



Public Health
England

Surveillance of influenza and other respiratory viruses, including novel respiratory viruses, in the United Kingdom: Winter 2012/13

About Public Health England

We work with national and local government, industry and the NHS to protect and improve the nation's health and support healthier choices. We address inequalities by focusing on removing barriers to good health.

We were established on 1 April 2013 to bring together public health specialists from more than 70 organisations into a single public health service.

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Executive summary

Although influenza activity in the UK rose to only low levels in the 2012/13 season, activity was prolonged and reached levels higher than those seen in 2011/12. A mix of influenza viruses meant both children and adults were affected; the season was initially marked by outbreaks reported in schools when influenza B was predominantly circulating, but after Christmas, outbreaks were mainly reported among the elderly in care homes, when influenza A(H3N2) circulation dominated. This unusual pattern of influenza B circulating prior to influenza A(H3N2) in England was also seen in Northern Ireland and Wales but not in Scotland. Although influenza A(H1N1)pdm09 comprised a low proportion of influenza positive specimens, it continued to circulate at higher levels than seen in 2011/12. An increase in influenza severity was seen relative to 2011/12 with a higher number of hospitalisations and ICU admissions. Cumulative excess all-cause mortality was high in the elderly, with the highest levels seen since 2008/09.

Activity from other circulating respiratory viruses was similar to levels reported in 2011/12. Two novel respiratory viruses emerged in 2012/13, Middle East Respiratory Syndrome coronavirus (MERS-CoV) in the Middle East and avian-origin influenza A(H7N9) in Eastern China. Both have high reported case fatality ratios, with the source of both viruses yet to be established. Four cases of MERS-CoV infection were identified in the UK but there have been no cases of influenza A(H7N9) infection. Surveillance procedures established in the UK for travellers returning with severe disease are on-going while the risk remains.

Background

Surveillance of influenza and other respiratory viruses in the United Kingdom (UK) is undertaken throughout the year by Public Health England (PHE) and collated by the Respiratory Diseases Department (RDD) of the PHE Centre for Infectious Disease Surveillance and Control, with regular outputs published during the winter season between October (week 40) and May (week 20) when influenza typically circulates. A variety of data sources are collated to provide information on circulating influenza strains, timing of influenza activity and to provide estimates of burden within the community, in hospitals and on mortality, as well as monitoring of vaccine uptake and effectiveness. Background information on the data sources covered in this report have previously been described elsewhere.¹ In 2011/12, the monitoring of influenza confirmed hospitalisations and intensive care admissions across the UK through the USISS sentinel and USISS mandatory severe disease surveillance schemes respectively were routinely reported for the first time. These schemes were continued in 2012/13. Also in 2011/12, standard EuroMOMO excess death calculations were routinely reported for the first time in England and Wales. In 2012/13, this has been expanded to all countries in the UK, allowing for the first time standardised reporting of all-cause all age excess mortality. As well as influenza and typical circulating respiratory viruses, PHE carries out surveillance for novel respiratory viruses with two emerging this season: novel coronavirus in the Middle East and influenza A(H7N9) in Eastern China. This report describes influenza activity experienced in the UK in the 2012/13 season from week 40 2012 (w/c 01/10/2012) to week 20 2013 (w/c 13/05/2013), activity of other typical circulating respiratory viruses and commentary on UK surveillance work undertaken for novel respiratory viruses.

¹Health Protection Agency. Surveillance of influenza and other respiratory viruses in the UK: 2011-2012 report. Available from http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1317134705939

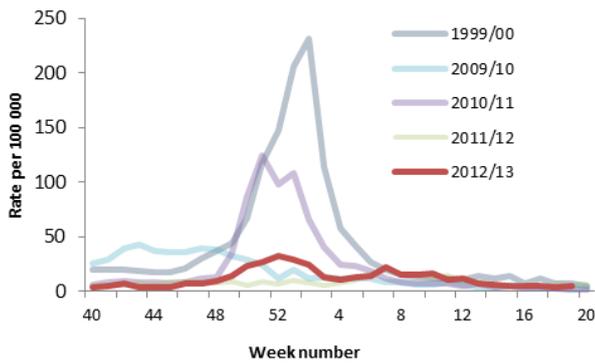
Observations

INFLUENZA

General Practitioner consultations

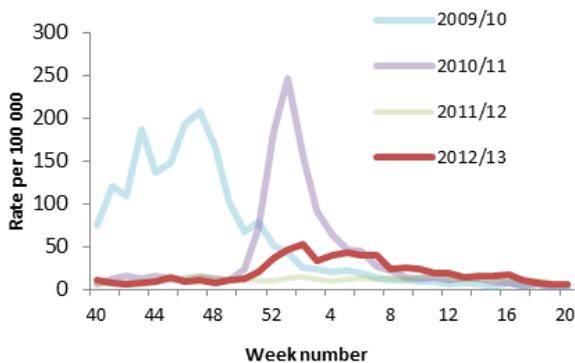
Weekly rates of General Practitioner (GP) consultations for influenza-like illness (ILI) through the Royal College of General Practitioners (RCGP) scheme were low in England during 2012/13 (Figure 1), although activity peaked at higher levels than seen in 2011/12 (20.2 per 100,000 in week 7 2012). A peak of 30.1 per 100,000 was seen in week 52 2012, with the highest rate seen in 1-4 year-olds (58.0 per 100,000). This was followed by a second period of elevated activity in February/March 2013, although this only peaked at 21.4 per 100,000 in week 7 2013 with the highest rate seen in 25-44 year-olds (30.2 per 100,000 in week 7 2013).

Figure 1. Weekly all age GP influenza-like illness rates for 2012/13 and past seasons, England and Wales (RCGP)



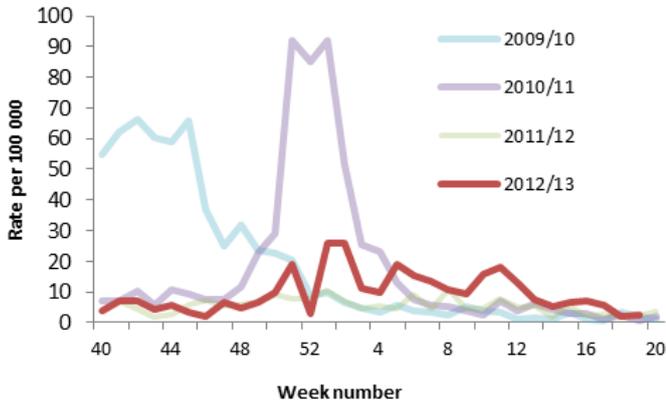
Similarly across the devolved administrations, reported ILI rates in 2012/13 were higher than in 2011/12. In Scotland ILI rates peaked at 52.1 per 100,000 in week 2 2013 (Figure 2) with a second peak of 43.8 per 100,000 in week 5 2013 (compared to a peak of 18.1 per 100,000 in week 11 2012). The highest rate by age group was seen during both peaks in 45-64 year-olds (68.4 per 100,000 in week 2 and 53.4 per 100,000 in week 6 2013).

Figure 2. Weekly all age GP influenza-like illness rates for 2012/13 and past seasons, Scotland



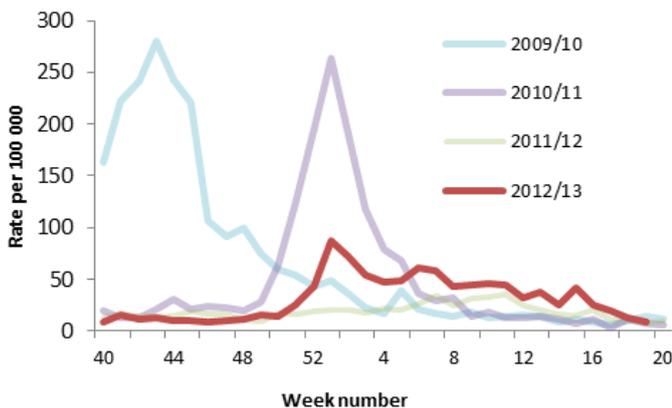
In Wales, due to activity coinciding with the Christmas/New Year period when practices were not open all week, a less clear peak was seen (Figure 3) with ILI rates reaching a maximum of 26.0 per 100,000 in week 2 2013 (compared to a peak of 10.9 per 100,000 in week 8 2012) with the highest rate reported in 45-64 year-olds (37.0 per 100,000).

