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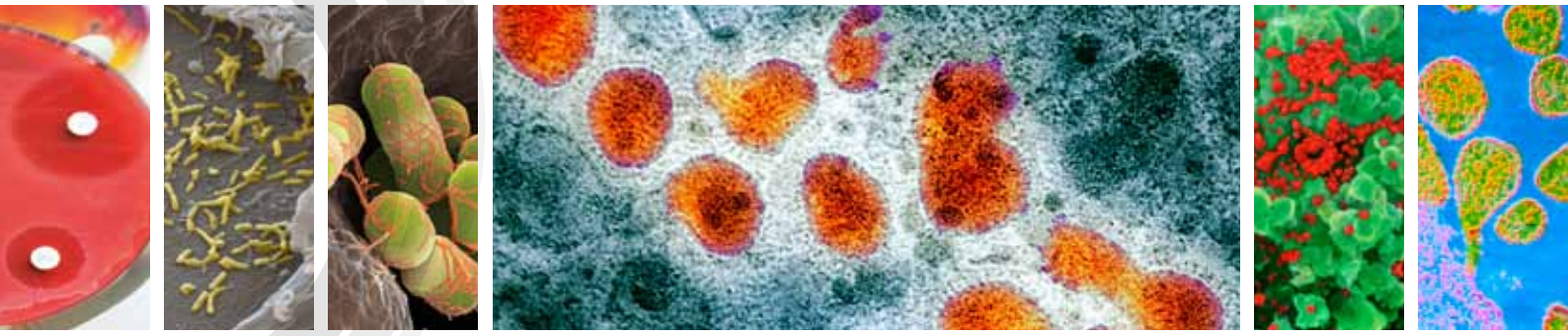
SURVEILLANCE REPORT



Annual epidemiological report

Respiratory tract infections

2014

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ECDC SURVEILLANCE REPORT

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This report of the European Centre for Disease Prevention and Control (ECDC) was coordinated by Catalin Albu, Sergio Brusin and Bruno Ciancio.

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In order to facilitate more timely publication, this year's edition of the Annual Epidemiological Report is being first published a disease group at a time and will later be compiled into one comprehensive report. This report presents the epidemiological situation for respiratory tract infections as of 2012.

Suggested citation: European Centre for Disease Prevention and Control. Annual epidemiological report 2014 – Respiratory tract infections. Stockholm: ECDC; 2014.

Stockholm, November 2014

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Abbreviations

CFR	Case fatality ratio
ELDSNet	European Legionnaires' Disease Surveillance Network
EU/EEA	European Union/European Economic Area
MERS-CoV	Middle East respiratory syndrome coronavirus
SARS	Severe acute respiratory syndrome
SARS-CoV	Severe acute respiratory syndrome coronavirus
US CDC	United States Centers for Disease Control and Prevention

Introduction

A note to the reader

The Annual Epidemiological Report 2014 gives an overview of the epidemiology of communicable diseases of public health significance in Europe, drawn from surveillance information on the 52 communicable diseases and health issues for which surveillance is mandatory in the European Union (EU) and European Economic Area (EEA) countries.[i] [ii] [iii] [iv]

In order to facilitate more timely publication, this year's edition of the Annual Epidemiological Report is being first published a disease group at a time and will later be compiled into one comprehensive report. This report presents the epidemiological situation for respiratory tract infections as of 2012 and describes the statistical and epidemiological methods used.

Produced annually, the report is intended for policymakers and health sector leaders, epidemiologists, scientists and the wider public. It is hoped that readers will find it a useful overview and reference to better understand the present situation in relation to communicable diseases in Europe. It should also usefully assist policymakers and health leaders in making evidence-based decisions to plan and improve programmes, services and interventions for preventing, managing and treating these diseases.

This year's edition of the report draws on surveillance data for 2012, submitted by Member States to the European Surveillance System. The report gives an outline description of the epidemiology for each disease, in a standard format, covering the years 2008–2012. In addition, updates from epidemic intelligence in relation to emerging public health threats for 2013 are given, by disease as relevant. Information on these is either directly reported to ECDC through Member State notifications on the Early Warning and Response System (EWRS), according to defined criteria[v], or found through active screening of various sources, including national epidemiological bulletins and international networks, and various additional formal and informal sources. In-depth reviews of the epidemiology of particular diseases (e.g. tuberculosis, HIV) or disease groups (e.g. food- and waterborne diseases) are published separately, sometimes in collaboration with other European agencies or the World Health Organization's Regional Office for Europe. These are referenced, for convenience, with the description of each disease. In addition, further information relating to most of the diseases reported here is available on the ECDC website health topics pages at http://ecdc.europa.eu/en/healthtopics.

