnostic testing of patients not responding to NI treatment is also performed.

Since week 40 2018, 901 influenza A(H1N1)pdm09 viruses have been tested for oseltamivir susceptibility, 880 were fully susceptible and 21 were resistant confirmed by PHE-RVU. All 21 oseltamivir resistant cases had the H275Y amino acid substitution. Available information on 8 of the 21 cases shows that 7 had received oseltamivir treatment and 1 case had no known history of prior exposure to oseltamivir. Of the 901 influenza A(H1N1)pdm09 viruses, 713 have also been tested for zanamivir susceptibility and all were susceptible.

Oseltamivir susceptibility has been determined for 171 influenza A(H3N2) viruses, with 158 also tested for zanamivir susceptibility, all of which were fully susceptible.

All of the 3 influenza B viruses tested for both oseltamivir and zanamivir susceptibility 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 are some differences in extraction specifications, so 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 28 February 2019 was reported from 96.7% (6,680/6,910) of GP practices in England in 2018 to 2019. Comparative data are up to 28 February 2018 where uptake was reported from 97.5% (6,982/7,159) of GP practices in England in 2017 to 2018. This season saw a vaccine uptake of 72.0% in 65+ year olds (compared to 72.9% in 2017 to 2018) and 48.0% for those aged 6 months to under 65 years of age with 1 or more underlying clinical risk factors (excluding pregnant women without other risk factors and carers), compared to 49.7% in 2017 to 2018 (Table 3). Uptake in pregnant women was 45.2%, compared to 47.0% in 2017 to 2018. The more detailed final uptake reports are now publicly available¹⁴.

In Scotland, the uptake of seasonal influenza vaccine is estimated by Health Protection Scotland (HPS) throughout the season, also based on automated 4-weekly extracts from >95% of all Scottish GP practices. As such, vaccine uptake reported here should be regarded as provisional. Cumulative uptake in 2018 to 2019 to week 15 showed vaccine uptake of 73.7% in 65+ year olds (compared to 73.7% in 2017 to 2018). Uptake amongst those aged 6 months to under 65 year olds in 1 or more clinical at-risk groups was 42.4% (compared to 44.8% in 2017 to 2018). Overall uptake in pregnant women (including those with and without other risk factors) up to week 15 2019 was 45.7%, compared to 49.4% in 2017 to 2018. The uptake in pregnant women (without other risk factors) was 44.5%, compared with 48.1% in 2017 to 2018. The uptake in pregnant women (with other risk factors) was 57.4%, compared with 61.8% in 2017 to 2018.

¹⁴ Vaccine Uptake – Influenza vaccine uptake reports. www.gov.uk/government/collections/vaccine-uptake#seasonal-flu-vaccine-uptake:-figures

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 collected through the Audit+ Data Quality System. Cumulative uptake data on influenza vaccinations administered were received from 100% of GP practices in Wales in 2018 to 2019. This showed a vaccine uptake of 68.3% in 65+ year olds (compared to 68.8% in 2017 to 2018) and 47.1% for those aged 6 months to under 65 years of age with 1 or more underlying clinical risk factor (excluding morbidly obese patients without other risk factors), compared to 48.5% in 2017 to 2018. Overall uptake in pregnant women was 74.2% compared to 72.7% in 2017 to 2018. In Wales, vaccine coverage in pregnant women is measured differently using a survey of pregnant women giving birth each year during January. In addition, as elsewhere in the UK, data are also automatically collected from general practices for women with pregnancy related Read-codes, these data report uptakes of 59.1% in pregnant women at risk and 45.0% in healthy pregnant women.

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 2019 was reported from 99.1% of GP practices in Northern Ireland in 2018 to 2019. In the population aged 65+ years uptake was 70.0% (compared to 71.8% in 2017 to 2018) and in the population of under 65 years at risk the uptake was 52.4% (compared to 56.0% in 2017 to 2018). Uptake in pregnant women was 44.3% compared to 47.1% in 2018 to 2019.

Uptake by frontline healthcare workers in England was 70.3% from 98.8% of organisations, an increase from 68.7% in 2017 to 2018. In Scotland, uptake figures in healthcare workers across all territorial health boards was 51.2%; this compares with 45.7% in 2017 to 2018. In Wales, uptake reached 55.5% compared to 56.9% in 2017 to 2018. In Northern Ireland, uptake in frontline healthcare workers including social care was 35.4% compared to 33.4% in 2017 to 2018. Uptake for healthcare workers excluding social care was 39.5% in 2018 to 2019.

Table 3 summarises uptake in adults in the UK.

Table 3. Influenza vaccine uptake in 65+ year olds, 6 months to under 65 years at risk, pregnant women and healthcare workers, 2018 to 2019, UK

Target Group		England			Scotland			Northern Ireland			Wales		
		Number vaccinated	Denominator	% uptake	Number vaccinated	Denominator	% uptake	Number vaccinated	Denominator	% uptake	Number vaccinated	Denominator	% uptake
65+ years		7,260,596	10,087,978	72.0	769,184	1,043,401	73.7	221,393	316,480	70.0	457,200	669,472	68.3
<65 years at risk*		3,276,592	6,820,919	48.0	322,149	760,299	42.4	144,846	276,173	52.4	183,605	389,635	47.1
Pregnant	No risk	257,595	589,866	43.7	17,922	40,252	44.5	-	-	-	10,808	24,003	45.0
	At Risk	35,764	59,367	60.2	2,428	4,231	57.4	-	-	-	1,783	3,016	59.1
	All**	293,359	649,233	45.2	20,350	44,483	45.7	9,932	22,413	44.3	310	418	74.2
Healthcare Workers*~		739,187	1,051,851	70.3	77,268	150,791	51.2	15,334	38,797	39.5	33,653	60,671	55.5

* The pregnant women and healthcare workers who are also in one or more clinical risk groups may also be included in our <65 years at risk category

** In Wales, overall vaccine coverage in pregnant women was estimated using a survey of 418 pregnant women giving birth during January 2019

*~ Excluding social care workers

Influenza vaccine (LAIV) programme for children

England

The Immform survey was used to monitor influenza vaccine uptake in 2 and 3 olds in primary care in England. The cumulative uptake for all GP-registered 2 year olds up to 28 February 2019 was 43.8% (compared to 43.3% in 2017 to 2018) and was 45.9% in 3 year olds (compared to 44.7% in 2017 to 2018) in England. This was reported from 96.2% of GP practices in England. The combined uptake for 2 and 3 year olds was 44.9% compared to 44.0% in 2017 to 2018.

The seasonal influenza vaccine programme for children school year reception, 1, 2, 3, 4 and 5 (4 years rising to 10 years of age) was mainly delivered via a school-based programme, although 1 area delivered vaccinations through general practice. Vaccine uptake was monitored through manual returns by local teams for their responsible population.

