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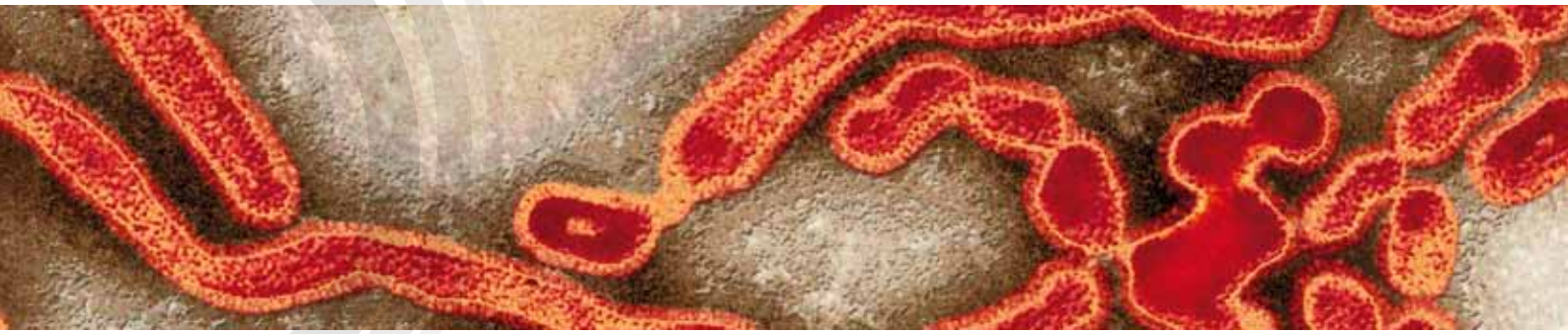
SURVEILLANCE REPORT



Influenza Surveillance in Europe

2008/09

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ECDC SURVEILLANCE REPORT

Influenza surveillance in Europe 2008/09

Week 40/2008 to week 39/2009

ECDC wishes to acknowledge the tremendous effort of all the Member States' experts who submitted data to EISN and the EWRS throughout the especially difficult years 2008 and 2009.

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Stockholm, June 2010

Contents

Abbreviations

ARI	Acute respiratory infection
CNRL	Community Network of Reference Laboratories for Human Influenza in Europe
EISN	European Influenza Surveillance Network
EISS	European Influenza Surveillance Scheme
EWRS	Early Warning and Response System
ILI	Influenza-like illness
TESSy	The European Surveillance System
RSV	Respiratory syncytial virus
SARI	Severe acute respiratory infection
EU/EEA	European Union Member States, Iceland, Liechtenstein and Norway

Summary

The 2008/09 influenza season in Europe started in week 48/2008, lasted about 10 weeks in each affected country and ended in week 16/2009 after peak activity had crossed the continent from west to east. The weekly (sub)type-specific proportions of influenza-positive sentinel samples showed two overlapping peaks, the initially dominant influenza A(H3N2) being replaced by influenza B as the most prevalent influenza virus after week 8/2009. The circulating influenza A(H3N2) and A(H1N1) viruses were shown to be antigenically closely related to the corresponding components included in the 2008/09 northern hemisphere influenza vaccine, whereas most of the isolated B viruses were Victoria lineage viruses and did not match the B vaccine component, a Yamagata lineage virus. Given the relatively low prevalence of B viruses observed during this season, however, this mismatch is unlikely to have been of particular public health significance.

Cases of the 2009 pandemic influenza A(H1N1) started to appear in Europe in week 16/2009. By week 39, the total reported number of confirmed cases amounted to 53 658 from all EU Member States, Iceland, Liechtenstein and Norway, and included 175 deaths in 14 countries. The case-based data showed that patients were between 0 and 90 years old (median: 19 years), 78% were younger than 30 years, and school children between 5 and 19 years of age accounted for 47% of all cases. The overwhelming majority of cases (96%) were not known to have any underlying medical conditions. Among those with underlying conditions, chronic lung disease was the most frequently reported underlying condition, accounting for 30% of these cases. Pneumonia was cited as a complication in 0.6% of pandemic influenza infections, the overall hospitalisation ratio was 13%, and 0.03% of cases were reported to have died.

The integrated European clinical and virological influenza surveillance network (EISN) proved effective in the timely detection of the start of the 2008/09 influenza season, in monitoring its course and in characterising its main virological features. The first 2009 pandemic influenza viruses detected in non-sentinel and sentinel patients were confirmed within one and three weeks respectively, after the first cases in Europe had fallen ill. However, the sentinel surveillance of influenza-like illness (ILI) and acute respiratory infection (ARI) only detected a clear increase with ten weeks' delay. Even in week 39/2009, when cases of pandemic influenza had been reported by all EU Member States, Iceland, Liechtenstein and Norway, ILI/ARI activity above the baseline had been seen only by nine of 29 countries reporting to EISN.

While a higher sensitivity would require greater numbers of sentinel physicians, other systematic shortcomings also need to be addressed. Suggested changes to the influenza surveillance system in Europe are:

- to further promote standardised reporting of the intensity, geographical spread and trends of ILI and ARI;
- to augment ILI and ARI surveillance with surveillance of severe acute respiratory infections (SARI);
- to introduce standardised epidemic thresholds for ILI/ARI sentinel surveillance;
- to further develop all-cause mortality surveillance at European level and to make regular outputs publicly available.

1 Introduction

Sentinel surveillance of influenza-like illness (ILI) and/or acute respiratory infection (ARI) had already been introduced in many European countries when the European Commission launched an initiative in 1989 that aimed at fostering international collaboration between national sentinel networks and that subsequently led to the formation of the European Influenza Surveillance Scheme (EISS) [1]. In 2003, EISS established the Community Network of Reference Laboratories for Human Influenza in Europe (CNRL) to standardise virological methods across Europe and to regularly assess the quality of CNRL laboratory performance [2]. In 2008, the coordination of influenza surveillance in Europe moved to ECDC and the former EISS became the European Influenza Surveillance Network (EISN), while the CNRL coordination was outsourced to a consortium led by the UK National Influenza Centre [3].

With the emergence of the 2009 influenza A(H1N1) pandemic in spring 2009, influenza surveillance in Europe gained increased interest among health professionals, politicians and the general public. The daily figures and maps that had to be produced sometimes narrowed the perception of what influenza surveillance can and should provide. The main objectives of influenza surveillance are to describe the epidemiology of influenza, to monitor intensity, geographical spread and trends; to know which influenza virus types and subtypes are circulating, to identify whether they are susceptible to antiviral treatment and how well they match the vaccine strains recommended by WHO; and finally to monitor the burden and spectrum of influenza disease and risk factors [4].

In order to help turn the collected data into national and European public health action, ECDC published daily updates on the 2009 influenza A(H1N1) pandemic [5], the more detailed 'Weekly Influenza Surveillance Overview' [6], intermittent analyses of pandemic influenza individual case reports [7] and several peer-reviewed scientific articles [3,8,9].