Figure 3. Weekly all age GP influenza-like illness rates for 2012/13 and past seasons, Wales



In Northern Ireland, ILI rates peaked at 87.0 per 100,000 in week 1 2013 (Figure 4) and remained elevated, but below baseline thresholds, for several months (compared to a peak of 36.3 per 100,000 in week 11 2012). By age group, the highest rates occurred in week 1 2013 in the 45-64 year-olds (131.6 per 100,000), in week 6 2013 in 5-14 year-olds (110.5 per 100,000) with later activity predominantly in older adults (peak of 108.0 per 100,000 in week 13 in 75+ year-olds).

Figure 4. Weekly all age GP influenza-like illness rates for 2012/13 and past seasons, Northern Ireland



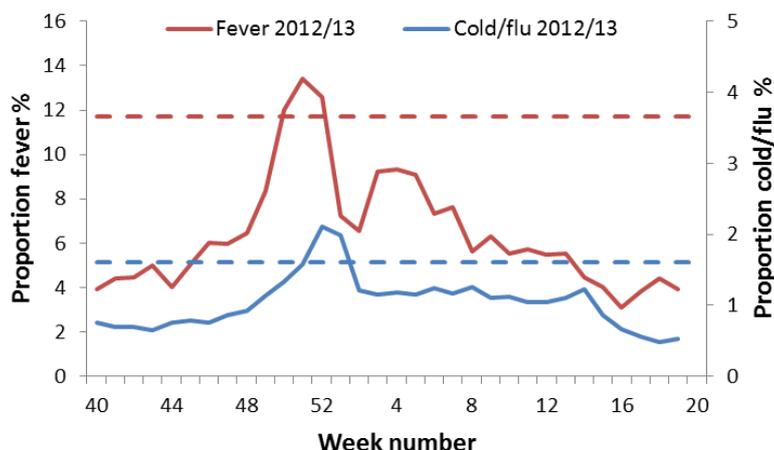
HPA\QSurveillance ILI rates, covering England, Northern Ireland and Wales, showed a similar level of activity to that seen through RCGP, peaking at 27.0 per 100,000 one week later in week 1 2013. By age group, activity initially peaked in 5-14 year-olds (33.5 per 100,000 in week 51 2012) and the peak in week 1 was driven by activity in adults, with the highest peak seen in 45-64 year-olds (39.4 per 100,000). Due to the current transition from the existing 'HPA & Nottingham University Division of Primary Care Collaborative National Surveillance System' to a new PHE GP in-hours surveillance system (which started daily data monitoring on April 1)

there is no data update available for week 14 2013 onwards for HPA/QSurveillance. Future seasons will report observations through the new PHE GP in-hours surveillance system.

Syndromic surveillance

In England and Wales, the national proportion of NHS Direct cold/flu calls for all ages exceeded the baseline threshold of 1.6% in week 52 2012 when it peaked at 2.1% (Figure 5), decreasing below the threshold in week 2 2013. The proportion of calls for fever in 5-14 year-olds exceeded the threshold of 11.7% slightly earlier in week 50 2012, providing an earlier warning for the start of influenza circulation. Activity peaked at 13.4% in week 51 2012 and decreased below the threshold in week 1 2013. For both indicators, levels did not re-breach thresholds for the subsequent influenza A wave and overall levels were higher than in 2011/12 but less than seen in 2010/11. Due to the on-going transition of urgent care services across England, including the introduction of NHS 111 in April 2013 to eventually replace NHS Direct, the volume of NHS Direct calls is gradually declining, particularly in those areas where NHS 111 is fully operational. Results should therefore be interpreted with caution from week 12 2013 onwards and future seasons will report observations through NHS 111.

Figure 5. Proportion of calls for fever (5-14 year-olds) and cold/flu (all ages) through NHS Direct, England and Wales, 2012/13

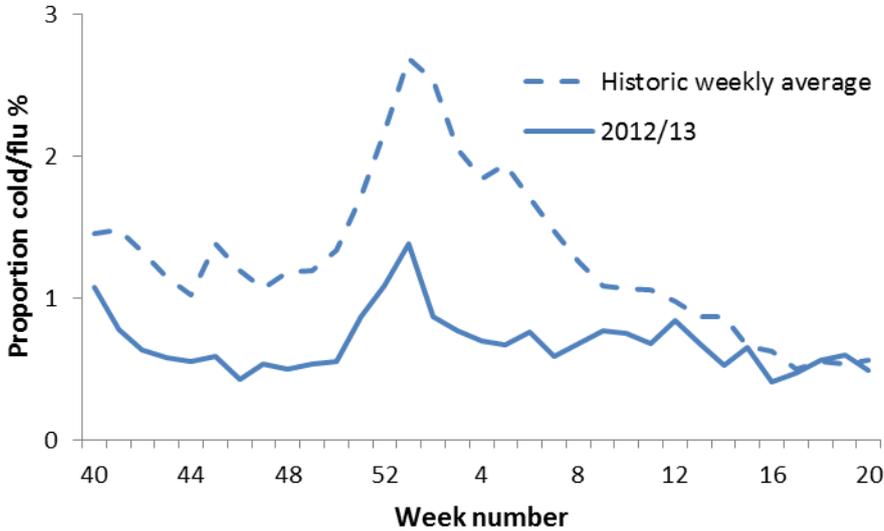


GP out of hours consultations for ILI in England peaked during week 52 2012 (daily peak on 23/6/12) at a peak of 32.8% of all out of hours consultations. Emergency department (ED) attendances for acute respiratory infection (ARI) peaked at 12.4% during week 52 2012 (daily peak on 25/12/2012). By age group, ARI ED attendances peaked in 0-4 year olds during week 48 2012, followed by a peak in the 5-14 year olds during week 52 2012 (daily peak on 25/12/2012).

In Scotland, the weekly proportion of all calls to NHS 24 that mention cold/flu was high at the beginning of the season (1.1% in week 40 2012), but consequently declined to 0.4% by week 46 (Figure 6). From week 47 the proportion started to increase again to peak in week 1 2013 at 1.4%, one week before the peak in GP consultation rates was observed. The call proportion then decreased to 0.7% in week 5 and fluctuated between 0.4% and 0.8% for the remainder of the season. The higher number of calls relating to cold and flu at the start of the season may in part have been attributable to calls relating to influenza vaccination. The proportion of cold/flu

calls for 2012/13 stayed below levels seen in the previous season (with the exception of a minor fluctuation in week 19) as shown by the historic baseline in figure xx.

Figure 6. Proportion of calls for cold/flu (all ages) through NHS 24, Scotland, 2012/13

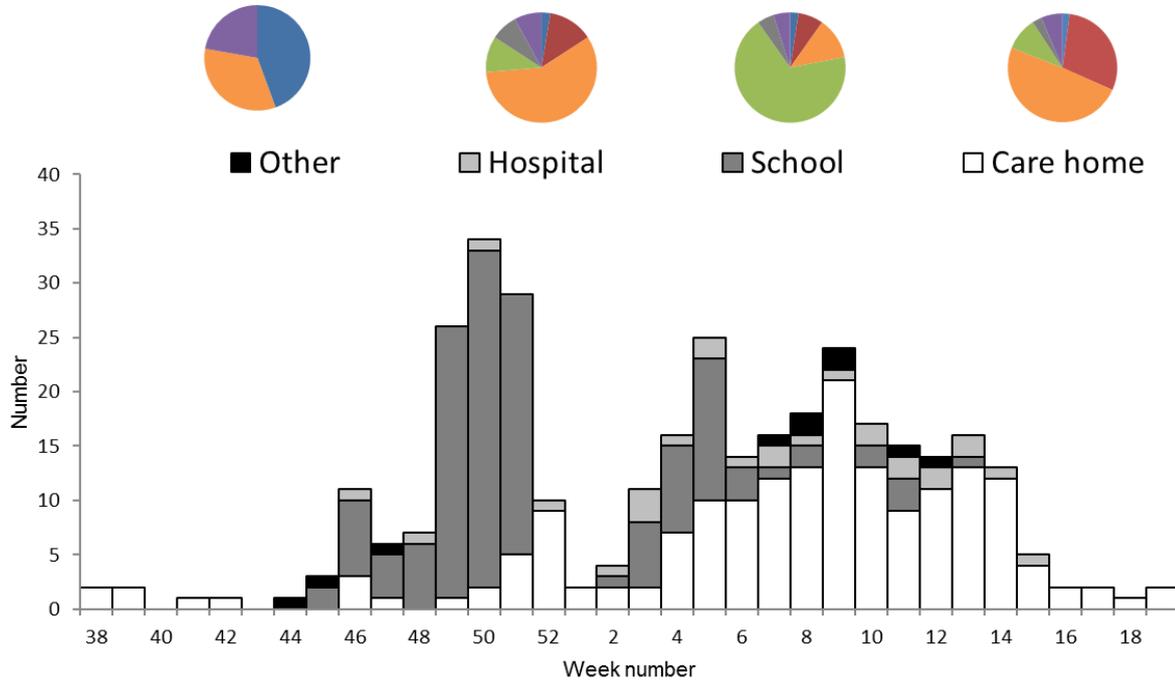


The historic baseline is based on NHS 24 data collected from October 2006 to May 2012, excluding the pandemic year 2009.