An estimated 2,461,563 children in school years' reception, 1, 2, 3, 4 and 5 (4 years rising to 10 years of age) in England received at least 1 dose of influenza vaccine during the period 1 September 2018 to 31 January 2019. With an estimated total target population of 4,051,698; the overall uptake was 60.8%. Total uptake in children in reception and school years 1, 2, 3, 4 and 5 was 64.3%, 63.6%, 61.5%, 60.4%, 58.3% and 56.5%, respectively. Uptake by local NHS England Team ranged from 49.4% to 68.9% in London and the Hampshire, Isle of Wight and Thames Valley team, respectively (Table 4). Overall uptake for children in school years' reception, 1, 2, 3, 4 and 5 age combined by LA (not shown here) ranged from 30.1% (6,138/20,399) in Tower Hamlets to 80.6% (17,174/21,309) in East Riding. Uptake by year group by LA ranged from 32.2% to 89.1% in reception, 34.2% to 82.3% in year 1, 31.4% to 80.3% in year 2, 31.3% to 80.7% in year 3, 26.3% to 78.3% in year 4 and 24.9% to 77.3% in year 5.

A more detailed PHE report on influenza vaccine uptake in England in primary school age children is publicly available ¹⁵.

¹⁵ Vaccine Uptake – Influenza vaccine uptake reports. www.gov.uk/government/collections/vaccine-uptake#seasonal-flu-vaccine-uptake:-figures

Table 4. Estimated number and proportion of children of school years reception, 1, 2, 3, 4 and 5 age who were vaccinated with influenza vaccine by local NHS England team from 1 September 2018 to 31 January 2019

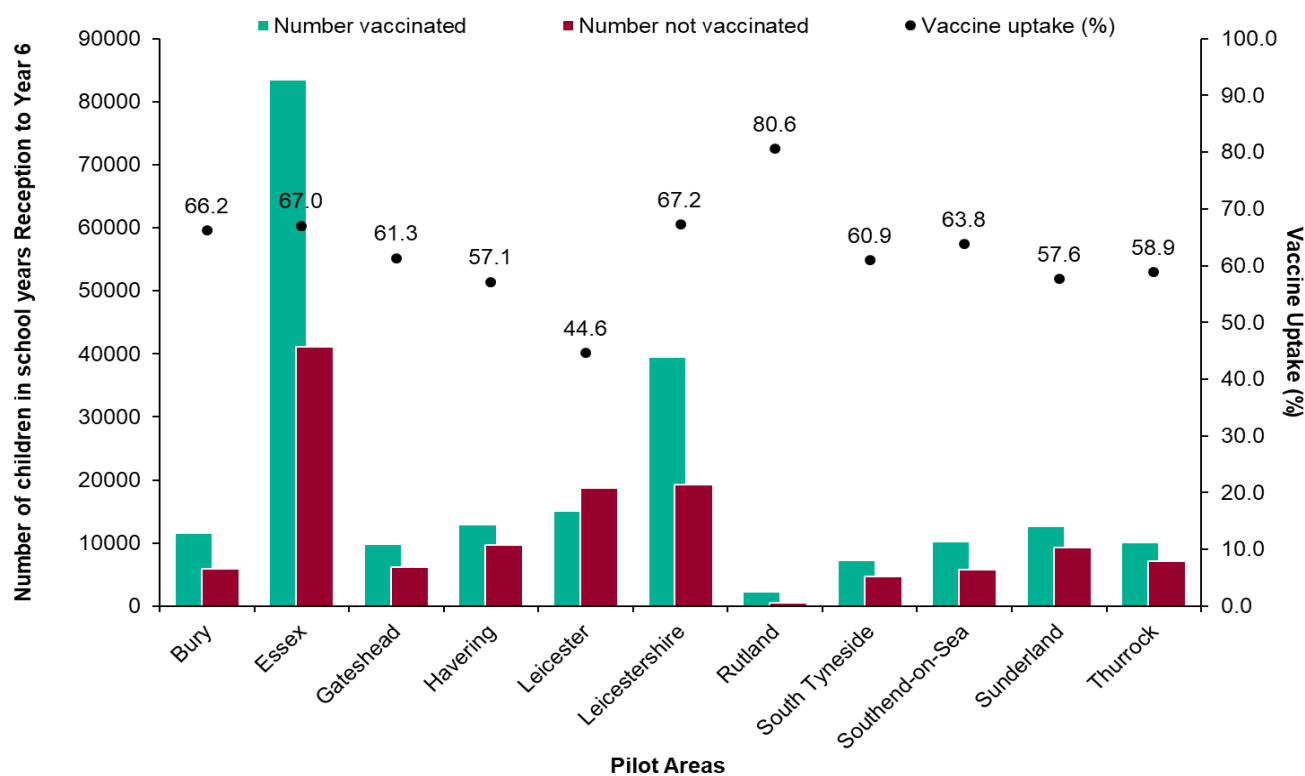
Local NHS England team	No. of children eligible for vaccination	No. of children vaccinated with at least 1 dose of influenza vaccine	Vaccine uptake (%)
London	646,222	319,424	49.4
London	646,222	319,424	49.4
Midlands & East	1,260,744	777,304	61.7
Central Midlands	361,384	218,899	60.6
East of England	308,448	190,795	61.9
North Midlands	257,490	169,760	65.9
West Midlands	333,422	197,850	59.3
North	1,135,678	712,286	62.7
Cheshire & Merseyside	173,483	113,706	65.5
Cumbria & North East	215,472	131,278	60.9
Greater Manchester	225,492	139,178	61.7
Lancashire & South Cumbria	110,356	68,243	61.8
Yorkshire & Humber	410,875	259,881	63.3
South East	633,944	419,240	66.1
Hampshire, Isle of Wight and Thames Valley	302,243	208,315	68.9
Kent, Surrey and Sussex	331,701	210,925	63.6
South West	375,110	233,309	62.2
South West North	177,456	113,602	64.0
South West South	197,654	119,707	60.6
Total	4,051,698	2,461,563	60.8

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

The 2018 to 2019 season also saw the continuation of the primary school-age vaccination programme in 5 pilot areas (11 Local Authorities) that have been piloting the programme since the 2013 to 2014 season (for pilot areas see [Appendix A](#)). Influenza vaccine was offered to all primary school age children aged 4-11 years (school years' reception to year 6) through a school based delivery model. The extension to the pilot programme to include reception aged children (aged 4 rising to 5) was made in September 2017.