This is the summary ECDC influenza surveillance report for the 2008/09 season.

2 Methods

2.1 Time and place

While the influenza surveillance season in Europe traditionally lasts from week 40 to week 20 of the following year, the 2009 pandemic prompted the surveillance system to remain active beyond week 20/2009. This report thus describes the one-year period from week 40/2008 to week 39/2009. During this extended surveillance season, data were received from all EU Member States, Iceland (since week 27/2009) and Norway, but not all participating countries contributed to each surveillance system component every week.

2.2 Syndromic surveillance

ILI/ARI surveillance is carried out by nationally organised sentinel networks of physicians, mostly general practitioners, covering at least 1–5% of the population in their countries. Depending on each country's choice, every sentinel physician reports the weekly number of patients seen with ILI, ARI, or both, to a nominated national focal point (Table 1). From the national level, both numerator and denominator data are then reported to the European Surveillance System (TESSy) database. Most countries use population denominators while some use the number of patient–physician encounters as the denominator (Table 1).

In addition to ILI/ARI rates, semi-quantitative and only partly standardised indicators of intensity, geographical spread and trend of influenza activity are reported. The intensity is assessed by comparing current ILI/ARI rates with country-specific baseline rates outside of the influenza season and with historical values. The intensity can range from 'low' (below or at baseline) to 'medium' (above baseline but still within the range seen previously), 'high' (higher than seen previously) and 'very high' (much higher than seen previously).

The geographical spread can range from 'no activity' to 'sporadic', 'local', 'regional' and 'widespread' activity. 'No activity' is characterised by baseline or below baseline ILI/ARI rates with no laboratory confirmations. 'Sporadic activity' is reported if there are isolated cases of laboratory-confirmed influenza in a region, or an outbreak in a single institution with clinical activity remaining at or below baseline. 'Local activity' refers to locally increased ILI/ARI rates or outbreaks in two or more institutions within a region, in conjunction with laboratory-confirmed cases of influenza. Levels of activity in the remainder of the region and other regions of the country remain at or below baseline. 'Regional activity' is defined by ILI/ARI rates above baseline, and laboratory-confirmed influenza infections, in one or more regions comprising less than 50% of the country's total population. Levels of activity in other regions of the country remain at or below baseline. Regional activity generally does not apply to countries with a population of less than 5 million unless the country is large with geographically distinct regions. Finally, 'widespread activity' is reported if one or more regions comprising 50% or more of the country's population are seeing ILI/ARI rates above baseline, in conjunction with laboratory-confirmed influenza infections.

The trend is assessed by comparing current influenza activity with previous weeks and can be 'increasing', 'decreasing' or 'stable'.

2.3 Virological surveillance

According to each nationally defined sampling strategy, the sentinel physicians take nasal or pharyngeal specimens from a subset of their ILI/ARI patients. The specimens are then sent to the respective country's CNRL laboratory for influenza virus detection, (sub)typing, antigenic and/or genetic characterisation and antiviral susceptibility testing. Some laboratories also test these specimens for the presence of respiratory syncytial virus (RSV). All results, including those obtained for non-sentinel specimens, as well as antiviral susceptibility data are uploaded every week to TESSy by nominated national focal points.

2.4 Pandemic influenza A(H1N1) surveillance

Soon after the first cases of the 2009 pandemic influenza had been diagnosed, influenza surveillance in Europe was upgraded to include daily case-based and aggregate reporting of laboratory-confirmed cases of pandemic influenza. This new surveillance component was first implemented in the Early Warning and Response System (EWRS). As more and more countries moved from pandemic containment to mitigation strategies and abandoned generalised laboratory testing for influenza, case-based reporting became less useful and was finally stopped. The aggregate reporting of pandemic influenza-related cases and deaths continued, and was eventually transferred to TESSy.

Shortly before the end of the period covered by this report, another surveillance component was introduced in TESSy: hospital-based surveillance of severe acute respiratory infection (SARI). Due to the lack of data reported before week 39/2009, however, this report does not include SARI surveillance and this will be reported separately.

Table 1: Syndromic influenza surveillance choice of numerator and denominator by country

Country	Numerator	Denominator
Austria	ARI	Population
Belgium	ILI, ARI	Population
Bulgaria	ARI	Population
Cyprus	ILI	Encounters
Czech Republic	ILI, ARI	Population
Denmark	ILI, ARI	Population
Estonia	ILI, ARI	Population
Finland*	—	—
France	ARI	Population
Germany	ARI	Population
Greece	ILI	Population
Hungary	ILI	Encounters
Iceland	ILI	Population
Ireland	ILI	Population
Italy	ILI	Population
Latvia	ILI, ARI	Population
Lithuania	ILI, ARI	Population
Luxembourg	ILI, ARI	Encounters
Malta	ILI	Encounters
Netherlands	ILI	Population
Norway	ILI	Population
Poland	ILI	Population
Portugal	ILI	Population
Romania	ILI, ARI	Population
Slovakia	ILI, ARI	Population
Slovenia	ILI, ARI	Population
Spain	ILI	Population
Sweden	ILI	Population
UK: England	ILI, ARI	Population
UK: Northern Ireland	ILI, ARI	Population
UK: Scotland	ILI, ARI	Population
UK: Wales	ILI	Population

* *Finland currently has no sentinel system for syndromic influenza surveillance in place.*

2.5 Data analysis

Syndromic and virological surveillance data were retrieved from TESSy. The intensity of influenza activity was colour-coded and displayed in a cross-tabulation of country and week of reporting. Countries were ordered by geographical longitude, the values of which were obtained from the US Central Intelligence Agency's World Fact Book[i] and the US National Geospatial Intelligence Agency[ii]. Numbers of sentinel specimens, crude and (sub)type-specific proportions of influenza-positive sentinel specimens, and (sub)type-specific numbers of influenza-positive non-sentinel specimens were plotted by week of reporting. Cumulative absolute and relative frequencies of antigenic and genetic virus characterisation results were determined, and the circulating strains were compared with the 2008/2009 northern hemisphere influenza vaccine as recommended by WHO [10].

Disaggregate pandemic influenza case data were retrieved from the ad hoc EWRS database. All analyses were limited to laboratory-confirmed cases. These numbers were plotted by week of onset, age group and probable country of infection. Dates of onset before March 2009 (n = 22) were thought to be implausible and were therefore not taken into account when using this variable. Age-specific incidence rates were calculated with denominator data downloaded from the Eurostat web portal[iii]. Finally, absolute and relative frequencies of underlying conditions were calculated, and the most frequently reported complication, as well as the hospitalisation rate and number of deaths, were determined.

i Available from https://www.cia.gov/library/publications/the-world-factbook/

ii Available from https://www1.nga.mil/Pages/Default.aspx

iii Available from http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/

3 Results

3.1 Syndromic surveillance

Medium or high intensity influenza activity was observed in at least one reporting country between weeks 48/2008 and 16/2009 and between weeks 26 and 39/2009 (Table 2). The normal influenza season started in western Europe in early December 2008, reached central and northern Europe in January 2009 and progressed to eastern and south-eastern Europe shortly thereafter. A similar geographical trend started to show 10 weeks after the last country had returned to baseline intensity levels, when an unusual summer wave of influenza activity first hit parts of the UK in June, then Iceland, Ireland, Malta and Norway in July before reaching Belgium and Spain in September (Table 2).