Outbreak reporting

Between week 40 2012 and week 20 2013, 460 acute respiratory outbreaks in closed settings were reported across the UK with two distinct peaks observed (Figure 7). The first peak occurred in week 50 2012 with 34 outbreaks, with the majority (91.2%) reported from schools. In 2013, an increasing number of outbreaks reported from care homes resulted in a second peak in week 9 2013 with 21 outbreaks (88% of all outbreaks in that week) and then numbers slowly decreased. Overall, 52% of outbreaks were from care home settings, followed by schools (36%), hospital (9%) and other settings (3%). Where information on virological testing was available, the majority of outbreaks in schools resulted from influenza B (73%, 60/82) while the majority in care homes resulted from influenza A (81%, 230/284). As seen in 2011/12, a number of outbreaks in care homes occurred where seasonal influenza vaccination uptake was high late in the season.

Figure 7. Weekly number of outbreaks by institution with overall virological activity where tested, UK



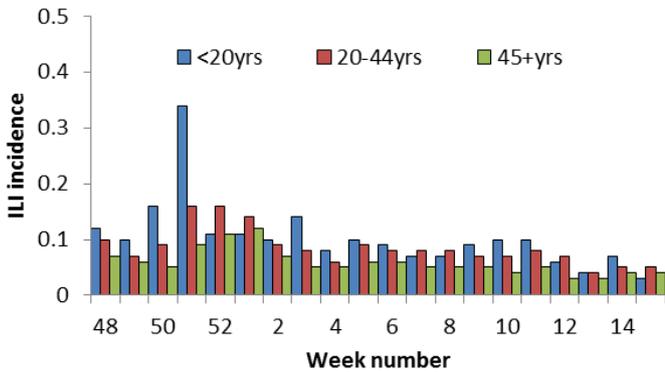
Blue= A(H1N1)pdm09
 Red = A(H3N2)
 Orange = A(unsubtyped)
 Green = influenza B
 Grey=influenza A and B
 Purple=other pathogens

Community questionnaires

As in 2011/12, a population-based two-stage telephone survey was conducted by RDD in England, Wales and Scotland before and after peak influenza activity in 2012/13 to determine self-reported ILI rates in the community. Households were recruited through quota sampling to ensure the sample was representative of the general population. Information was collected at enrolment on background demography, influenza vaccination status, chronic health conditions and household composition. A total of 1,203 participants and their households were recruited in the pre-season survey in November 2012 with 960 participants successfully re-contacted post peak activity (79.8% response rate). The cumulative clinical attack rate for the WHO ILI case definition for the 960 participants re-contacted was 5.7%. Further results will be published when available.

Flusurvey is an EU-funded project run by the London School of Hygiene & Tropical Medicine, providing internet-based surveillance of ILI in the UK population. During the 2012/13 season, the proportion of online Flusurvey participants reporting ILI peaked in week 51 2012 in under 20 year-olds (Figure 8). Evidence suggests taking public transport does not increase the likelihood of reporting ILI.

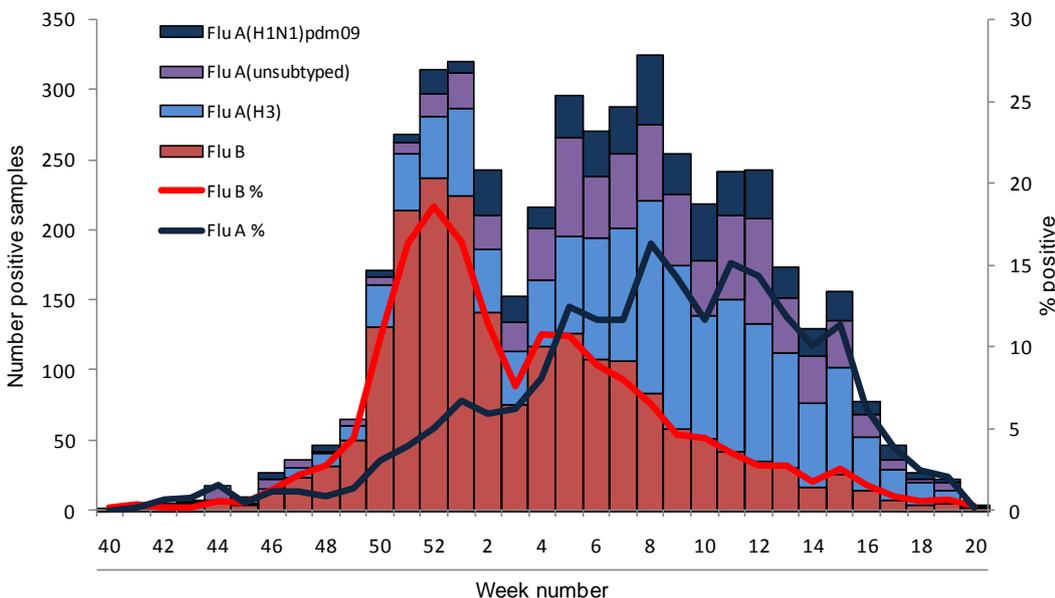
Figure 8. Proportion of Flusurvey registered participants reporting ILI by week and age group, UK, 2012/13



Virological surveillance

The proportion of reported influenza positive specimens by type and subtype tested through the Datamart surveillance scheme in England in 2012/13 confirmed observations through outbreak surveillance of two distinct virological waves (Figure 9). Influenza B was the dominant circulating virus in the first half of the 2012/13 season, peaking at 18.6% positivity in week 52 2012 and the highest activity seen in the 5-14 year group (50% in week 51 2012). Influenza A viruses (H3/unsubtyped) dominated in the second half of the 2012/13 season for a prolonged period, peaking at 16.3% positivity in week 8 2013, with the highest activity seen in 45+ year-olds (22.3% in week 8 2013). This is compared to activity in 2011/12 where a higher influenza A virus (H3/unsubtyped) positivity was reported (peak of 21.3% in week 7 2012) and little influenza B (peak positivity of 3.0% in week 15 2012). Low levels of influenza A(H1N1)pdm09 were co-circulating this season, peaking at 4.1% in week 8 2013, although activity was higher than in 2011/12 when very little A(H1N1)pdm09 circulated (0.7% overall positivity). Overall proportion of samples positive by subtype were as follows: 42.5% B and 57.5% A (31.0% A(H3N2), 16.2% A(unsubtyped) and 10.3% A(H1N1)pdm09).

Figure 9. Weekly number of all age influenza positive samples by subtype through the Datamart system and proportion positive by influenza type, England



Activity through GP-based sentinel swabbing schemes in England and Wales had a higher proportion of samples influenza B positive (60.9%) relative to influenza A (39.1%, 12.4% A(H1N1)pdm09 and 26.7% A(H3N2)) when compared to Datamart. Overall influenza positivity in England and Wales (peak of 56.6% in week 52 2012) was similar to overall positivity seen in Scotland (peak of 54.3% in week 1 2013), with positivity remaining above 30% until week 13 and 15 respectively. However, activity by subtype varied across the season (Figure 10). While England and Wales initially had just over a quarter of samples positive for influenza A, Scotland had just under a half dominated by influenza A(H3N2) up to week 4 2013. From week 5 onwards, in England and Wales the proportion of A(H1N1)pdm09 and A(H3N2) increased, while in Scotland the proportion of B increased. Swab B positivity in Scotland only dropped below 10% for two consecutive weeks in weeks 17 and 18 compared to 16 and 17 for influenza A swab positivity. Overall positivity across the season was similar between Scotland and England and Wales.

Activity through schemes coordinated in Wales and Northern Ireland was similar up to week 4 2013, with the majority of samples positive for influenza B. From week 5 2013 onwards, the proportion of samples positive for influenza A increased in both schemes, with overall influenza A positivity similar to that seen in England. Northern Ireland had a slightly higher proportion of A(H3N2) but this was not significantly different to that seen in the other countries ($p>0.05$).