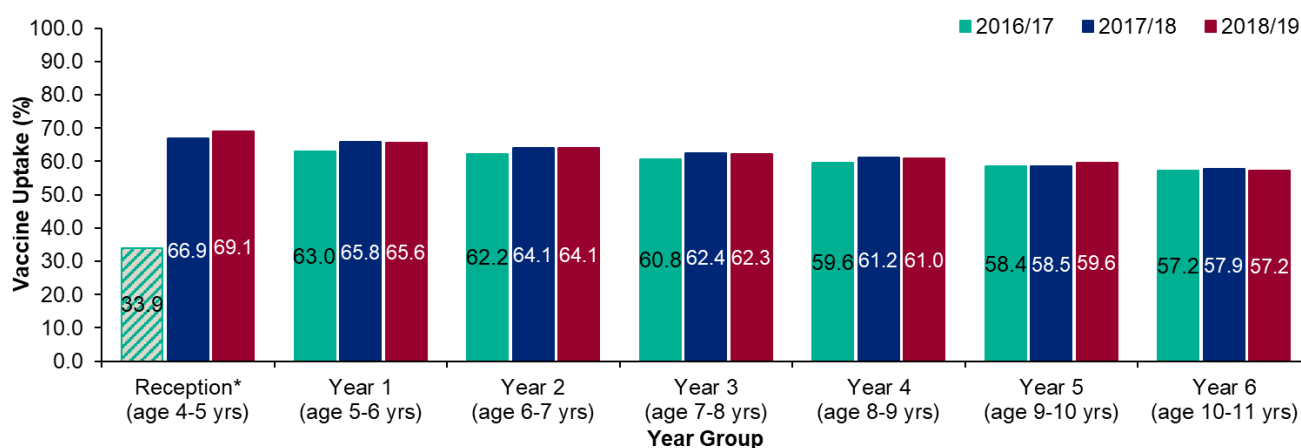
An estimated 214,977 primary school children aged 4-11 years in 5 pilot areas received at least 1 dose of influenza vaccine during the period 1 September 2018 to 31 January 2019. With an estimated total target population of 343,280, this results in an overall uptake of 62.6% (ranging by pilot site from 44.6% in Leicester to 80.6% in Rutland) (Figure 29).

Figure 29. Estimated proportion of primary school age children (aged 4-11 years) who were vaccinated with influenza vaccine by pilot area, England, 1 September 2018 to 31 January 2019



Vaccine uptake for the period 1 September 2018 to 31 January 2019 in pilot areas by year group ranged from 57.2% in school year 6 (aged 10 rising to 11 years) to 69.1% in reception (aged 4 rising to 5 years), with an overall pattern of decreasing uptake with increasing age (Figure 30). In the pilot areas, the cumulative LAIV vaccine uptake in the 2018 to 2019 season was 62.6% which was similar to the uptake in the 2017 to 2018 season (62.4%), both years based on combined data for reception to year 6.

Figure 30. Estimated proportion of primary school age children (aged 4-11 years) who were vaccinated with influenza vaccine by year group in pilot areas, England, 2016 to 2019



*Children in ages 4-5 years old were vaccinated in GP practices during the 2016/17 season.

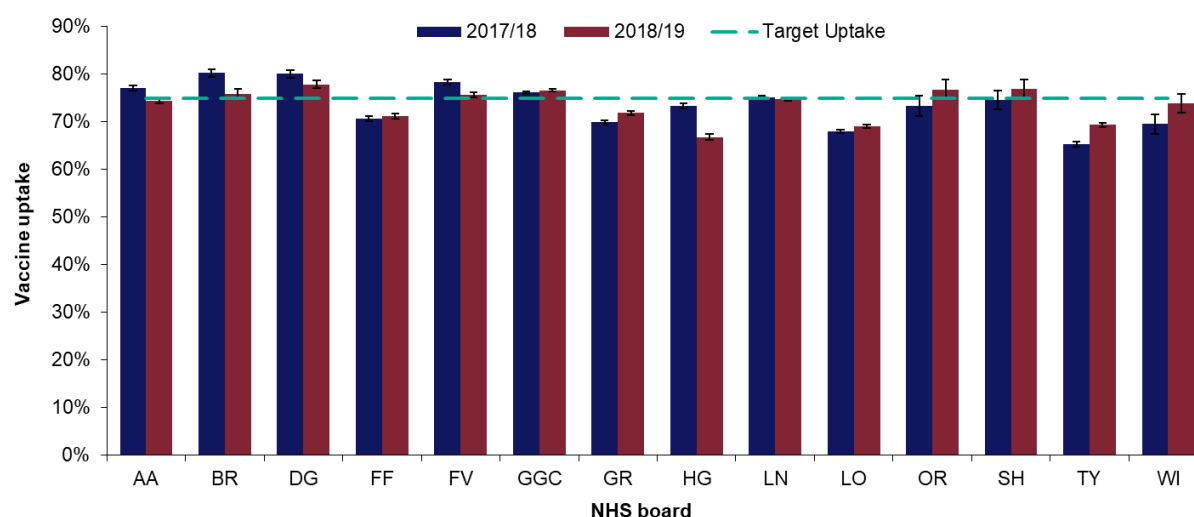
Scotland

The estimated uptake in preschool children (2 to under 5 year olds, not yet in school) vaccinated in the GP setting was 55.6% in 2018 to 2019 (compared to 56.9% in 2017 to 2018).

In 2018 to 2019, the offer of influenza vaccine was made to all primary school aged children in Scotland with an estimated 301,943 children aged 4-11 years who received at least 1 dose of influenza vaccine. With an estimated total target population for the school based programme of 414,086, this resulted in an uptake of 72.9% at the end of the season. This is similar to the vaccine uptake achieved during the primary school programme in 2017 to 2018 (301,160 children vaccinated out of a target population of 412,721, resulting in an 73.0% 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 some 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 31).

Figure 31. Mean influenza vaccine uptake (%) by NHS board, with confidence intervals [CI] for the primary schools in 2017 to 2018 to week 15 2018, compared to the previous season



* For the majority of NHS health board, the uptake includes data obtained from general practices on the number of children vaccinated in schools.

**NHS Health boards include: Ayrshire & Arran (AA), Borders (BR), Dumfries & Galloway (DG), Fife (FF), Forth Valley (FV), Greater Glasgow & Clyde (GGC), Grampian (GR), Highland (HG), Lanarkshire (LN), Lothian (LO), Orkney (OR), Shetland (SH), Tayside (TY), Western Isles (WI).

Wales

In Wales, immunisations for 2 and 3 year olds were delivered through general practices, apart from 1 health board where the majority of 3 year olds were immunised through nursery school immunisations sessions (uptake in these nursery school sessions was 66.1%). National uptake of influenza vaccine in 2 and 3 year olds decreased in 2018 to 2019. Uptake of influenza vaccine for children aged 2 years was 50.4% (compared to 51.7% in 2017 to 2018), for 3 year olds it was 48.3% (compared to 48.8% in 2017 to 2018). For the whole group of children aged 2 and 3 years, uptake was 49.4% (compared to 50.2% in 2017 to 2018).