Of 28 countries uploading weekly influenza data during the winter 2008/09, 25 reported medium intensity for 3 to 13 weeks (median: 8) and 12 reported high intensity for 1 to 4 weeks (median: 2.5). Of the 26 countries uploading influenza data for at least two weeks during summer 2009, nine reported medium intensity for 1 to 10 weeks (median: 4) and three reported high intensity for 2 to 7 weeks (median: 4). Cyprus, Latvia and Wales did not report any influenza activity above baseline levels throughout the entire year. Based on the periods of high intensity, the winter wave peaked in Europe between week 51/2008 and week 11/2009. The summer wave was still ongoing in week 39/2009.

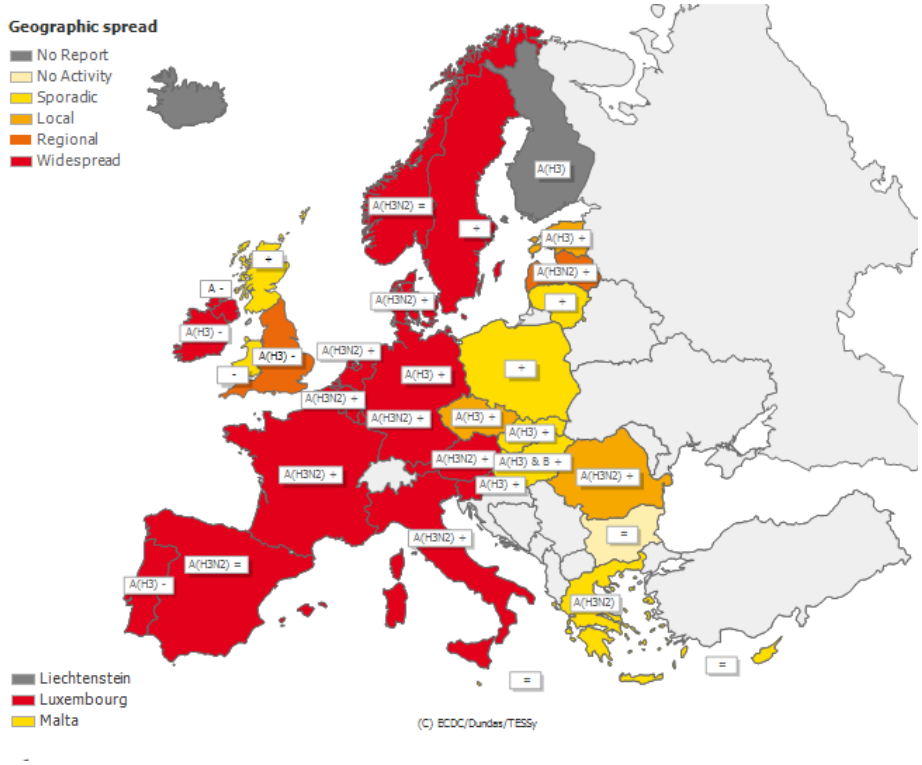
Of the 20 countries reporting age-specific ILI/ARI rates during winter 2008/09, most observed the highest intensity levels among children aged below 15 years of age. However, Ireland, Norway and the UK reported the highest intensity levels not in children, but in those aged between 15 and 64 years, with England, Northern Ireland and Wales reporting peaks in those aged over 64 years. In summer 2009, 19 countries reported age-specific ILI/ARI rates. Again, most described peak influenza transmission among children aged below 15 years, with Iceland, Romania and Scotland also reporting peak influenza activity among 15–64 year-olds. Norway and Sweden reported the highest ILI/ARI rates in persons aged 15–64 years old without observing equivalent transmission in children.

In 16 of 23 countries where a historical comparison was possible, the magnitude of the 2008/09 influenza winter wave was within the range of the previous seasons. However, Austria, the Czech Republic, Greece, Ireland, the Netherlands, Poland and parts of the UK (England and Wales) registered higher ILI/ARI rates in 2008/09 than during one or more (up to eight) of the most recently preceding winter seasons. Of the 23 countries reporting throughout the entire year 2008/09, only Malta, Norway and parts of the UK (England and Scotland) experienced a markedly higher influenza intensity peak in summer than in winter, with an up to six-fold difference.

Table 2: Intensity of influenza activity in the EU, Iceland and Norway during the 2008/09 season, by country (ordered by geographical longitude) and week of reporting

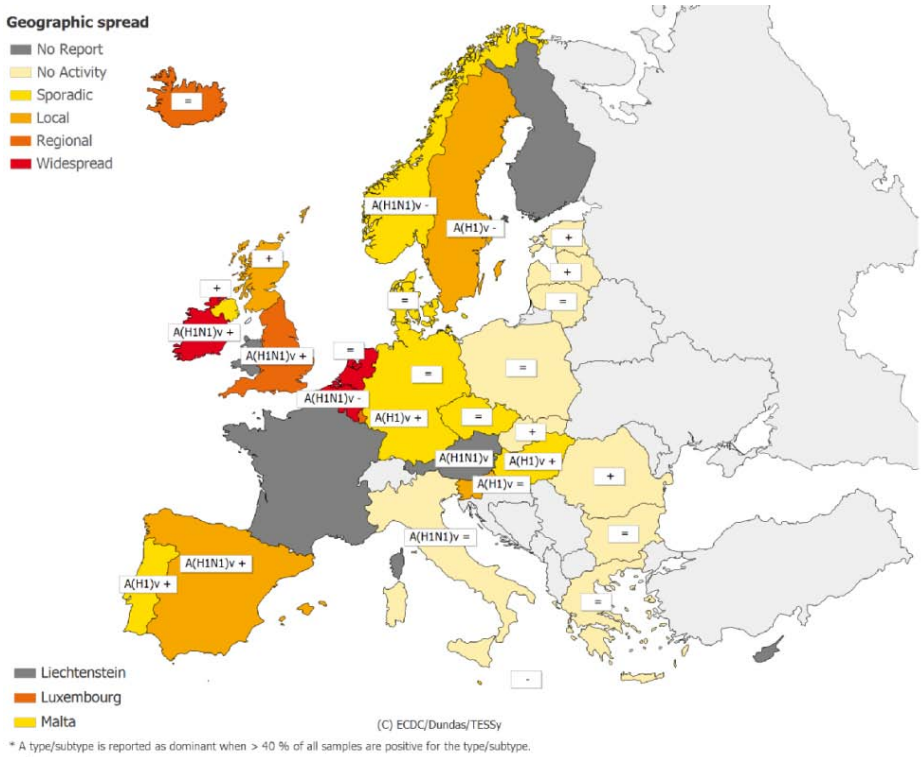
Coinciding with the intensity of influenza activity, the geographical spread of influenza virus transmission in Europe peaked around the same weeks in winter (Map 1) whereas in week 39/2009, the summer wave had yet to fully unfold (Map 2).