The reader will appreciate that most surveillance systems capture only a proportion of the cases occurring in their countries. Some cases of disease remain undiagnosed ('under-ascertainment'), and some are diagnosed but not reported to public health authorities ('underreporting'). The pattern of this under-ascertainment and underreporting varies by disease and country, involving a complex mix of healthcare-seeking behaviour, access to health services, availability of diagnostic tests, reporting practices by doctors and others, and the operation of the surveillance system itself.

The direct comparison of disease rates between countries should therefore be undertaken with caution. The reader should be aware that in most cases, differences in case rates reflect not only differences in the occurrence of the disease, but also in systematic differences in health and surveillance systems as described here.

[i] 2000/96/EC: Commission Decision of 22 December 1999 on the communicable diseases to be progressively covered by the Community network under Decision No 2119/98/EC of the European Parliament and of the Council. Official Journal, OJ L 28, 03.02.2000, p. 50–53.

[ii] 2003/534/EC: Commission Decision of 17 July 2003 amending Decision No 2119/98/EC of the European Parliament and of the Council and Decision 2000/96/EC as regards communicable diseases listed in those decisions and amending Decision 2002/253/EC as regards the case definitions for communicable diseases. Official Journal, OJ L 184, 23.07.2003, p. 35–39.

[iii] 2007/875/EC: Commission Decision of 18 December 2007 amending Decision No 2119/98/EC of the European Parliament and of the Council and Decision 2000/96/EC as regards communicable diseases listed in those decisions. Official Journal, OJ L 344, 28.12.2007, p. 48–49.

[iv] Commission Decision 2119/98/EC of the Parliament and of the Council of 24 September 1998 setting up a network for the epidemiological surveillance and control of communicable diseases in the Community. Official Journal, OJ L 268, 03/10/1998 p. 1-7.

[v] 2009/547/EC: Commission Decision of 10 July 2009 amending Decision No 2000/57/EC on the early warning and response system for the prevention and control of communicable diseases under the Decision No 2119/98/EC of the European Parliament and of the Council. Official Journal, OJ L 181, 14.07.2009 p. 57-60.

Each year, we observe improvements in the harmonisation of systems, definitions, protocols and data at Member State and EU levels. Nevertheless, data provided by the Member States continue to show a number of inconsistencies. In several situations, the quality and comparability of the data are not optimal, and more work is planned, in conjunction with Member States, to see how best to improve this situation.

This report aims to be consistent with previously published ECDC surveillance reports for 2012 relating to specific diseases and disease groups. However, Member States update their data continually and a number have made specific corrections for this report, including corrections to data reported for earlier years. Accordingly, some minor differences will be seen when comparing the data in this report to previous Annual Epidemiological and disease-specific reports.

Description of methods

Data sources: indicator-based surveillance (disease cases)

All EU Member States and three EEA countries (Iceland, Liechtenstein and Norway) send information at least annually from their surveillance systems to ECDC relating to occurrences of cases of the 52 communicable diseases and health issues under mandatory EU-wide surveillance. Reports are sent according to case definitions established by the EU[i].

Data upload by Member States occurs continually throughout the year. In conjunction with annual ECDC reports for particular diseases or disease groups, and the consolidated annual report, ECDC issues 'data calls,' with specified end dates, to facilitate accurate and up-to-date submission of data for the previous calendar year.

The information submitted by Member States to ECDC is defined through a 'metadataset' for each disease under surveillance. The metadataset includes the case classification for the disease (particularly whether the case is confirmed or probable) according to official case definitions as determined by the European Commission. It also defines the information to be included with each case report. Most data are submitted as anonymised individual case data, but aggregated data are reported by some Member States for some diseases. Countries actively report zero cases for particular diseases, as applicable.