The childhood influenza programme in Wales expanded to include children in school years 5 and 6 (9 and 10 year olds), meaning all primary school children were eligible. Uptake in school children increased. Children aged 4, 5, 6, 7, 8, 9 and 10 years, received their vaccinations in school immunisation sessions and uptake was 72.1%, 71.8%, 71.2%, 70.8%, 68.7%, 68.1% and 66.6% in each of these groups respectively. For the group as a whole, uptake was 69.9% (compared to 68.3% in 2017 to 2018).

Northern Ireland

In 2018 to 2019, the childhood influenza vaccination programme continued to include all pre-school children aged 2 to 4 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 2018 to 2019 for pre-school children aged 2 to 4 years old was 47.6% (compared to 50.6% in 2017 to 2018). The vaccination uptake rate for children in primary school (aged approximately 4 to 11 years old) was 75.9% (compared to 76.5% in 2017 to 2018).

Vaccine effectiveness

Influenza vaccine effectiveness (VE) in adults and children in primary care in the United Kingdom (UK): provisional end-of-season results 2018 to 2019.

The UK is in the sixth season of introducing a universal childhood influenza vaccine programme and the first season of introducing a newly licensed adjuvanted influenza vaccine (aTIV) for those aged 65+ years. As in previous seasons, influenza vaccine effectiveness (VE) was measured using a test-negative case control design through 5 primary care influenza sentinel swabbing surveillance schemes in England (2 schemes), Scotland, Wales and Northern Ireland adjusting for key confounders (aVE). There were 1,553 controls and 773 cases of whom 584 were due to A(H1N1)pdm09 and 170 were A(H3N2). The provisional end-of-season aVE was 44.3% (95% CI: 26.8, 57.7) against all laboratory-confirmed influenza; 45.7% (95% CI: 26.0%, 60.1%) against

influenza A(H1N1)pdm09 and 35.1% (95% CI: -3.7%, 59.3%) against A(H3N2). Overall aVE was 49.9% (95%CI: -13.7%, 77.9%) for all 65+ year olds and 62.0% (95% CI: 3.4%, 85.0%) for those who received aTIV. Overall aVE for 2-17 year olds receiving LAIV was 48.6% (95% CI: -4.4%, 74.7%) (Table 5).

There is evidence of overall significant influenza VE in 2018/19, most notably against influenza A(H1N1)pdm09, but as seen in 2017 to 2018, there was reduced VE against A(H3N2). aTIV provided significant protection for those 65+ year olds. Next season, the vaccine composition is being updated according to WHO recommendations; the adjuvanted vaccine will continue to be available for older adults and a cell-based vaccine will be available for adults.

Table 5: Adjusted influenza vaccine effectiveness (VE) against medically-attended laboratory confirmed influenza by age group and influenza type in 2018/19, UK.

Group	A(H3N2) adjusted VE(%) (95% CI)	A(H1N1)pdm09 adjusted VE (%) (95% CI)	All adjusted VE (%) (95% CI)
2-17 year olds (LAIV only)	27.1 (-130.5, 77)	49.9 (-14.3, 78.0)	48.6 (-4.4, 74.7)
18-64 year olds (any vaccine)	49.6 (0.5, 74.4)	40.3 (13.6, 58.8)	44.2 (21.3, 60.5)
65+ year olds (any vaccine)	24.2 (-123.6, 74.3)	67.1 (5.1, 88.6)	49.9 (-13.7, 77.9)
65+ year olds (aTIV)	NA	NA	62 (3.4, 85.0)
All ages	35.1 (-3.7, 59.3)	45.7 (26.0, 60.1)	44.3 (26.8, 57.7)

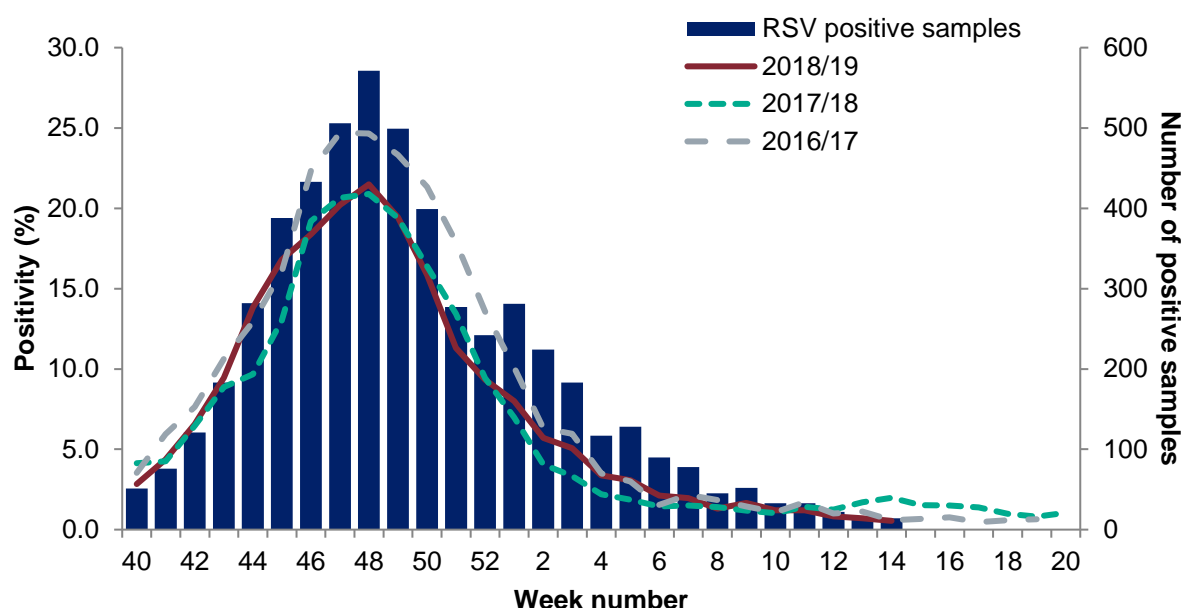
CI: confidence interval; VE: vaccine effectiveness; NA: not applicable

* Adjusted for age-group, sex, month, risk-group, pilot area and surveillance scheme.