Figure 10. Proportion of influenza positive sentinel virology samples during the first part of the season (weeks 40-4), the second part of the season (weeks 5-20) and overall (weeks 40-20) by influenza subtype for each scheme, UK



*Scotland additionally had 12 influenza A samples not subtyped

Green=Flu B

Blue = A(H1N1)pdm09

Red = A(H3N2)

Through non-sentinel sources in Scotland (ECOSS), influenza A swab positivity peaked in the first part of the season with 17.9% in week 52, and continued with a prolonged tail, with positivity fluctuating between 6 and 9% until week 13. Influenza B positivity was lower than positivity for influenza A in the first part of the season and increased to peak in week 6 at 10.4%. Though influenza B swab positivity through non-sentinel sources remained overall lower than that detected through the GP sentinel (as well as lower than influenza A activity detected through non-sentinel sources), it showed a similar pattern in time. It is of interest that the samples from non-sentinel sources are primarily derived from hospitals, which may explain the lower apparent influenza B activity detected through these samples.

Virus characterisation

During the 2012/13 season, the PHE Respiratory Virus Unit (RVU) has isolated and antigenically characterised 335 influenza A(H3N2) viruses, all similar to the A/Victoria/361/2011 H3N2 vaccine strain, and 88 influenza A(H1N1)pdm09 viruses similar to the A/California/07/2009 vaccine component. Of 398 influenza B viruses isolated, 92% belong to the B-Yamagata lineage, and are antigenically related to the influenza B vaccine strain, B/Wisconsin/1/2010, and 8% belong to the B-Victoria lineage. Globally as reported by WHO, the majority of influenza A viruses characterised during 2012/13 have been antigenically related to those contained in the trivalent vaccine. Among the B viruses characterised globally, 10-30% of reported B viruses were of the Victoria lineage. The remainder were of the Yamagata lineage which were antigenically related to the vaccine recommended component.

During the 2012/13 season the West of Scotland Specialist Virology Centre (WoSSVC) sequenced 128 Influenza A(H3N2) viruses. All fell within genetic group A/Victoria/208/2009, mainly into clade 3C (76%), and 21 influenza A(H1N1)pdm09 viruses, the majority (91%) of which fell into group 6 (e.g. A/St Petersburg/27/2011). Subtyping was performed for 731 influenza B samples, 78% of which were subtyped as Yamagata lineage and 22% as Victoria lineage. All eight sequenced B/Victoria samples fell within Group 1A as represented by B/Brisbane/60/2008. All eight sequenced B/Yamagata viruses fell within group 3 as represented by B/Brisbane/3/2007 and B/Massachusetts/02/2012. Antigenic data suggest that most, but not all, group 3 viruses may be poorly protected by the vaccine.

For the 2013/14 influenza season in the northern hemisphere, WHO have published the recommended composition of influenza virus. It is recommended trivalent vaccines contain the following strains: an A/California/7/2009 (H1N1)pdm09-like virus, an A(H3N2) virus antigenically like the cell-propagated prototype virus A/Victoria/361/2011 (with a recommendation for A/Texas/50/2012) and a B/Massachusetts/2/2012-like virus (Yamagata lineage).

Antiviral resistance

Since week 40 2012, four unlinked sporadic influenza A(H1N1)pdm09 viruses have been found to be resistant to oseltamivir at RVU and regional laboratories in England; two following treatment with oseltamivir, and two from patients without any treatment history. Additionally, one influenza B virus with an I221T amino acid substitution was detected in a community specimen, without antiviral exposure. This virus exhibits reduced susceptibility to oseltamivir but retains sensitivity to zanamivir. Globally, WHO have reported only very low numbers of oseltamivir and zanamivir resistant viruses detected during the season.

Hospital surveillance of confirmed influenza cases

Through the USISS mandatory scheme, a total of 946 ICU/HDU admissions of confirmed influenza were reported across the UK from week 40 2012 to week 20 2013, including 107 (11.3%) deaths. This is both a higher number of cases and proportion of deaths among hospitalised cases than seen through the same scheme in 2011/12 when 266 admissions and 25 (9.4%) deaths were reported, although the difference was not significant ($p=0.49$). Case numbers started notably increasing from week 50 2012 and peaked twice over the season; in week 1 2013 and week 7 2013 (Figure 11). The majority of admissions were due to influenza A in the latter part of the season, with influenza B admissions decreasing from week 4 (Figure 12).

Overall, 292 (31%) admissions were reported to be due to influenza B, and 654 (69%) influenza A; 284 (30%) A(unknown subtype), 178 (19%) A(H1N1)pdm09 and 192 (20%) A(H3N2). When compared to the proportion of viruses circulating through the Datamart scheme, admissions had a significantly higher proportion of influenza A ($p=0.001$). Admissions occurred in all age groups with the largest number seen in 45+ year-olds (33% in 45-64 year-olds and 27% in 65+ year-olds). Influenza ICU/HDU deaths were reported to have been infected with influenza A(H3N2) (35), influenza B (32), influenza A(H1N1)pdm09 (26) and influenza A(unknown subtype) (14).

Figure 11. Weekly number of influenza confirmed admissions to ICU/HDU and subsequent deaths in 2012/13 and 2011/12 through the USISS mandatory scheme, UK

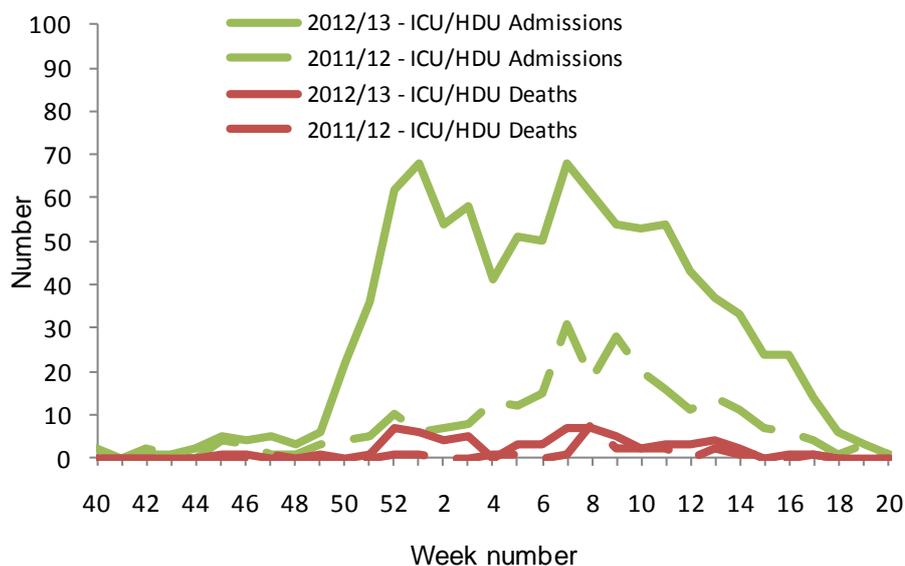
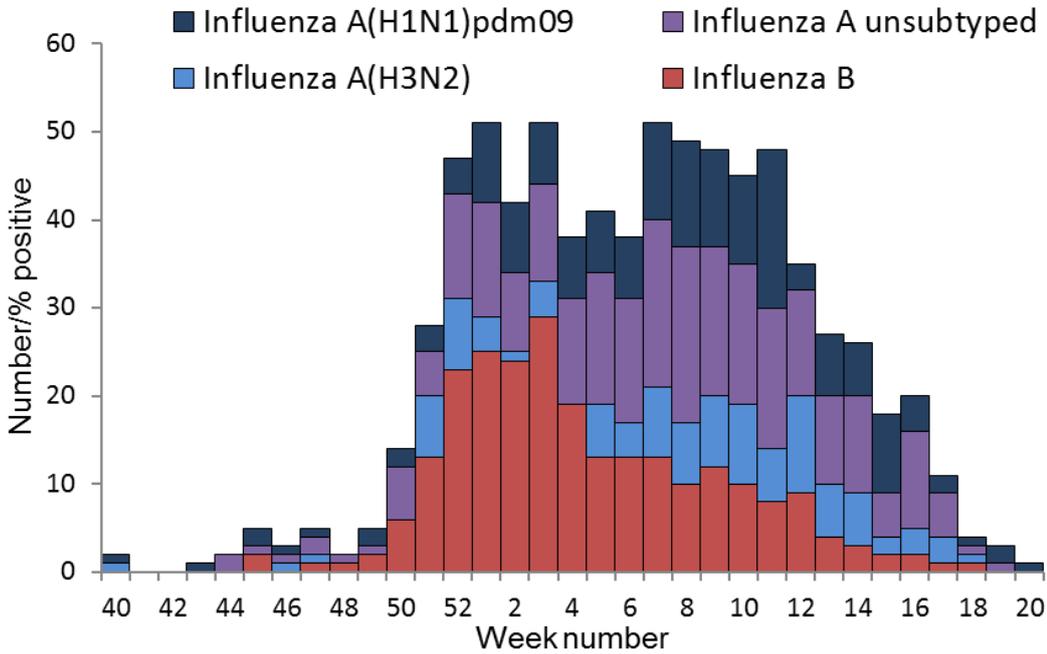