Map 1: Geographical spread of influenza in Europe in week 3/2009



Source: EISS Weekly Electronic Bulletin.

Map 2: Geographical spread of influenza in Europe in week 39/2009



Source: TESSy, week 39/2009

3.2 Virological surveillance

During the 2008/09 surveillance period, sentinel physicians in Europe collected 42 482 respiratory specimens of which 12 500 (29.4%) tested positive for influenza virus. Of these, 84% were type A (predominantly H3 and H3N2), and 16% were type B (Table 3). In addition, 39 638 non-sentinel specimens were found to be positive for influenza virus. The weekly proportion of influenza-positive sentinel samples peaked twice. The first peak, at 50.1%, occurred in week 3/2009, the second peak, at 35.9%, in week 11/2009 (Figure 1). The distribution of weekly sentinel samples by influenza type and subtype reveals three distinct peaks: the first, attributable to A(H3N2) in week 4/2009, then to influenza B in week 12/2009 and the 2009 pandemic influenza A(H1N1) virus toward the end of the period under surveillance (Figure 2). The same three peaks are noticeable in the distribution of weekly numbers of non-sentinel samples by influenza type and subtype, although the overrepresentation of hospitals supplying samples, the lack of a denominator and of a fixed sampling protocol result in a different distribution (Figure 3).

Of 791 genetically characterised influenza viruses, 540 (68.3%) were found to be A/Brisbane/10/2007(H3N2)-like, 27 (3.4%) were A/Brisbane/59/2007(H1N1)-like, 187 (23.6%) were A /California/7/2009(H1N1)v-like, 26 (3.3%) were B/England/393/2008-like or B/Victoria/304/2006-like (B/Victoria/2/87 lineage) and 11 (1.4%) were B/England/145/2008-like or B/Florida/4/2006-like (B/Yamagata/16/88 lineage). Table 4 presents the antigenic characterisation results. The circulating influenza A(H3N2) and A(H1N1) viruses were shown to be antigenically closely related to the corresponding components included in the 2008/09 northern hemisphere influenza vaccine, whereas most of the isolated B viruses were Victoria lineage viruses and did not match the B vaccine component (a Yamagata lineage virus).

All A(H3N2) viruses tested were resistant to M2 inhibitors but susceptible to neuraminidase inhibitors (Table 5). Most of the A(H1N1) viruses tested were resistant to Oseltamivir, but not to Zanamivir or M2 inhibitors. All A(H1N1)v viruses tested were susceptible to neuraminidase inhibitors, but resistant to M2 inhibitors, and all B viruses tested were susceptible to neuraminidase inhibitors.

Table 3: Distribution of influenza-positive sentinel samples by type and subtype, from week 40/2008 to week 39/2009

Type/subtype	Weeks 40/2008–18/2009		Weeks 19–39/2009		Total (weeks 40/2008–39/2009)	
	n	%	n	%	n	%
A(H1)	180	1.7	4	0.2	184	1.5
A(H1N1)	112	1.1	7	0.3	119	1.0
A(H3)	3636	35.3	20	0.9	3656	29.2
A(H3N2)	1869	18.1	10	0.5	1879	15.0
A(H1)v	0	0	347	15.8	347	2.8
A(H1N1)v	0	0	1658	75.3	1658	13.3
A not subtyped	2610	25.3	94	4.3	2704	21.6
A unsubtypable	2	0	0	0	2	0
B	1890	18.4	61	2.8	1951	15.6
Total	**10299**		**2201**		**12500**	

Figure 1: Proportion of influenza-positive sentinel samples in Europe by week of reporting, from week 40/2008 to week 39/2009

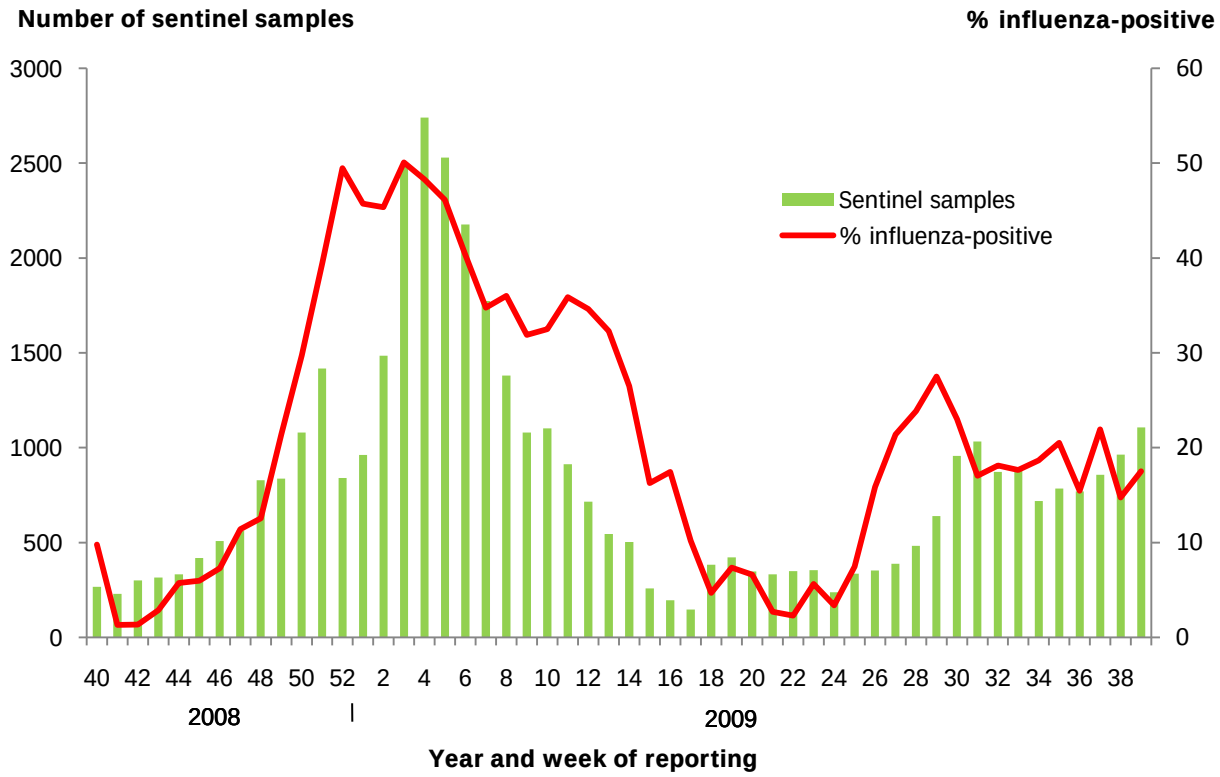


Figure 2: Proportion of influenza-positive sentinel samples in Europe by week of reporting, type and subtype, from week 40/2008 to week 39/2009