Other respiratory viruses

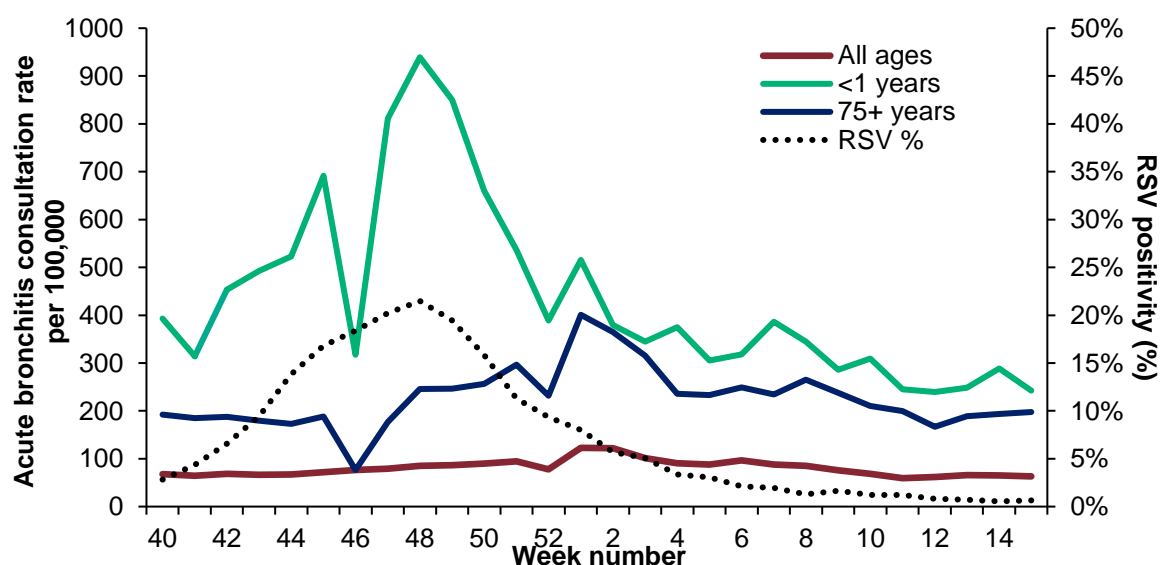
Respiratory syncytial virus (RSV) reported through DataMart Surveillance system peaked in week 48 2018 at 21.5% positivity, with circulation above 10.0% between week 44 2018 and 51 2018 (Figure 32). This peak was observed around the same time as the peaks seen in the last 2 seasons, 20.9% in 2017 to 2018 peaking in week 48 2017 and 24.7% in 2016 to 2017 peaking in week 47 2016. The highest positivity was seen in children aged less than 5 year of age, with a peak of 47.3% in week 48 2018, similar to the peak in 2017 to 2018. The lowest age-specific peak positivity was noted in the 15-44 year olds, with a peak of 7.1% in week 49 2018.

Figure 32. RSV number of positive samples and positivity (%) by week in Respiratory Datamart, 2016 to 2019, England



The overall RCGP GP acute bronchitis rate peaked at 122.8 per 100,000 in week 01 2019. The rate in under 1 year olds peaked the same week as RSV positivity in week 48 2018 at 939.2 per 100,000, and at a similar to previous seasons, whereas the rate for 75+ year olds peaked in the same week as the overall rate (week 01 2019) at 400.9 per 100,000 (Figure 33).

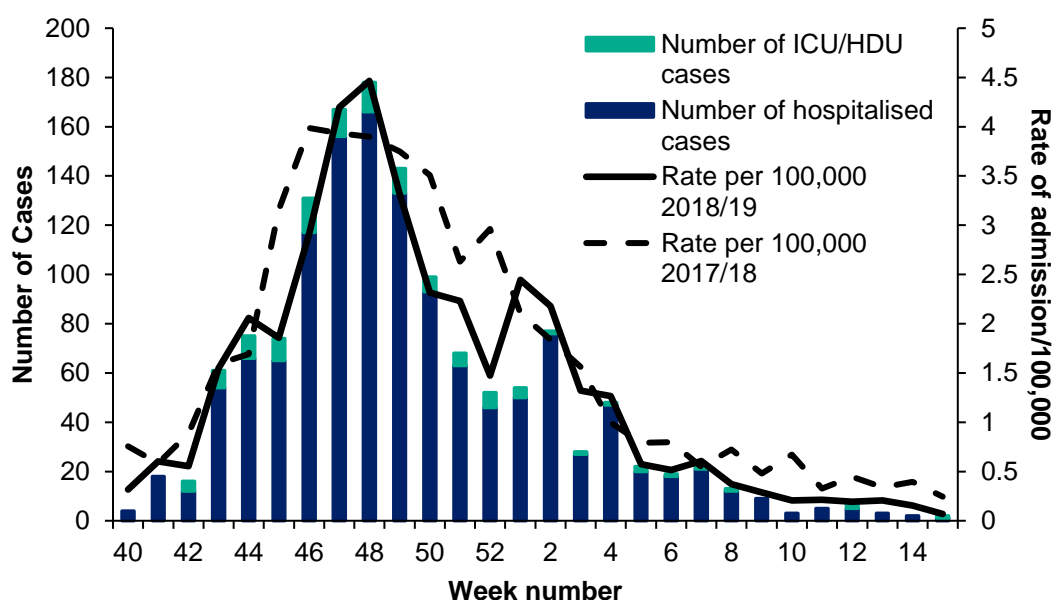
Figure 33. Weekly acute bronchitis consultation rates overall, in under 1 year olds and 75+ year olds with RSV positivity (%) through the RCGP scheme, 2018 to 2019, England



As part of a WHO initiative to pilot RSV surveillance¹⁶, England has been monitoring and collating data on confirmed hospitalised RSV cases through the USISS sentinel scheme in 2018 to 2019.

Between week 40 2018 and week 15 2019, a total of 1,400 confirmed RSV cases (1,292 hospitalised and 108 admitted to ICU/HDU) have been reported from 9 participating trusts. The rate of hospital admission due to RSV peaked in week 48 2018 at 4.5 per 100,000 trust catchment population, appearing slightly later than the peak in 2017 to 2018 (Figure 34). The highest number of confirmed RSV cases were noted in the <1 year olds.

Figure 34. Weekly hospitalised RSV case rate per 100,00 trust catchment population, England, week 40 2018 to week 15 2019