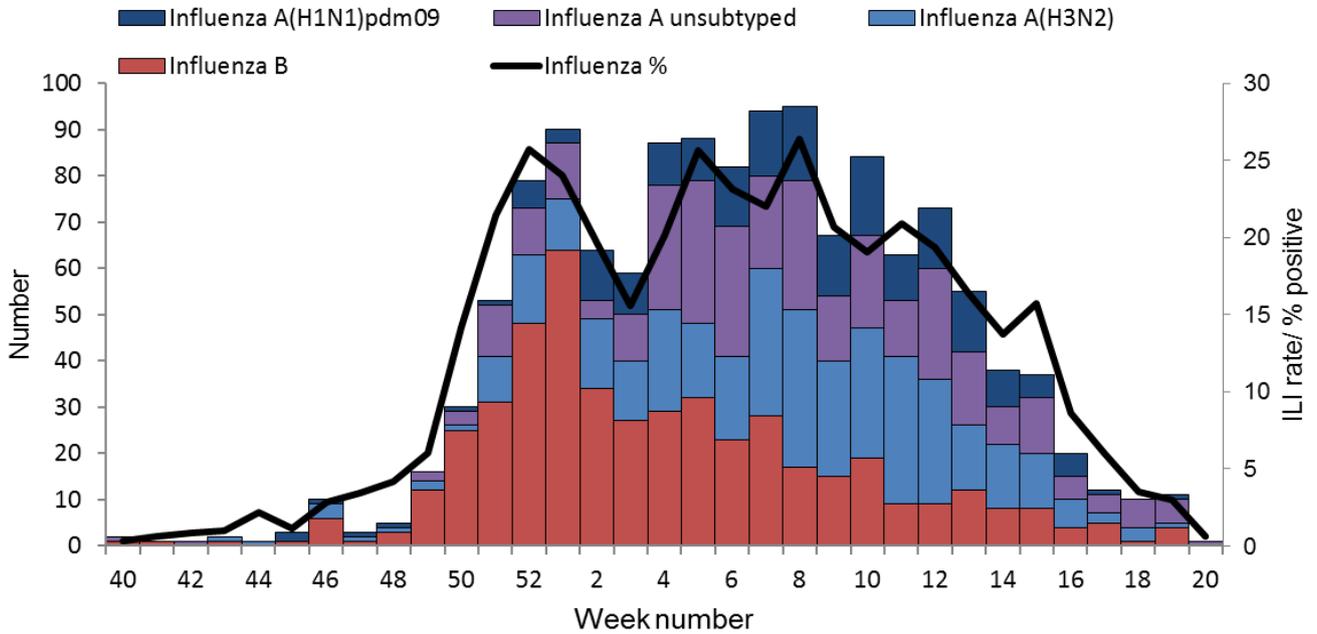
Figure 12. Weekly number of influenza confirmed admissions to ICU/HDU by influenza subtype through the USISS mandatory scheme, 2012/13, UK



In the USISS sentinel hospital surveillance scheme, a total of 1,336 hospitalised confirmed influenza cases were reported from 32 sentinel NHS acute trusts across England during 2012/13, with an average of 26/32 trusts (81%) reporting each week. Compared to ICU admissions reported through the USISS mandatory system, a slightly higher proportion of hospitalised cases were due to influenza B (36%, 479) relative to influenza A (27% (360) A(H3N2), 24% (315) A(unknown subtype) and 14% (182) A(H1N1)pdm09). Influenza B admissions peaked in week 1 2013 and influenza A(H3N2) admissions peaked in week 7 2013 (Figure 13). The weekly number of hospitalised cases followed the pattern of ILI activity through the RCGP scheme and overall influenza positivity, with activity peaking and persisting in similar weeks.

Out of the 1,341 hospitalised cases reported, 167 cases (12.5%) were treated in ICU/HDU. Of these cases, the same proportion were influenza B (52, 31%) as seen through USISS mandatory, with the remaining 40 A(H3N2) (24.0%), 41 A(H1N1)pdm09 (24.1%) and 32 A(unknown subtype) (19.2%). Twenty of these ICU/HDU cases later died, resulting in a crude case-hospital fatality ratio of 1.5% (20/1341), which was not significantly higher than seen in 2011/12 (0.8%, 4/513, p=0.33).

Figure 13. Weekly number of influenza confirmed admissions to hospital by influenza subtype through the USISS sentinel scheme in England, weekly all age ILI consultation rate through the RCGP scheme in England and Wales, and proportion of samples positive for influenza through the Datamart scheme in England, 2012/13



Seasonal influenza vaccine uptake

In England, the uptake of seasonal influenza vaccine is monitored by PHE on behalf of the Department of Health. Cumulative uptake on vaccinations administered from 99.3% of GP practices in England in 2012/13 showed vaccine uptake of 73.4% in 65+ year-olds (compared to 74.0% in 2011/12) and 51.3% for those aged six months to under 65 year-olds in one or more clinical at-risk groups (excluding pregnant women without other risk factors and carers) (compared to 51.6% in 2011/12) (Table 1). In Scotland, the uptake of seasonal influenza vaccine is estimated by Health Protection Scotland throughout the season, based on automated weekly extracts from 99% of all Scottish GP practices. Cumulative uptake in 2012/13 showed vaccine uptake of 76.5% in 65+ year-olds (compared to 76.2% in 2011/12) and 55.9% for those aged six months to under 65 year-olds in one or more clinical at-risk groups (excluding pregnant women without other risk factors and carers) (compared to 56.4% in 2011/12). In Wales, uptake in 65+ year-olds reached the same level as last year, 67.7%, and uptake in under 65 year-olds in a clinical risk group reached 49.7% (compared to 50.0% the previous season). Uptake in Northern Ireland in 65+ year-olds reached 75.0% (compared to 77.0% in 2011/12) and 80.2% in under 65 year-olds in a clinical risk group compared to 81.7% the previous season.

Uptake in all pregnant women in England reached 40.3%, considerably higher than 27.3% in 2011/12. This increase was seen across the devolved administrations (from 41.4% to 54.0% in Scotland, from 31.7% to 43.6% in Wales and from 58.4% to 64.6% in Northern Ireland).

Uptake by frontline healthcare workers in England showed 45.6% were vaccinated from 97.7% of Trusts (compared to 44.6% in 2011/12). In Scotland, uptake by healthcare workers across all

staff groups showed 33.7% were vaccinated from 86% of all territorial and special health boards (33.5% from 100% of territorial health boards) compared to a population weighted mean uptake across all health care worker staff groups of 30.4% in territorial health boards 2011/12. Uptake increased in Wales (from 30.9% to 35.5%) and was similar in Northern Ireland (from 20.8% to 20.4%).

Table 1. Seasonal influenza vaccination uptake by target group, UK, 2011/12 and 2012/13 seasons

	England		Scotland		Wales		Northern Ireland	
	2011/12	2012/13	2011/12	2012/13	2011/12	2012/13	2011/12	2012/13
65+yrs	74.0	73.4	76.2	76.5	67.7	67.7	77.0	75.0
<65yrs at risk	51.6	51.3	56.4	55.9	50.0	49.7	81.7	80.2
no risk	25.5	38.8	39.6	52.8	xxx	42.1	xxx	xxx
Pregnant at risk	50.8	59.0	60.0	68.6	xxx	59.6	xxx	xxx
all	27.3	40.3	41.4	54.0	31.7	43.6	58.4	64.6
Healthcare workers	44.6	45.6	30.4	33.7	30.9	35.5	20.8	20.4

*NB. Figures for Scotland are estimated because complete data is not available until later in the summer. Between-country comparisons should be made with caution given that different methods are used.