Data are uploaded and validated by the Member States using ECDC's online system for the collection of surveillance data, the European Surveillance System (TESSy). Member States' information specialists transform the data in their surveillance systems into an appropriate format before uploading to TESSy. System reports generated by TESSy allow Member States to review uploaded data and to make modifications where necessary. TESSy performs automatic validation and additional data validation is conducted by ECDC staff, in liaison with designated disease experts and epidemiologists in the Member States. Once the draft report is produced, it is sent to Member States' National Surveillance Coordinators for final validation. Any final corrections are uploaded to TESSy.

For each disease under surveillance, TESSy also holds a description of the key attributes of the surveillance systems for that disease in each Member State. This information is included in the report to aid the interpretation of surveillance data for each reported disease. Member States are asked to verify and update this information each year.

Data sources: event-based surveillance

The report also presents information relating to health threats identified by ECDC through epidemic intelligence activities, from formal and validated informal sources. These threats are documented and monitored by using a dedicated database, called the Threat Tracking Tool (TTT). Data analysed in this report are extracted from the TTT and the EWRS database. The analysis of monitored threats covers the period from the activation of the TTT in June 2005 until the end of 2013; EWRS entries are covered from January 2005 to the end of 2013.

The expression 'opening a threat' refers to the way ECDC assesses threats during its daily threat review meetings. ECDC experts evaluate potential threats and validate events requiring further attention or action from ECDC, based on their relevance to public health or the safety of EU citizens. The following criteria are used to open a threat and further monitor an event:

- more than one Member State is affected
- a disease is new or unknown, even if there are no cases in the EU
- there is a request from a Member State or from a third party for ECDC to deploy a response team
- there is a request for ECDC to prepare a risk assessment of the situation
- there is a documented failure in an effective control measure (vaccination, treatment or diagnosis)
- there is a documented change in the clinical/epidemiological pattern of the disease, including changes in disease severity, mode of transmission, etc.
- the event matches any of the criteria under the International Health Regulations (IHR) or EWRS.

[i] 2002/253/EC: Commission Decision of 19 March 2002 laying down case definitions for reporting communicable diseases to the Community network under Decision No 2119/98/EC of the European Parliament and of the Council. Official Journal, OJ L 86, 03.04.2002, p. 44–62.

Events are considered relevant to be reported to the EWRS if one or more of the criteria below are met. After the revised International Health Regulations (IHR) entered into force on 15 June 2007, the decision was amended, and criteria now include both IHR notifications and the need to exchange details following contact tracing[i].

The Commission Decision on serious cross-border threats to health[ii]; 'lays down rules on epidemiological surveillance, monitoring, early warning of, and combating serious cross border threats to health, including preparedness and response planning related to those activities, in order to coordinate and complement national policies'.

With reference to this Decision, the following criteria are applied for reporting to the EWRS:

- outbreaks of communicable diseases extending to more than one EU Member State
- spatial or temporal clustering of cases of a disease of a similar type if pathogenic agents are a possible cause and there is a risk of propagation between Member States within the Union
- spatial or temporal clustering of cases of disease of a similar type outside the EU if pathogenic agents are a possible cause and there is a risk of propagation to the Union
- the appearance or resurgence of a communicable disease or an infectious agent which may require timely coordinated EU action to contain it
- any IHR notification (also reported through EWRS)
- any event related to communicable diseases with a potential EU dimension necessitating contact tracing to identify infected persons or persons potentially in danger, which may involve the exchange of sensitive personal data of confirmed or suspected cases between concerned Member States.

Data analysis

General principles

All analyses are based on confirmed cases where possible. For some diseases, some Member States do not distinguish confirmed from other cases; in these situations, total case reports from these countries are used in the analyses and the country concerned is identified in a footnote to the summary table. For some diseases (e.g. tuberculosis, Legionnaires' disease), confirmed cases are defined on a specific basis, described in the relevant sections. For other diseases the reporting of only confirmed cases would result in a severe underestimation of the true disease burden, hence both probable and confirmed cases are reported. The 'month' variable used in the seasonality analyses is based on the date that the country chooses as its preferred date for reporting. This could be either date of onset of disease, date of diagnosis, date of notification, or some other date at the country's discretion.

Population data

Population data for the calculation of rates are obtained from Eurostat, the statistical office of the EU. Data for overall calculations are extracted from the Eurostat database 'Demographic balance and crude rates' (DEMO_PJAN). The population as of 1 January of each year is used. Totals per year and per country are available for all countries for 2012. For calculation of age- and gender-specific rates, the data are aggregated into the following age groups for the analyses: 0–4, 5–14, 15–24, 25–44, 45–64 and ≥65 years.