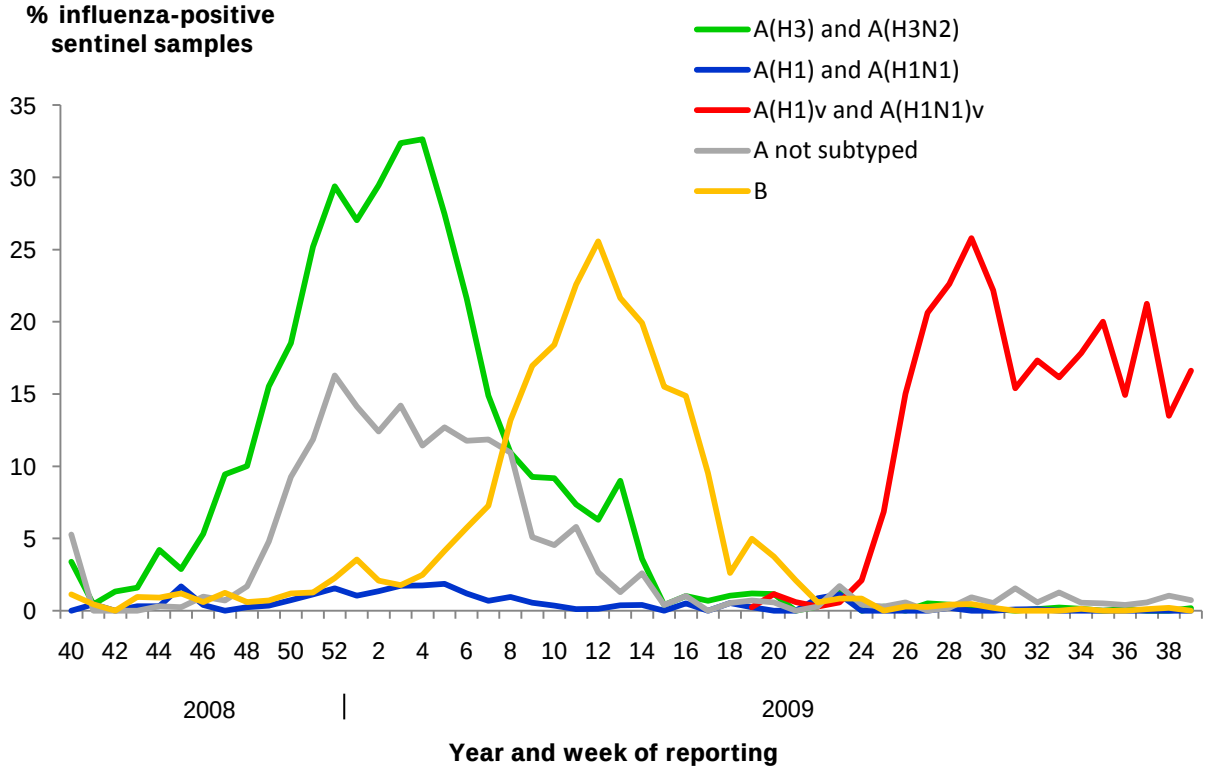


Figure 3: Number of influenza-positive non-sentinel samples in Europe by week of reporting, type and subtype, from week 40/2008 to week 39/2009

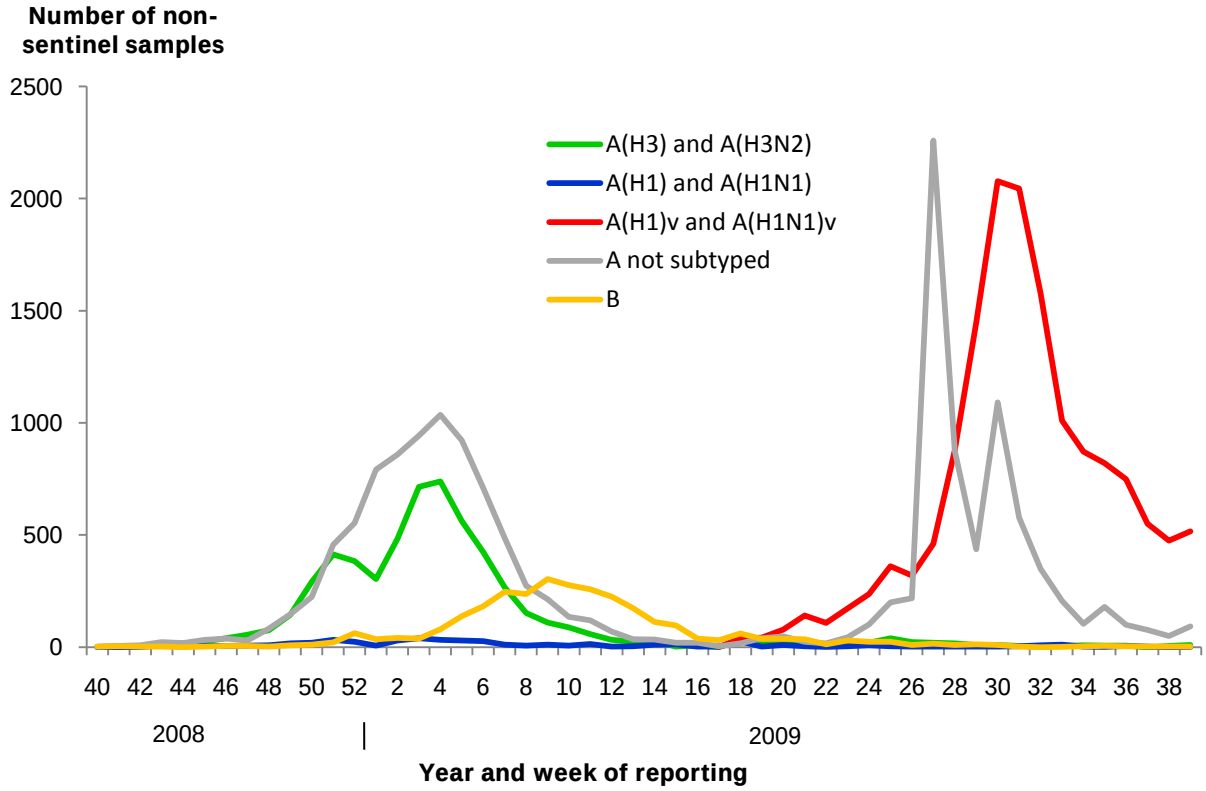


Table 4: Antigenic influenza virus characterisations in Europe from week 40/2008 to week 39/2009, based on sentinel and non-sentinel samples

	n	%	Matches vaccine strain*
A/Brisbane/10/2007(H3N2)-like	4122	69.4	Yes
A/Brisbane/59/2007(H1N1)-like	230	3.9	Yes
A/California/7/2009 (H1N1)v-like	151	2.5	
B/Malaysia/2506/2004-like (B/Victoria/2/87 lineage)	1302	21.9	No
B/Brisbane/60/2008-like (B/Victoria/2/87 lineage)	92	1.5	No
B/Florida/4/2006-like (B/Yamagata/16/88 lineage)	45	0.8	Yes
Total	**5942**		

**As recommended by WHO.*

Table 5: Antiviral resistance by influenza virus type and subtype, from week 40/2008 to week 39/2009, based on sentinel and non-sentinel samples

Virus type and subtype	Resistance to neuraminidase inhibitors				Resistance to M2 inhibitors	
	Oseltamivir		Zanamivir			
	n tested	n resistant (%)	n tested	n resistant (%)	n tested	n resistant (%)
A(H3N2)	653	0	612	0	644	644 (100)
A(H1N1)	260	256 (98.5)	260	0	124	1 (0.8)
A(H1N1)v	424	0	415	0	56	56 (100)
B	117	0	113	0	n.a.	n.a.