Seasonal influenza vaccine effectiveness

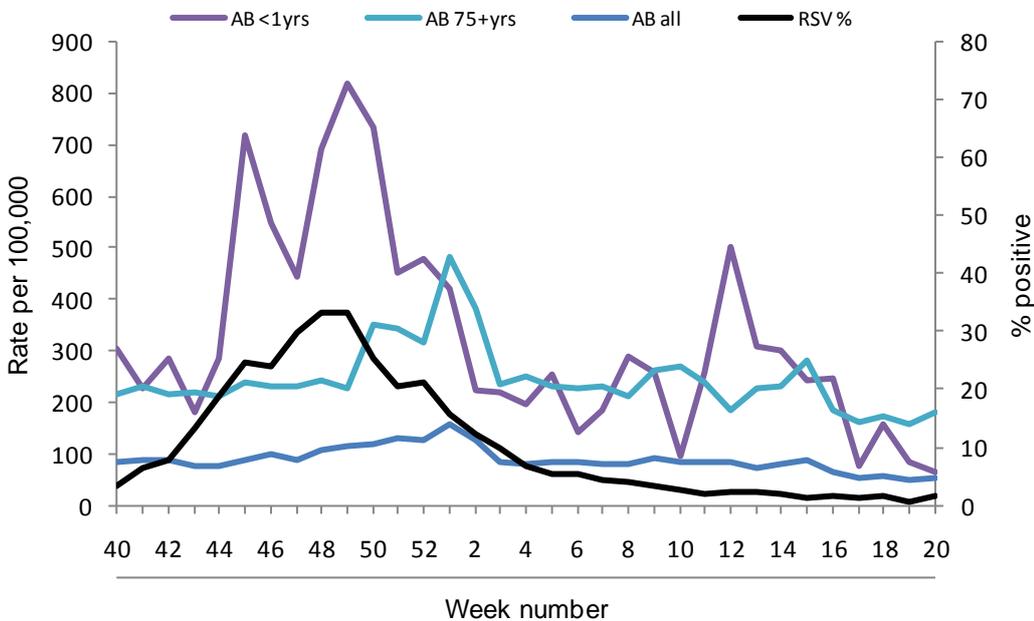
A mid-season estimate of seasonal influenza vaccine effectiveness was produced for the UK.² An overall adjusted vaccine effectiveness of 51% (95% CI 27% - 68%) was reached against all laboratory-confirmed influenza in primary care, which is within the expected range of effectiveness of a trivalent influenza vaccine. When type-specific protection was considered, this reached 52% (95% CI 27%-68%) for influenza B, and 49% (95% CI -2%-75%) for influenza A. This compares to an end of season estimate in 2011/12 for effectiveness against confirmed A(H3N2) infection of 23% (95% CI -10%-47%). An estimate for the end of the 2012/13 season is currently being prepared.

²McMenamin J, Andrews N, Robertson C, Fleming DM, Durnall H, von Wissmann B, Ellis J, Lackenby A, Cottrell S, Smyth B, Zambon M, Moore C, Watson JM, Pebody RG. Effectiveness of seasonal 2012/13 vaccine in preventing laboratory-confirmed influenza infection in primary care in the United Kingdom: mid-season analysis 2012/13. *Euro Surveill*, 2013;18(5):pii=20393.

OTHER RESPIRATORY VIRUSES

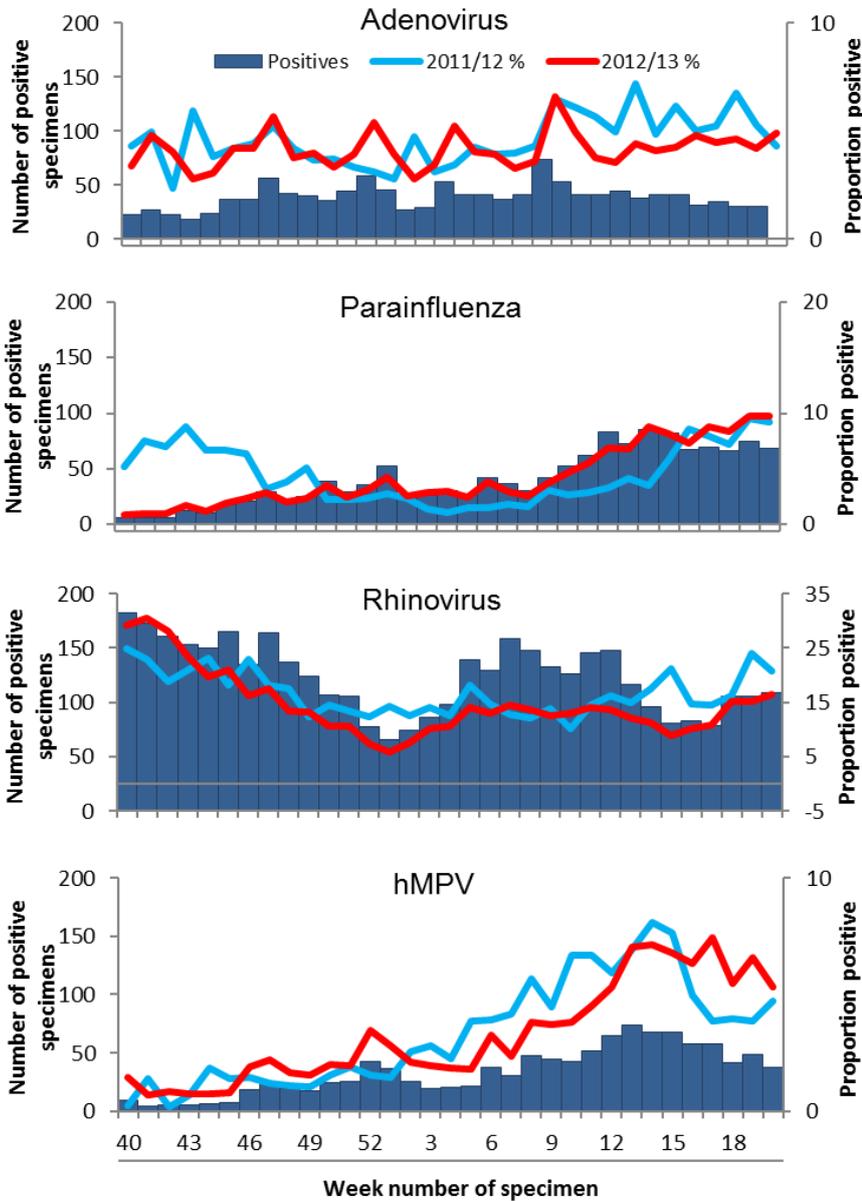
Respiratory Syncytial Virus activity (RSV) reported through Datamart peaked in week 49 2012 at 33.2% positivity, with circulation above 10% between weeks 43 2012 and 3 2013 (Figure 14). A similar peak was seen in 2011/12 of 34.5% in week 52 2012. The highest positivity was seen in children aged less than five years old, with a peak of 54.8% in the same week and the lowest peak positivity in 15-44 year-olds (11.2% in week 52 2012). This activity in young children coincided with acute bronchitis GP consultation rates and acute respiratory infection attendances in young children. GP acute bronchitis rates in under one year-olds peaked at 818.9 per 100,000 in week 49 2012 while rates in 75+ year-olds peaked at 484.4 per 100,000 in week 1 2013.

Figure 14. Weekly acute bronchitis consultation rates overall, in under one year-olds and 75+ year-olds through the RCGP scheme, England and Wales, and proportion of samples positive for RSV through the Datamart scheme, England, 2012/13



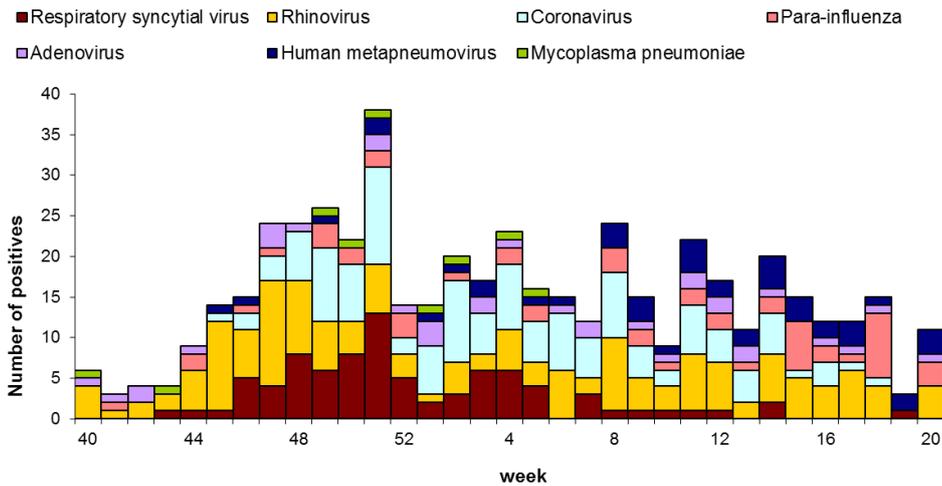
Of the other respiratory viruses monitored through Datamart, the highest activity was seen with rhinovirus (Figure 15), peaking at 30.5% in week 41 2012 and with two subsequent lower peaks in weeks 7 2013 (14.4%) and 20 2013 (16.4%). Rhinovirus activity appears to be low during the winter months and particularly when influenza is circulating. Parainfluenza detections were minimal at week 40 2012 and gradually increased during the season, peaking in week 19 2013 at 9.8% positivity; while in 2011/12 there were two peaks with positivity reaching 8.8% in week 43 2011 and 9.5% in week 19 2012. Seasonality was observed for human metapneumovirus (hMPV) infections as seen in previous seasons; positivity peaked at 7.4% at the end of the season in week 17 2013 compared to a peak of 8.1% the previous year in week 14 2012. Low levels of activity for adenovirus were observed all year round with no clear seasonality seen in 2012/13.