Presentation of analyses

The descriptive epidemiology for each disease is set out as a summary table by country and supplementary figures describing overall epidemiology at EU/EEA level. These include the trend for reported confirmed cases from 2007–12, age- and gender-specific rates, and occurrence by month ('seasonality'), if relevant. Additional graphs, figures and maps are used where necessary to illustrate other important aspects of the disease epidemiology in the EU and EEA.

Summary table

The summary table for each disease indicates whether the country data were reported from a surveillance system with national or lesser geographical area of coverage. The table also indicates what type of data the country submitted: case based ('C'), aggregated ('A') data or data submitted to a disease-specific network ('D').

[i] Commission Decision of 10 July 2009 amending Decision No 2000/57/EC on the early warning and response system for the prevention and control of communicable diseases under the Decision No 2119/98/EC of the European Parliament and of the Council, in Official Journal of the European Union. 2009. p. L 181: 57-9.

[ii] Commission Decision 1082/2013/EU, of 5th November 2013 of the European Parliament and the Council of 22 October 2013 on serious cross-border threats to health.in Official Journal of the European Union 2013.p.L293:1-15.

This table presents an overview of the number and rates (including age-standardised rates) of confirmed cases or total cases depending on the disease reported by the Member States surveillance systems for the period 2008–12. The total number of reported cases (independent of case classification) for 2012 is also shown. Confirmed case rates are given per 100 000 persons (the number of reported confirmed cases divided by the official Eurostat estimate of the population for that year multiplied by 100 000). Countries that made no report for a disease are excluded from the calculation for overall European rates for that disease. Country reports from systems with less than national coverage (e.g. where only some regions of the country report nationally) are also excluded from calculation of overall EU case rates.

Age-standardised rates (ASR) are calculated to facilitate comparisons between countries by adjusting for differences with respect to certain underlying population characteristics such as age. ASRs were calculated when the EU/EEA rate exceeds 1 per 100 000 population and are given per 100 000 persons. ASRs were calculated using the direct method according to the following formula:

$$ASR = \frac{\sum_{i=1}^{6} (r_i p_i)}{\sum_{i=1}^{6} p_i}$$

where r_i is the specific rate for the age group i in the population being studied, and p_i is the population of age group i in the standard population. The standard population considered in this report was based on the average population of the EU27 Member States for the period 2001–2010 (Table). This standard population was defined to reflect the current age structure of Europe.

Age group	Standard population
0–4	25 506 062
5–14	54 043 285
15–24	62 075 051
25–44	143 411 393
45–64	124 427 054
65+	81 889 316
Total	**491 352 161**

Aspects of descriptive epidemiology at EU/ EEA level

The descriptive epidemiology for each disease for the EU and EEA region overall is described as follows:

Trends in reported number of confirmed cases. The number of confirmed cases by month, 2008–12, for the EU/EEA is presented as a figure. Countries with consistent reporting of cases or zero cases for the whole five-year period are included. The figure also shows a centred 12-month moving average to show the overall trend by smoothing seasonal and random variations.

Age- and gender-specific rates for confirmed cases. Age- and gender-specific rates for the EU/EEA Member States are presented and given per 100 000 persons. It should be noted that these analyses are based only on cases for which both age and gender were reported. For some diseases this can result in exclusion of a significant proportion of cases, and the overall EU and EEA rate will be underestimated. The denominator includes the sum of the populations within the respective age–gender groups, including countries which actively reported zero cases.

Seasonal distribution of cases. For diseases where reported occurrence varies by month, a figure showing the seasonality is presented. This shows the total number of confirmed cases reported for each month in 2012, compared with the maximum, minimum and average number of cases observed for each month for the period 2008–12. These analyses include only cases for which the month of reporting is given; for some diseases this can result in exclusion of significant numbers of cases.

It will be noted that for some diseases reported numbers are too small for some or all of the above analyses to be presented.

Data protection

The data received in TESSy from Member States are subject to Regulation (EC) No 45/2001 of the European Parliament and of the Council of 18 December 2000, providing for 'the protection of individuals with regard to the processing of personal data by the Community institutions and bodies, and on the free movement of such data.' High standards of data protection consistent with these requirements are applied, supervised by the ECDC Data Protection Officer (DPO). ECDC data protection arrangements are also under the review of the European Data Protection Supervisor.