Source: Weekly Influenza Surveillance Overview, week 39/2009.

3.3 Pandemic influenza surveillance

When the EWRS case-based reporting of pandemic influenza was discontinued after week 39/2009, the EWRS database contained 11 275 records from 28 EU/EEA Member States. Of these cases, 11 207 were laboratory-confirmed. Based on 8 328 cases with a plausible date of onset (first case: 19 April 2009), up to 344 persons were reported to have fallen ill per day and up to 1 684 per week. The epidemiological curve peaked in week 25/2009 (Figure 4).

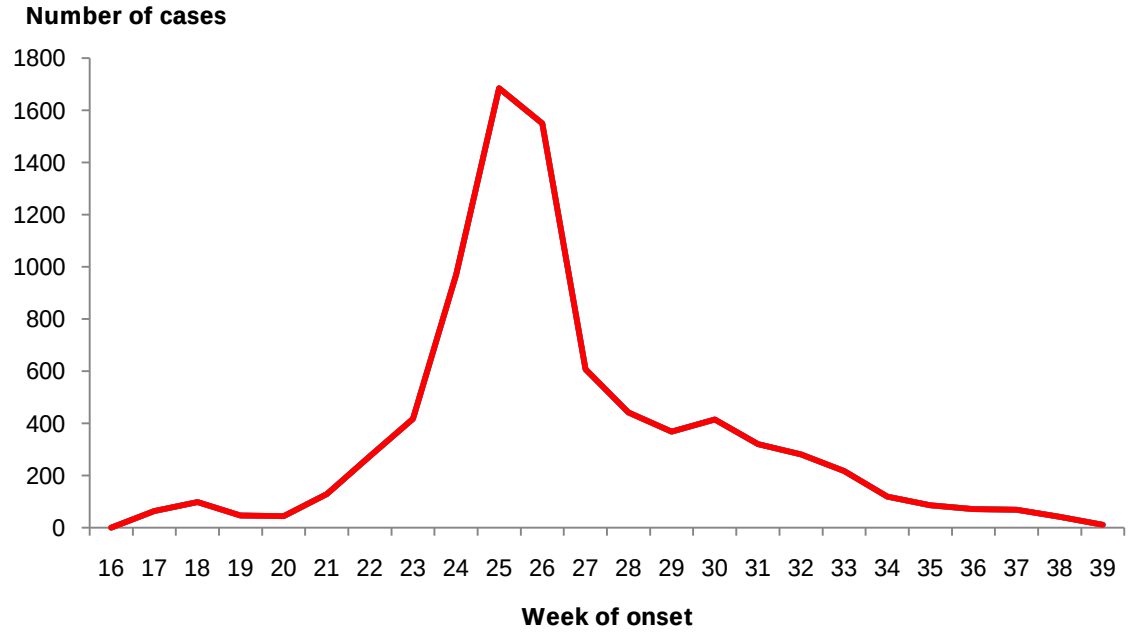
Reports showed that patients were between 0 and 90 years old (median: 19 years), 78% were younger than 30 years, while those aged between 5 and 19 years of age accounted for 46.5% (Figure 5). The overall male-to-female ratio was 1:1, but among cases under 30 years of age, males were overrepresented by 20%.

Of 10 759 cases with information on probable country of infection, 3 599 (33.5%) were imported, with the United States, Spain, the UK and Mexico accounting for 2 348 (65.2%) of travel destinations. The epidemiological curve by probable country of infection shows the chronology (Figure 6). The steep increase in the number of cases without a travel history started in week 17 and peaked in week 25.

Of the 11 207 confirmed cases of pandemic influenza, 10 803 (96.4%) were not reported to have any underlying medical condition. The remaining 404 cases suffered from 489 underlying conditions, most frequently from chronic pulmonary disease which was reported for 120 patients (29.7%, Table 6). Sixty-four (0.6%) of 11 207 cases developed pneumonia as a complication, 1 443 (13.1%) of 10 990 patients with information on hospitalisation status were hospitalised, and three (0.03%) of 11 045 patients with information on survival status were reported to have died. Two of the deaths occurred in patients with an underlying condition, one of whom also had a complicating pneumonia.

The aggregate cumulative numbers of confirmed cases of pandemic influenza and related deaths that ECDC had collected by the end of week 39/2009 amounted to 53 658 cases from all EU Member States, Iceland, Liechtenstein and Norway, including 175 deaths in 14 countries (Table 7). However, at this time, 20 countries had already stopped recommending generalised laboratory testing of suspected cases, and six countries had not updated their numbers for at least a week.

Figure 4: Cases of 2009 pandemic influenza in Europe* by week of onset, from week 16 to week 39/2009



** From week 16 to week 27/2009, cases of pandemic influenza reported by the UK accounted for 66% of all cases reported in Europe. The appearance of the epidemic curve after week 27/2009 was heavily influenced by the decision taken by the UK government (and subsequently others) to stop generalised laboratory testing for pandemic influenza.*

Figure 5: Cases and incidence of 2009 pandemic influenza in Europe by age group, from week 16 to week 39/2009