Figure 15. Number and proportion of samples positive for adenovirus, parainfluenza, rhinovirus and human metapneumovirus through the Datamart scheme, England, 2012/13



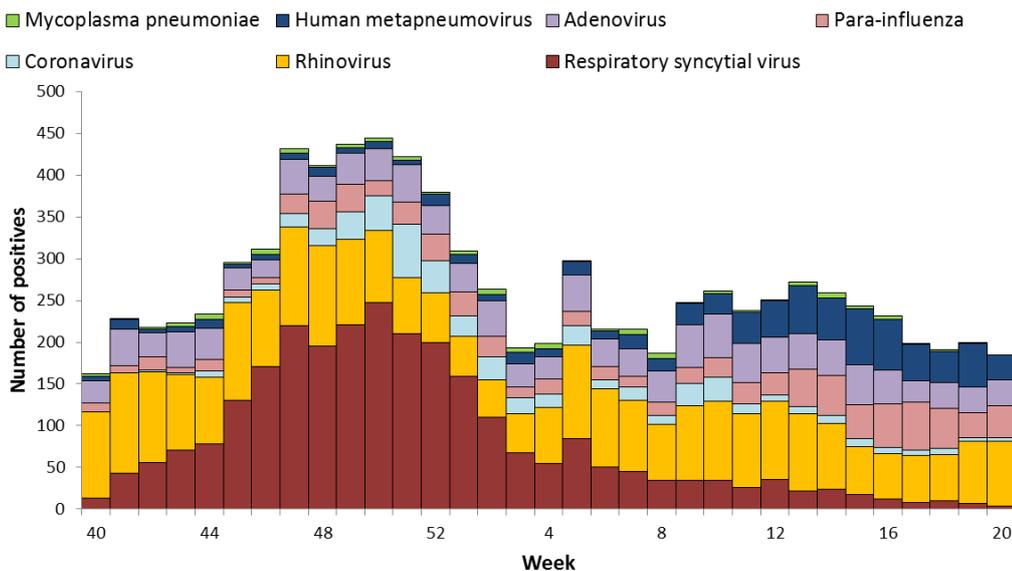
In Scotland, the most common non-influenza respiratory pathogens circulating in the 2012/13 season as detected through the GP sentinel scheme were rhinovirus (155 positive samples, 31% of non-influenza detections), seasonal coronavirus (127, 24.8%) and RSV (84, 16.4%). The peak number of RSV and seasonal coronavirus samples detected through the GP sentinel system occurred in week 51 2012 and rhinovirus activity peaked in week 47 2012 (Figure 16). Parainfluenza activity peaked later in the season in week 18 2013. Similarly, hMPV activity showed an increase towards the end of the season, although the number of samples was low. Few *Mycoplasma pneumoniae* positive samples were detected and low numbers of adenovirus were detected throughout the season.

Figure 16. Number of laboratory confirmed seasonal respiratory pathogens other than influenza submitted through sentinel sources, Scotland, 2012/13



The pattern of non-influenza respiratory pathogens detected through non-sentinel sources differed slightly to that seen in sentinel samples. RSV (2706 positive samples, 29.6% of detections) accounted for a similar proportion of total non-influenza detections as rhinovirus (2870, 31.3%). Adenovirus was detected in 13.8% (1264), whereas seasonal coronavirus only accounted for 5.8% (527) of non-sentinel pathogens detected. Both hMPV (763, 8.3%) and parainfluenza virus (897, 9.8%) also contributed significant proportions. Mycoplasma pneumoniae was only detected in a low proportion of samples. Similar to the pattern over time observed in sentinel samples, RSV and seasonal coronavirus detections peaked in week 51 2012 (Figure 17). Rhinovirus detections through non-sentinel sources peaked in week 48, with a secondary peak observed in week 5. Peaks in hMPV and parainfluenza virus detections were seen later in the season, in week 15 and 17 respectively.

Figure 17. Number of laboratory confirmed seasonal respiratory pathogens other than influenza submitted through non-sentinel sources, Scotland, 2012/13



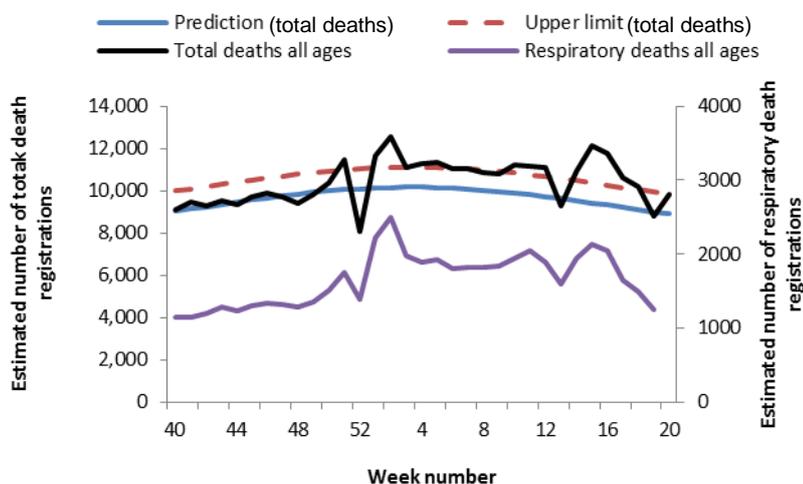
EXCESS ALL-CAUSE MORTALITY SURVEILLANCE

Mortality by week of death registration

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

The number of deaths during 2012/13 was high. Out of 32 weeks, 25 (78%) were above baseline levels and 14 (44%) were above the upper limit which allows for variation. The number of deaths notably increased above the upper limit for two periods in 2013: in weeks 1-2 and weeks 15-18 (Figure 18). Further analysis at subdivisions of all-cause data showed the excess to predominantly be found in the elderly (85+ year-olds) and in deaths coded as resulting from respiratory causes. The sharp drops in number of deaths correspond to weeks when there were bank holidays and fewer days when deaths were registered and so are likely to be artificial.

Figure 18. Weekly number of estimated all-age all-cause and respiratory ONS death registrations by week of registration, England and Wales, 2012/13