Data are made available on request to other European Agencies, Institutions and approved researchers, under procedures in accordance with the above requirements, approved by the ECDC Management Board.

Respiratory tract infections

Influenza (including animal influenza) and other respiratory viruses

Seasonal influenza

- In countries within the European Union/European Economic Area (EU/EEA) influenza virus circulated for as long as in previous seasons, although in a number of countries circulation continued for longer.
- During the 2012–2013 season, the percentage of sentinel specimens positive for influenza was much higher than in previous seasons.
- Overall, influenza A and B viruses circulated almost equally in Europe, but their proportions varied substantially from country to country.
- Of the sentinel influenza A viruses subtyped, 62% were A(H1N1)pdm09, and of the B viruses ascribed to lineage, 90% were Yamagata and 10% Victoria.
- Of A(H1N1)pdm09 viruses tested, very few carried the mutation associated with reduced inhibition by oseltamivir.
- Vaccine effectiveness was considered to be moderate or low.
- Vaccination coverage in the older age groups has been declining since 2008 in most EU countries.
- Influenza A viruses were more prevalent in hospitalised severe cases than in patients from primary care settings.
- In 14 reporting countries, excess all-cause mortality possibly related to influenza was at higher levels among older people than in the past three winters.

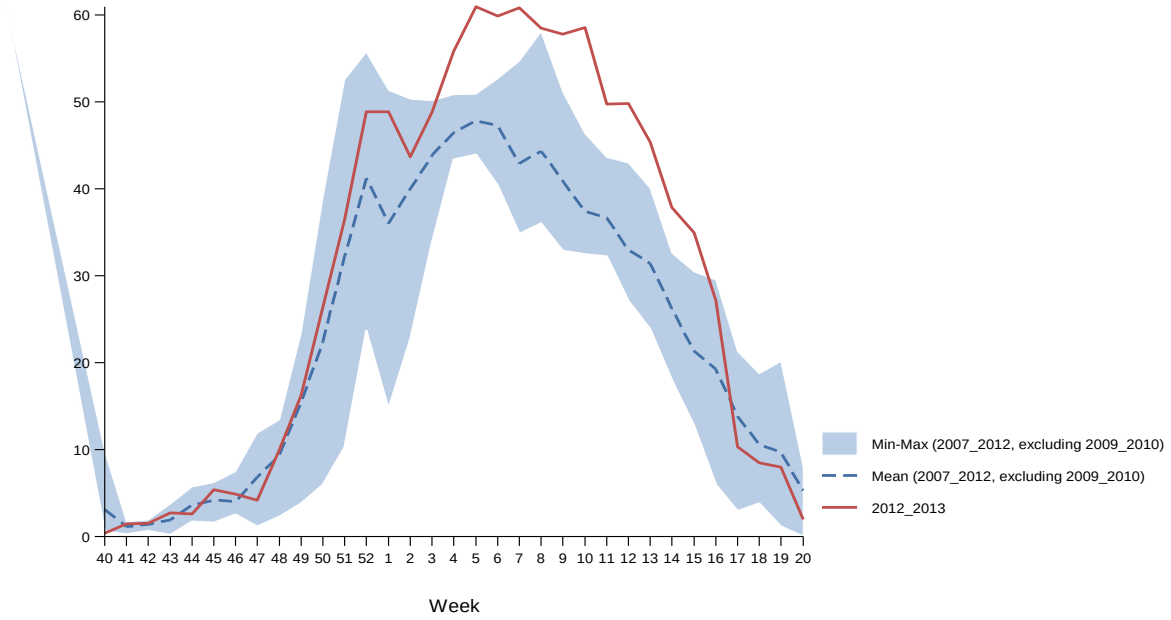
Background

Influenza is a respiratory infection caused by two types of human influenza viruses, A and B. Seasonal epidemics occur every winter in countries with a temperate climate. Emergence and dominance of circulating viruses are variable and unpredictable. In addition, frequent mutations in the surface sites of the viruses, called 'antigenic drift', may alter protection induced by previous infection or immunisation, explaining the need to regularly adapt the composition of the seasonal influenza vaccine. The latter is the main preventive measure and is essentially recommended to subpopulations at risk of severe complications (i.e. persons with impaired immunity or with underlying conditions).