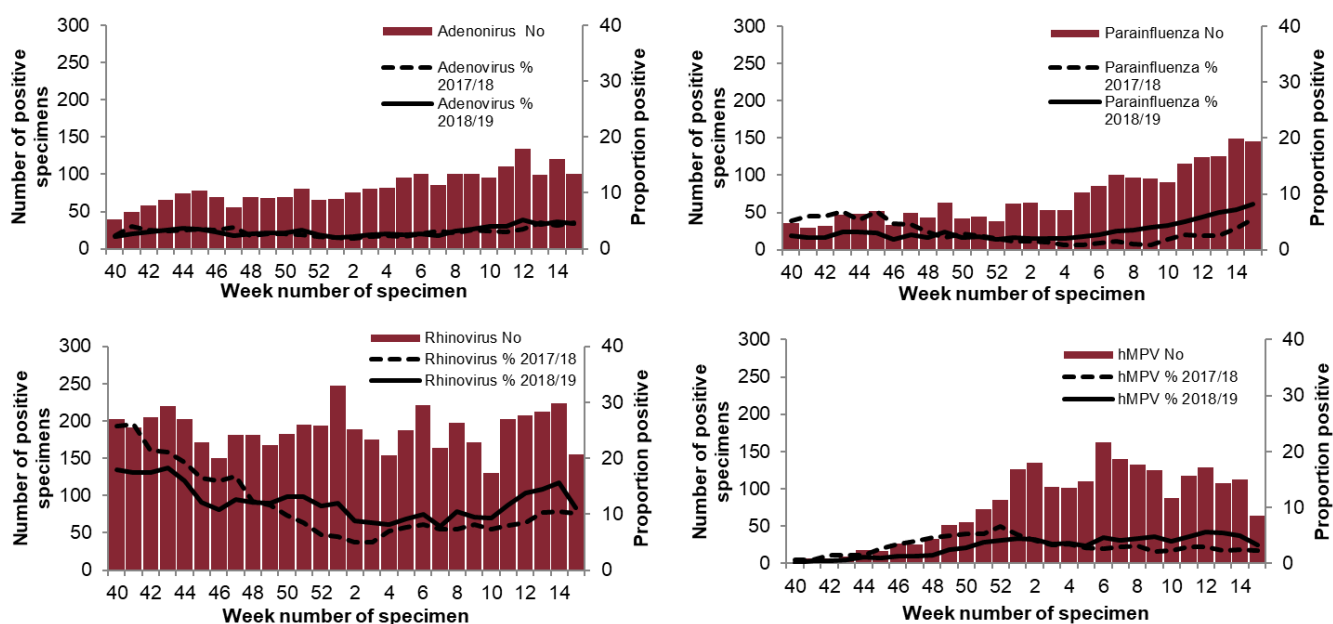


Of the other respiratory viruses monitored through the respiratory DataMart system, the highest activity was seen with rhinovirus at the beginning of the season but activity was slightly lower during the winter months when influenza was starting to circulate before increasing from week 11 2019.

Parainfluenza activity remained at a stable low level during the winter months, activity started to increase from week 06 2019 similar to rhinovirus was low during the months when influenza was circulating. Human metopneumovirus (hMPV) activity slowly increased around week 44 2018 to week 51 2018 where levels remained stable until week 06 2019 when a further slow increase in percent positivity was observed. Consistent with previous seasons, low levels of adenovirus were observed throughout the season with no clear seasonality seen (Figure 35).

¹⁶ WHO RSV surveillance. www.who.int/influenza/rsv/en

Figure 35. Weekly number of positive samples and proportion positive for other respiratory viruses, 2017-2019



In Scotland, the pattern of non-influenza respiratory pathogens detected through non-sentinel sources (ECOSS) for 2018 to 2019 season (up to week 15 2019), was similar to that seen in the previous 2 seasons (2016 to 2017 and 2017 to 2018). Rhinovirus was the most commonly detected non-influenza pathogen (4,491 detections, 34.0% positive samples) followed by RSV (3,603 detections, 27.3% positive samples), adenovirus (1,645 detections, 12.5% positive samples) and coronavirus (1,469 detections, 11.1% positive samples). The other non-influenza pathogens (parainfluenza, hMPV and *Mycoplasma pneumoniae*) were detected in a lower proportion of positive samples (6.9%, 7.5% and 0.6%, respectively).

In Wales, 10,391 hospital and non-sentinel GP samples were routinely tested for: influenza, RSV, adenovirus, *Mycoplasma pneumoniae*, rhinovirus, parainfluenza, enterovirus and hMPV. An additional 1,292 samples were tested only for influenza and RSV (using a rapid test system). The 2 most commonly detected non-influenza respiratory pathogens were rhinovirus (1,607 detections, 15.5% positive samples) and RSV (666/11,863 detections, 5.7%, positive samples). Other detected causes of respiratory infection included: human metapneumovirus (4.0%), enterovirus (3.9%), parainfluenza (3.9%), adenovirus (3.6%) and *Mycoplasma pneumoniae* (0.4%).

Excess all-cause mortality surveillance

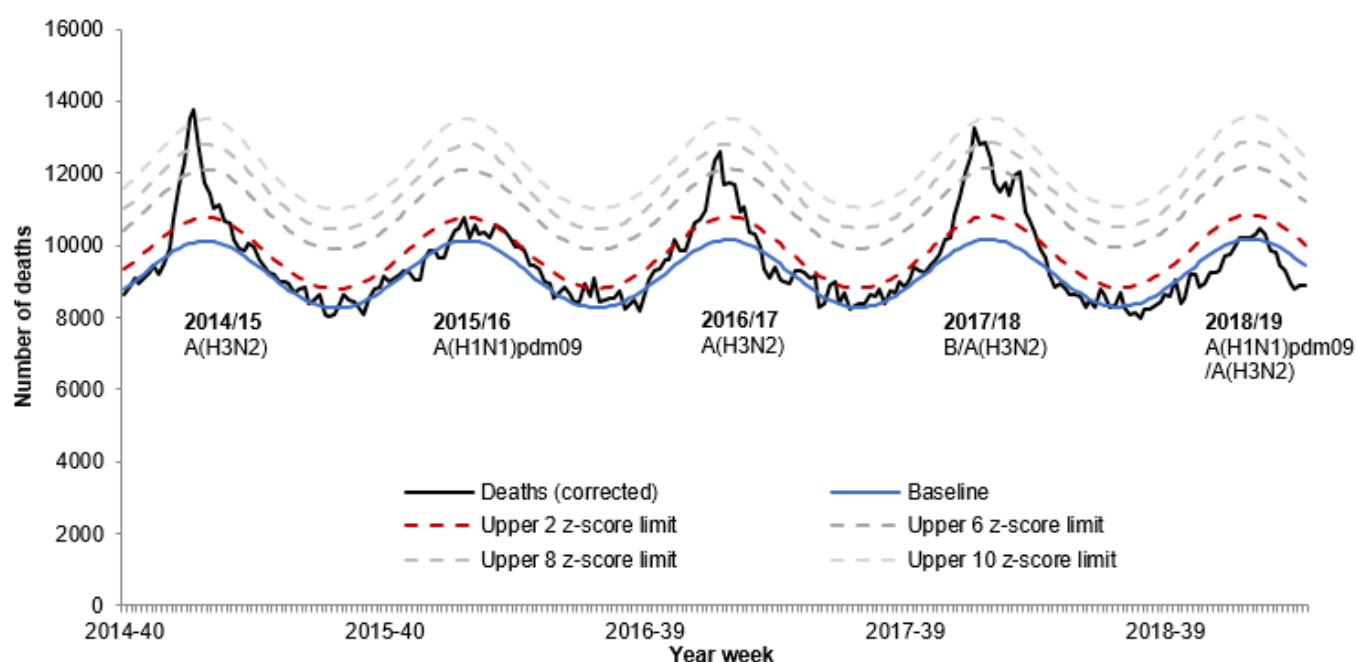
Excess mortality is defined as a significant number of deaths reported over that expected for a given point in the year based on historical patterns, allowing for weekly variation in the number of deaths.