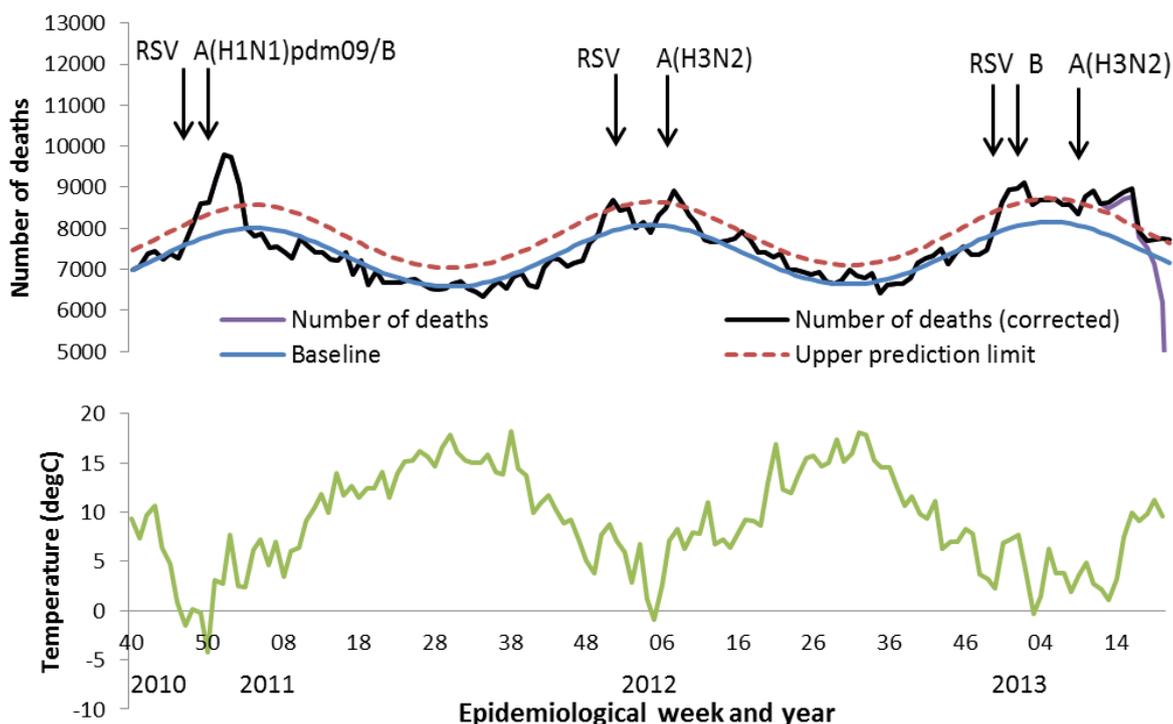


Mortality by week of death

Standardised reporting through the EuroMOMO algorithm occurs across a European network and enables a direct comparison between excess mortality estimation in countries within the UK. The number of deaths is corrected by reporting delay, avoiding impact of bank holidays as illustrated above. During 2012/13, two periods of excess mortality were seen in England across all regions; firstly for four weeks from week 50 2012 to 1 2013, and secondly from week 9 to 15 2013. When age group was modelled, this excess was localised to 65+ year-olds with a small excess seen in one week in 5-14 year-olds (week 51 2012). No significant excess was seen in under five year-olds or in 15-64 year-olds. The cumulative number of excess deaths in 65+ year-olds (defined as number of deaths relative to the baseline summed across the season) during 2012/13 is the highest seen since 2008/09 and this observation was seen in several

countries across Europe. All-cause mortality is modelled and can be descriptively compared to factors that may explain it (Figure 19). The first peak in activity coincides with circulating respiratory virus activity, including influenza B and RSV. The second peak in activity coincides both with prolonged A(H3N2) circulation and comparatively low temperatures for the time of year relative to previous seasons.

Figure 19. Weekly number of estimated all-cause deaths by week of death in 65+ year-olds, England, and weekly mean Central England Temperature, week 40 2010 to week 20 2012/13. Week of peak virus activity is indicated.



For the first time, excess all-cause mortality was calculated weekly with the same algorithm in each country in the UK, enabling standardised reporting of all-cause excess mortality across the countries in the UK (Table 2). Significant excess mortality was seen in Northern Ireland during the two periods identified in England, with the majority of excess detected in the second period from week 12 to week 15 2013 and a similar crude excess all-cause mortality rate. The rates were lower in Scotland and Wales. In Scotland, the majority of excess mortality was seen during the first period, from week 52 2012 to week 4 2013. This coincided with the time period that influenza A(H3N2) was dominant in Scotland. A similar pattern of excess deaths correlating temporally with A(H3N2) activity was also seen in Denmark at this time. Significant excess mortality was seen in Wales in the second period (weeks 11, 14 and 15 2013).

Table 2. Significant all-age excess all-cause mortality in each UK country as calculated with the standard EuroMOMO algorithm, 2012/13

	Number excess all-cause deaths	Crude excess all-cause mortality rate*	Weeks with excess mortality	
			2012	2013
England	8925	16.8	50-52	1,5,9-15
Scotland	730	13.9	52	1-,4,15
Wales	296	9.7	-	14-15
Northern Ireland	313	17.3	50	1-3,8-9,12-15

*Rate per 100,000 population estimated using extrapolated of ONS mid-year population values

NOVEL RESPIRATORY VIRUSES

Human MERS-CoV infections

Following an initial retrospective report of Middle East Respiratory Syndrome Coronavirus (MERS-CoV) case in Saudi Arabia, confirmation of an imported case from Qatar in London was reported in September 2012. Intensive clinical and virological follow up of contacts of the confirmed case identified no further cases, suggesting human-to-human transmission of this virus had not occurred, despite 64 close contacts identified. Surveillance continued during the 2012/13 influenza season, with individuals tested if they met the suspect case definition. Up to February 2013, 40 suspected cases were identified in the UK and all tested negative for MERS-CoV. In February 2013, a second imported case was confirmed and a cluster of cases identified with two of 135 contacts subsequently testing positive, one of whom later died. The other case experienced mild respiratory symptoms only and recovered. No further contacts of these two subsequent cases were positive for MERS-CoV on virological testing. Following on from the cluster and up to 31 May 2013 in the UK, ongoing surveillance identified a further 16 suspect cases which tested negative for MERS-CoV. Globally as of 2 June 2013, a further 49 cases have been confirmed resulting in a total of 53 laboratory confirmed cases, 30 of whom have died, resulting in a case fatality ratio of 57%. Sporadic cases in the community have been reported in several countries in the Middle East (including Jordan, Qatar, Saudi Arabia and the United Arab Emirates (UAE)) but the source of infection is unknown. Further human to human transmission has been reported in association with some of these cases, but has not been sustained. Cases have also been reported by four countries in Europe—France, Germany, Italy and the UK—and by Tunisia and Morocco in North Africa. All the European and North African cases have had a direct or indirect connection to the Middle East. However, in France, Italy, the UK and Tunisia, there has also been limited local transmission among close contacts – both household and healthcare workers - who had not been to the Middle East but had been in contact with a sick traveller recently returned from the Middle East.

Human influenza A(H7N9) infections

The first human infection with avian A/H7N9 influenza was reported in China in February 2013 and up to 31 May 2013, 132 cases have been reported in China of whom 37 have died resulting in a case fatality ratio of 28%. There has been no evidence of sustained human-to-human transmission. Up to 31 May 2013, ongoing surveillance in the UK has identified seven patients meeting the epidemiological and clinical criteria for suspect case classification and have been tested for the A(H7N9) virus. All tested negative.

Conclusions

There was a prolonged influenza season in 2012/13, with influenza positivity remaining high and prescription of antivirals in the community, based on detection of circulating influenza, recommended for a long time period (five months). Unusually, influenza B circulated prior to influenza A(H3N2) in England; this pattern of circulation was seen in Northern Ireland and Wales, however influenza B circulated later in the season after A(H3N2) in Scotland. The proportion of samples positive for A(H1N1)pdm09 was not insignificant and higher than seen in 2011/12 when influenza A(H3N2) dominated, and resulted in ICU and hospital admissions.

The start of the 2012/13 influenza season saw increases in the proportion of samples positive for influenza and outbreaks reported in schools. The reporting of outbreaks shifted to care homes later on in the season as influenza A started to circulate and influenza B activity decreased. GP ILI consultation rates were higher than seen in 2011/12, but less than seen in 2010/11 across the UK. As the systems in each country vary because of factors such as case definitions and methods of data extraction, absolute rates cannot be compared. Work has been done to standardise reporting of activity to make activity comparable and assist with interpretation of activity for the 2013/14 season. A report will be published when finalised.

An increase in influenza impact was seen relative to 2011/12 with a higher number of hospitalisations and ICU admissions. Cumulative excess all-cause mortality was higher in the elderly than seen over the previous few seasons across Europe; while this cannot be attributed directly to influenza, the temporal coincidence with influenza A(H3N2) across UK countries and Europe is suggestive of some contribution.

Activity from other typical circulating respiratory viruses, including RSV, rhinovirus, adenovirus, parainfluenza and hMPV, was overall similar to that seen in 2011/12. Surveillance was also established for the two novel viruses which emerged in 2012/13: MERS-CoV and influenza A(H7N9), both of which have high reported case fatality ratios. As the source of both of these viruses is yet to be fully established, it is likely that cases will continue to be reported. Surveillance established in the UK for travellers returning with severe disease is currently in place while the risk remains.

In conclusion, although influenza activity overall was low, it was higher than seen in 2011/12 and a mix of viruses meant that both children and adults were affected. While the level of severe disease due to influenza in adults and children leading to hospitalisation was not as high as seen in 2010/11 and 2009/10 respectively, high levels of excess all-cause mortality in 65+ year-olds suggests the impact of influenza on the elderly was high. The emergence of novel respiratory viruses has highlighted the importance of robust surveillance systems and procedures to provide early detection and inform control procedures and policy.

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