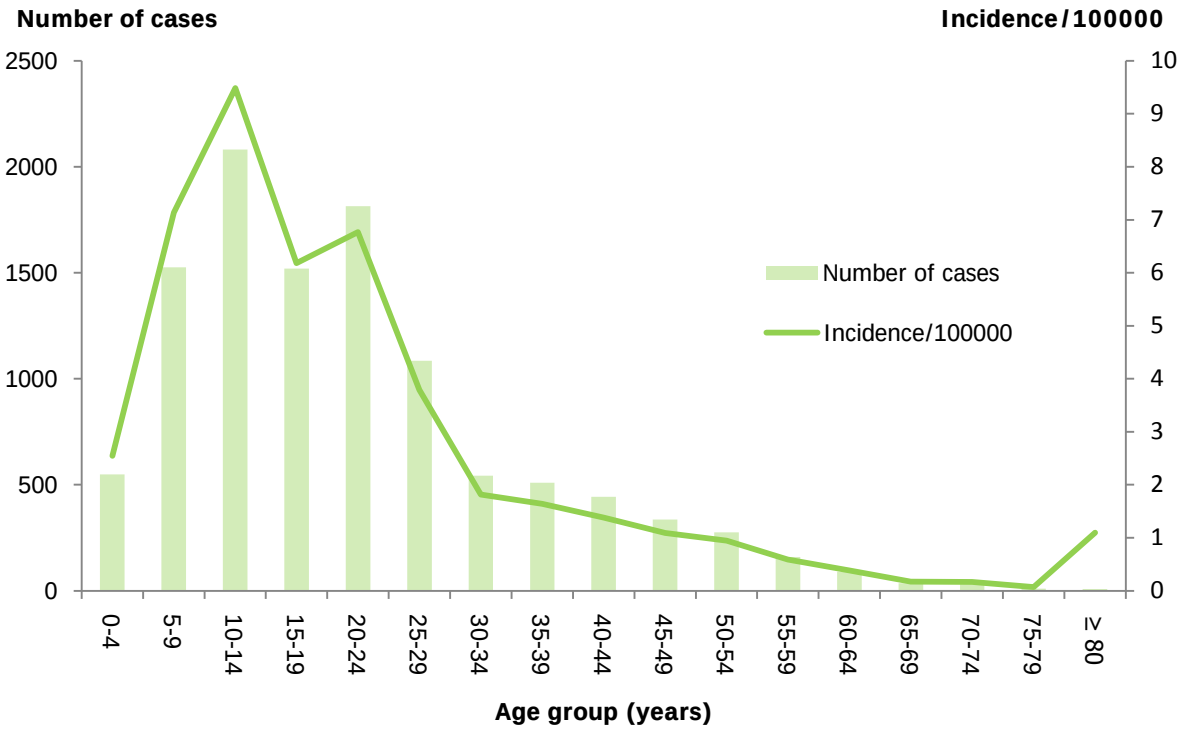
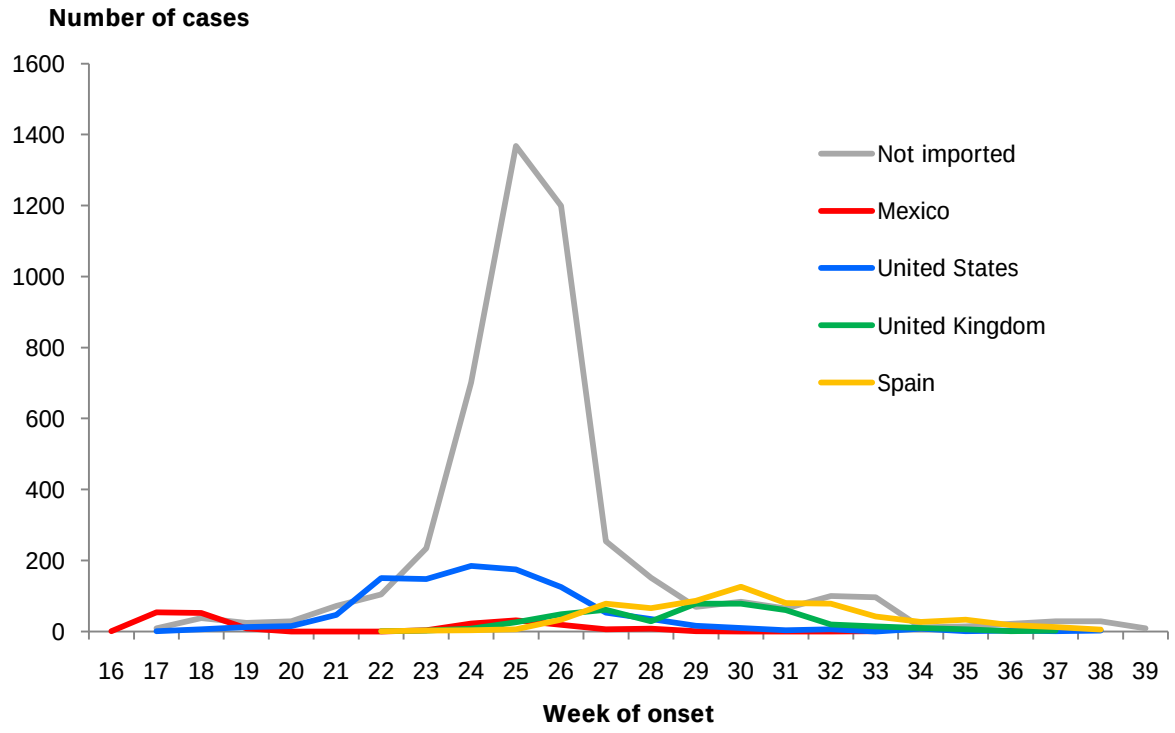


Figure 6: Cases of 2009 pandemic influenza in Europe* by probable country of infection, from week 16 to week 39/2009



** From week 16 to week 27/2009, cases of pandemic influenza reported by the UK accounted for 66% of all cases and 84% of non-imported cases reported in Europe. The appearance of the epidemic curve after week 27/2009, was heavily influenced by the decision taken by the UK government (and subsequently others) to stop generalised laboratory testing for pandemic influenza.*

Table 6: Cases of 2009 pandemic influenza in Europe by underlying condition, from week 16 to week 39/2009 (n = 404)

Underlying condition	n	% *
Chronic pulmonary disease	120	29.7
Diabetes	48	11.9
Chronic heart disease	36	8.9
Pregnancy	31	7.7
Cancer	13	3.2
HIV	10	2.5
Epilepsy	9	2.2
Malnutrition	3	0.7
Other	219	54.2
Total	**489**	

** One case can have more than one underlying condition. Percentages refer to the number of cases with underlying conditions (n = 404) as the denominator.*

4 Discussion

The 2008/09 influenza season in Europe started in week 48/2008, lasted about 10 weeks in each affected country and ended in week 16/2009 after peak activity had crossed the continent from west to east. A similar spatial trend had already been described for some of the previous seasons [11]. Virologically, the regular 2008/09 influenza season was biphasic, first dominated by influenza A(H3N2), then by influenza B, although overall, influenza A(H3N2) accounted for most virus detections. This contrasted with the United States where the 2008/09 season was dominated by oseltamivir-resistant influenza A(H1N1) virus [12], as experienced in Europe the previous year [13]. Influenza A(H3N2) viruses are said to cause more severe disease, in terms of hospitalisation rates and mortality, than influenza A(H1N1) viruses [14,15]. However, the European SARI surveillance system, that could have supplied severity data and was rapidly implemented later to better monitor the pandemic, was not yet in place, and ILI/ARI sentinel surveillance in Europe only captures indicators of frequency and geographical spread. Most countries did not see higher consultation rates during the 2008/09 influenza season compared with preceding seasons.