The UK uses the European monitoring of excess mortality (EuroMOMO) algorithm to estimate weekly all-cause excess mortality¹⁷. This algorithm allows for direct comparison between excess mortality estimates in the countries of the UK.

The number of deaths by date of death is corrected by reporting delay and excess determined by week of death, avoiding the impact of bank holidays.

During 2018 to 2019, up to week 15 2019, no significant excess mortality was seen in England in all ages, with the total number of observed deaths much lower than observed since 2015 to 2016, the last season where A(H1N1)pdm09 was the dominant subtype (Figure 36). Significant excess was seen the 5-14 year olds in week 45 2018 and in week 3 2019 (Table 6).

Figure 36. Weekly observed and expected number of all-age all-cause deaths, with the dominant circulating strain type(s) , England, 2014 to 2019



Across the devolved administrations of the UK, modelled estimates using the EuroMOMO model showed significant excess in all ages for Scotland and Northern Ireland. By age group, excess was seen in the 5-14 year olds across all countries with the exception of Wales (Table 6).

¹⁷ EuroMOMO. www.euromomo.eu

Table 6. Weeks with excess mortality observed in 2018 to 2019 (up to week 15) in the UK

Age group (years)	Weeks with excess in 2018 to 2019			
	England	Wales	Scotland	Northern Ireland
<i>All ages</i>	-	-	52-2	6; 11
<5	-	-	-	49
5-14	45; 3	-	50	48; 8
15-64	-	8	52-1	-
65+	-	-	52; 2	6; 11

Paediatric mortality

Fatal case reports from local health protection teams and the Office for National Statistics (ONS) were received for influenza-related deaths in children in England.

Provisional data shows that during the 2018 to 2019 winter influenza season between 1 October 2018 and up to 18 April 2019, 13 influenza-related fatal cases were reported in children aged between 0 to 17 years. There were 7 female and 6 male cases. 12 of the 13 cases had influenza A infection (including 7 influenza A(H1N1)pdm09 and 5 influenza A(not subtyped)) and the remaining case had influenza infection (no type/subtype information available) recorded as part of their cause of death.

Information available shows that underlying medical conditions were reported from 10 of the 13 cases. Information on influenza vaccination history during the 2018 to 2019 season were available from 5 out of the 13 fatal cases with 4 cases not having had the influenza vaccine.

Influenza-attributable deaths

The FluMOMO model is an extension of the EuroMOMO algorithm which aims to estimate the excess number of deaths associated with influenza activity, adjusting for extreme temperature¹⁸. Similar to the EuroMOMO model, it is a standardised model which can be applied across countries and has been used previously in England to estimate such deaths¹⁹.

Figure 37 represents the weekly number of all-age deaths and attribution to influenza and extreme temperature. Though there was no statistically significant excess mortality observed through the EuroMOMO algorithm, the majority of the mortality seen in 2018

¹⁸ FluMOMO. www.euromomo.eu/methods/flumomo.html

¹⁹ Pebody RG, Green HK, Warburton F, Sinnathamby M, Ellis J, Mølbak K, Nielsen J, de Lusignan S, Andrews N (2018). Significant spike in excess mortality in England in winter 2014/15 – influenza the likely culprit. *Epidemiology and Infection* 1–8. <https://doi.org/10.1017/S0950268818001152>

to 2019 above baseline appears to be associated with influenza infection (Figure 37 and Table 7).

Figure 37. Weekly number of all-age deaths and attribution to influenza (red line) and extreme temperature (green line), England, 2014 to 2019 (up to week 15)

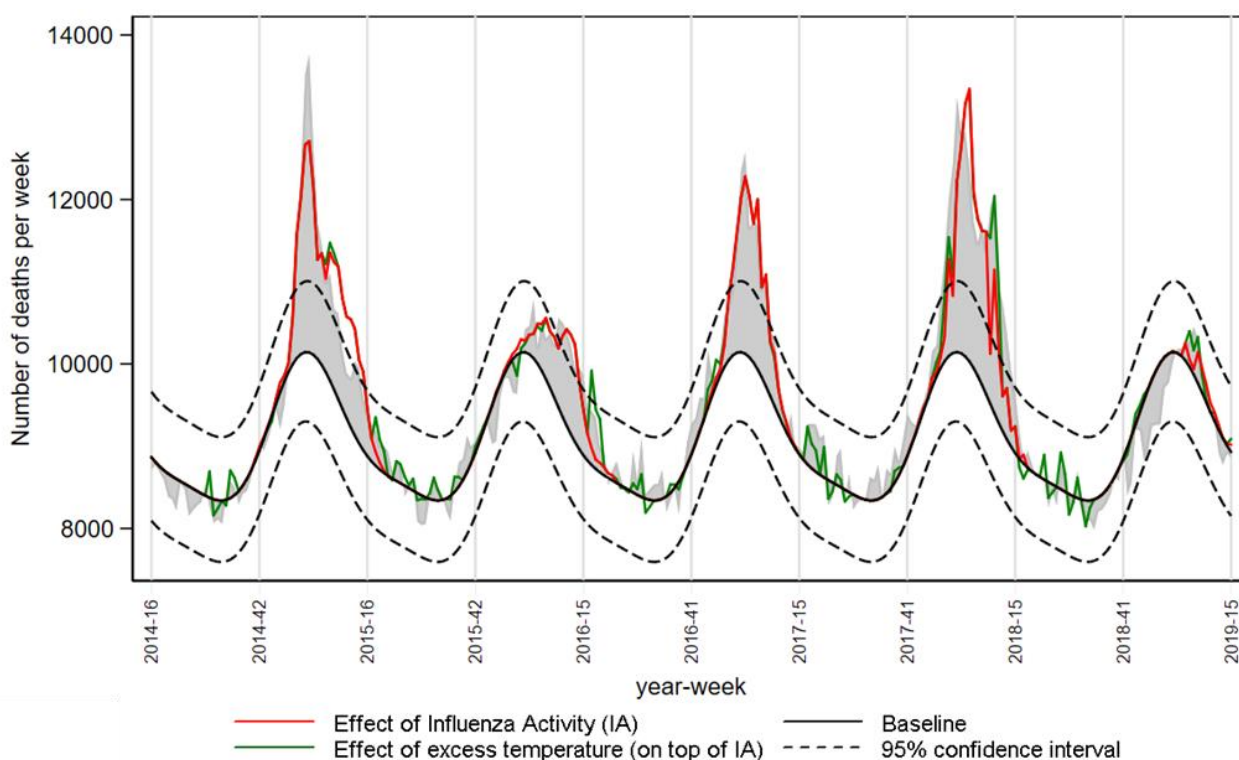


Table 7. Number of deaths associated with influenza observed through the FluMOMO algorithm with confidence intervals, England, 2014 to 2015 season to 2018 to 2019 (up to week 15)

Season	All ages	0-4 years	5-14 years	15-64 years	65+ years
2014/15	28,330 (27,462 to 29,208)	91 (79 to 104)	13 (9 to 18)	701 (635 to 769)	25,143 (24,368 to 25,926)
2015/16	11,875 (11,237 to 12,524)	84 (72 to 96)	11 (6 to 16)	1,259 (1,178 to 1,342)	9,459 (8,941 to 9,987)
2016/17	18,009 (17,260 to 18,768)	77 (66 to 89)	20 (14 to 26)	578 (519 to 639)	15,167 (14,546 to 15,798)
2017/18	26,408 (17,260 to 18,768)	6 (3 to 10)	2 (0 to 5)	1,462 (1,373 to 1,553)	22,237 (21,482 to 23,000)
2018/19*	1,692 (1,352 to 2,056)	3 (0 to 7)	10 (6 to 15)	192 (147 to 241)	914 (666 to 1,186)

*data up to week 15 2019

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 2,399 laboratory confirmed cases have been reported globally up to 24 April 2019 in 27 countries. This includes at least 827 fatal cases (case fatality ratio of 34.4%). 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 several countries including the UK, France, Tunisia and the Republic of Korea.

MERS-CoV infection was originally confirmed in 4 cases with 2 imported cases to the UK detected in September 2012 and January 2013, respectively. The 2 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 meet the suspect case definition. One positive case has been reported in the UK since February 2013, the imported case was confirmed to have MERS-CoV infection in 23 August 2018. No onward transmission was detected amongst their close contacts. This brings the total number of positive cases seen in the UK to 5. Since the start of the MERS-CoV global outbreak up to 01 May 2019, 1,502 suspected cases amongst returning travellers have been identified in the UK and tested negative for MERS-CoV. However, in April and May 2014, 2 laboratory confirmed cases transited through London Heathrow Airport on separate flights to the USA. Contact tracing of flight contacts did not identify any further cases.

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 low²⁰. For further PHE information on management and guidance of possible cases, please see information online²¹.

²⁰ www.gov.uk/government/publications/mers-cov-risk-assessment

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

Human influenza A(H7N9) infections

Since the first 3 human infections with avian influenza A(H7N9) were reported in China through WHO in April 2013 ²², up to 09 April 2019, 1,568 cases have been reported, including at least 615 deaths giving an overall case fatality ratio of 39.2%. Only 1 human case of influenza A(H7N9) has occurred since October 2018.

For further updates, please see the WHO website ²³ and for PHE advice on clinical management, please see information available online ²⁴.

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

Since 2003, 860 cases of avian influenza A(H5N1) have been reported including 454 deaths, giving an overall case fatality rate of 53%. Cases have been reported from 16 countries. From 01 January 2018 to 09 April 2019, no further cases have been reported.

As of 09 April 2019, a total of 22 human influenza A(H5N6) cases have been reported since February 2014.

Most human cases of avian influenza were exposed to H5 and H7 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 H5N1 and H7N9 virus infections have been reported including those involving healthcare workers, current epidemiological and virological evidence suggests that these viruses have not acquired the ability to undergo sustained transmission amongst humans. It is important to ensure that imported cases of suspect avian influenza are detected promptly to ensure public health measures including infection control can be rapidly put in place to minimise any risk of onward transmission ²⁵.

²² www.who.int/csr/don/2013_04_01/en/

²³ www.who.int/influenza/human_animal_interface/influenza_h7n9/en/

²⁴ www.gov.uk/government/collections/avian-influenza-guidance-data-and-analysis

²⁵ www.who.int/influenza/human_animal_interface/Influenza_Summary_IRA_HA_interface_09_04_2019.pdf?ua=1

Conclusions

Low to moderate levels of influenza activity were seen in the community in the UK in 2018 to 2019, with influenza A(H1N1)pdm09 being the predominant virus circulating throughout the season followed by influenza A(H3N2). The health impact was predominantly seen in younger age groups, with increased numbers of GP ILI consultations, hospitalisations and ICU/HDU admissions seen particularly in the 15-44 and 45-64 year olds. Little excess mortality was seen, except in the 5-14 year olds. The activity in general practice varied across the UK (low peak activity in England, Scotland and Northern Ireland but medium in Wales). All countries experienced, a high impact of influenza on the health service, with the peak admissions of influenza to both hospital and ICU/HDU similar or higher than those observed in the past 7 seasons since the scheme has been operating.

The 2018 to 2019 season saw the introduction of the new adjuvanted influenza vaccine for those aged 65 years and over. Influenza vaccine uptake in 2018 to 2019 varied across the UK. In England, the uptake rates were slightly lower than the previous season in those aged 6 months to under 65 years of age with 1 or more underlying clinical risk factors, 65+ year olds and pregnant women, but was higher than last season for healthcare workers. In Scotland, the uptake in those aged 6 months to under 65 years of age with 1 or more underlying clinical risk factors, healthcare workers and pregnant woman was lower than the previous season, however uptake for the 65+ year olds remained the same. In Wales, uptake in these targeted groups were slightly lower than the previous season with the exception of pregnant women. In Northern Ireland, uptake in the target groups were slightly lower than the previous season with the exception of the uptake in healthcare workers which was higher. Provisional vaccine effectiveness for adults – including the elderly were encouraging in 2018 to 2019, including for the new aTIV vaccine.

Roll out continues of the childhood LAIV programme across the UK which was first implemented in 2013 to 2014 and, is now in its sixth season. The programme targeted 2 to 3 year olds in primary care and all children of school year reception, 1, 2, 3, 4 and 5 age across the UK. Uptake levels varied by country with an increase observed in England and among school children in Wales. Provisional vaccine effectiveness of LAIV in children aged 2-17 years of age demonstrated significant effectiveness this season. Northern Ireland uptake was lower than the previous season as was primary care delivery in Scotland and Wales. 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 2 which were first identified 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. Indeed a case of imported MERS-CoV was reported in the UK in August 2018, though fortunately with no onward transmission.

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Appendix A

Appendix A: LAIV Pilot Areas by Local Authority

NHS Local Team (Pilot Area)	Local Authority
Leicestershire and Lincolnshire	Leicester
	Rutland
	Leicestershire
Cumbria, Northumberland, Tyne and Wear	South Tyneside
	Sunderland
	Gateshead
East of England	Essex
	Southend-on-Sea
	Thurrock
Greater Manchester	Bury
London	Havering