The antigenic characteristics of influenza viruses circulating in Europe during the regular 2008/09 influenza season were similar to those of the A(H1N1), A(H3N2) and B/Yamagata lineage components included in the 2008/09 northern hemisphere influenza vaccine. However, B/Victoria lineage viruses accounted for the majority of B viruses detected. The mismatch of the B/Victoria/2/87 lineage viruses with the vaccine is, however, unlikely to have been of particular public health significance given the relatively low prevalence of B viruses observed during this season. It is important to note that the match between the circulating viruses and the strains included in the annual seasonal vaccine is not the only determinant of vaccine effectiveness. There have been seasons where the vaccine still proved to be effective despite an apparently significant mismatch [16]. It is therefore important that the yearly assessment of influenza vaccine effectiveness also takes account of the results of epidemiological studies [17].

Although the emergence of the 2009 influenza A(H1N1) pandemic was not entirely unexpected, its causative agent, timing and geographical origin of the first wave in North America took many by surprise. Moreover, its impact in terms of morbidity and mortality was found to have been lower than that of previous pandemics [18]. As this report does not extend beyond the first 23 weeks of the 2009 pandemic, most analyses pertaining to this subject had to be based on the disaggregate data collected through the EWRS. The shape of most epidemiological curves depicting the pandemic in this report is therefore heavily influenced by changes in testing and control strategies. In particular, the steep decline after the peak in week 25 can be partly explained by a tendency to move away from intense contact tracing and to limit laboratory testing to severe cases. By contrast, based on an independent stable sampling strategy, the weekly proportion of influenza-positive sentinel specimens indicated that the pandemic gained momentum beyond week 39/2009.

The integrated European clinical and virological influenza surveillance network (EISN) proved effective in the timely detection of the start of the 2008/09 influenza season, in monitoring its course and in characterising its main virological features. The virological surveillance also confirmed the first 2009 pandemic influenza viruses in non-sentinel and sentinel patients within one and three weeks, respectively, after the first cases in Europe had fallen ill. However, the sentinel surveillance of ILI/ARI rates detected an increase only with ten weeks' delay. Even in week 39/2009, when 53 658 cases of pandemic influenza had been reported by all EU Member States, Iceland, Liechtenstein and Norway, ILI/ARI activity above baseline had been seen by only nine of 29 countries reporting to EISN. Case-based and aggregate reporting of pandemic influenza cases provided a more sensitive surveillance instrument but had their own limitations. Case-based reporting was done in the context of labour-intensive containment efforts and extensive contact tracing and tended to be delayed and incomplete, as documented by the much higher aggregate numbers that were reported at the same time. In some instances, due to lack of resources, batches of case-based data were transmitted to ECDC for recoding and inputting [8]. Further, both case-based and aggregate reporting of pandemic influenza became less realistic as countries increasingly moved from a containment to a mitigation strategy, changing their recommendations from testing and treating every suspected case to focusing on severe cases [19].

While exhaustive surveillance of influenza contributed to the early assessment of this pandemic, it was and could be carried out only temporarily, and sentinel ILI/ARI and virological surveillance remain the cornerstones of the system. They have proven their worth for many decades and have so far defied all predictions that they might collapse in the face of a pandemic. However, there is still room for improvement. The height of the ILI/ARI curves in the various countries cannot be considered an accurate indicator of disease incidence and hence of the severity of the epidemic in terms of attack rates. Even in a season such as 2008/09 when there was a relatively homogeneous virus circulating across Europe, there were remarkable differences in the incidence of reported ILI and ARI between countries. These differences cannot be completely explained by differences in the application of the EU case definition or by differences in the population under surveillance. Using modified definitions, differences in the respective healthcare systems, other influences on consultation and healthcare-seeking behaviour (such as, for example, reimbursement issues for medication and consultations), and organisational

needs (such as certificates needed for absenteeism) play an important role [20]. Especially during the pandemic, several countries actively recommended that anyone with influenza symptoms stay at home and should not approach their primary care provider, thus excluding them from the possibility of being reported. This prompted the demand for alternative, so-called non-traditional, forms of surveillance to be tested to adjust for this bias. Various examples such as monitoring web-based self-reporting of ILI, using data from dedicated flu telephone helplines or monitoring specific web queries related to ILI symptoms have been tried, but as yet none have emerged as valid alternatives when healthcare-seeking behaviour is artificially altered in this way. A better understanding of the national surveillance systems through a standard evaluation process could help to better interpret such differences. Furthermore, there is no agreed standard method used within EISN to calculate thresholds (or baselines) of increased influenza activity. This means that the same reported level of intensity could correspond to widely different levels of consultation rates in different countries.

Influenza sentinel surveillance in Europe relies heavily on primary care practices and is therefore systematically blind to more severe disease outcomes like complications, hospitalisations or death. While the recent addition of hospital-based SARI sentinel surveillance partly addresses this shortcoming, mortality surveillance is still in its infancy in Europe [21] and does not yet produce publicly available weekly outputs.

This pandemic has highlighted some of the strengths and weaknesses of the existing influenza surveillance system and should be seen as an opportunity for improvement. A more standardised way of reporting influenza intensity, geographical spread and trends will make it easier to assess the true impact of influenza. SARI and mortality surveillance will complete the epidemiological picture. Finally, the system as a whole will generate the reliable and comprehensive data required to justify necessary public health action against influenza in Europe.

Table 7: Reported cumulative aggregate numbers of confirmed cases of 2009 pandemic influenza and related deaths in Europe by country, end of week 39/2009

Country (date of report (day/month))	Cumulative cases	Cumulative deaths
Austria (18/9)	361	0
Belgium (30/7)	126	1
Bulgaria (18/9)	70	0
Cyprus (14/7)	297	0
Czech Republic (24/9)	293	0
Denmark (24/9)	651	0
Estonia (24/9)	68	0
Finland (24/9)	304	0
France (23/9)	1 125	29
Germany (23/9)	19 703	0
Greece (15/9)	2 149	3
Hungary (17/9)	206	2
Iceland (23/9)	200	0
Ireland (13/9)	1 613	4
Italy (23/9)	2 470	3
Latvia (19/9)	30	0
Liechtenstein (23/9)	5	0
Lithuania (24/9)	53	0
Luxembourg (23/9)	280	1
Malta (18/9)	298	3
Netherlands (17/9)	1 473	4
Norway (24/9)	1 336	4
Poland (23/9)	164	0
Portugal (23/9)	2 983	1
Romania (21/9)	334	0
Slovakia (24/9)	133	0
Slovenia (18/9)	244	0
Spain (24/9)	1 538	36
Sweden (24/9)	1 381	2
United Kingdom (24/9)	13 770	82
Total	**53 658**	**175**

Note: Countries shaded green were not recommending laboratory testing for all suspect cases.
Deaths are included in the cumulative number of confirmed cases.
Fatal cases are reported in the country where the death occurred.

Source: Adapted from ECDC Daily Pandemic (H1N1) Update, 25 September 2009.
http://ecdc.europa.eu/en/healthtopics/Documents/090925_Influenza_AH1N1_Situation_Report_0900hrs.pdf

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