Epidemiological situation (week 40/2012 to week 20/2013)

Influenza activity started in early December in France, Ireland and the UK, peaked in other European countries without any particular geographic pattern and subsided in Portugal and Romania at the end of April. Influenza virus circulation, best measured by the percentage of specimens positive for influenza in sentinel practices, lasted as long as in previous seasons, but the intensity was higher (Figure 1). Children aged 0–4 and 5–15 years were the most affected age groups.

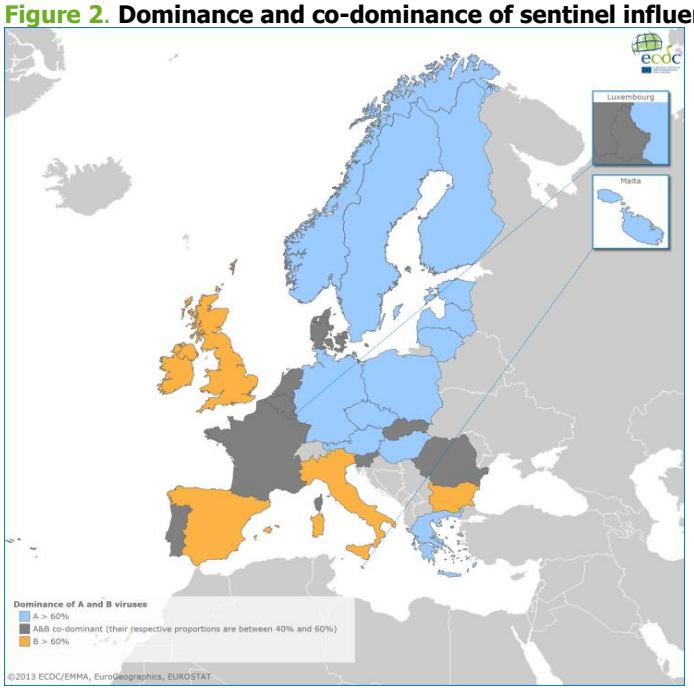
Figure 1. Weekly percentage of sentinel specimens positive for influenza, EU/EEA, 2012–2013 and average for 2007–2011 seasons with upper and lower ranges (excluding pandemic season 2009–2010)



Virology

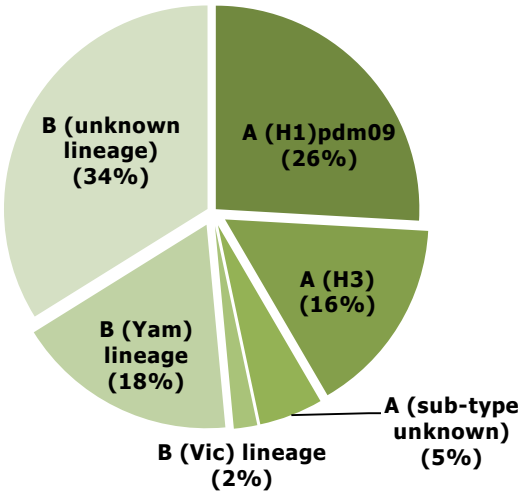
Overall, in Europe, influenza A and B viruses circulated almost equally, accounting for 47% and 53% of sentinel specimens, respectively. However, these proportions varied substantially across countries, with influenza A viruses dominating in 13 countries in central and northern Europe and B viruses dominating in five countries. In the nine remaining countries, the two viruses were co-dominant (Figure 2). In countries with the longest duration of influenza activity, a first peak of influenza A was followed by a second peak of influenza B.

Figure 2. Dominance and co-dominance of sentinel influenza A and B viruses, EU/EEA, 2012–2013



In total, 62% of the sentinel influenza A viruses subtyped were A(H1N1)pdm09, accounting for at least 50% of A viruses in 21 countries while A(H3N2) virus dominated in only five countries. Of the B viruses ascribed to lineage, 90% were Yamagata and 10% Victoria (Figure 3). The vast majority of A(H3N2) and B (Yamagata) viruses from 23 EU countries were antigenically similar to strains included in the influenza vaccine for the 2012–2013 season. However, genetic drift of some circulating A(H1N1)pdm09 and A(H3N2) viruses from vaccine strains was identified [1].

Figure 3. Proportions of sentinel influenza virus detections by type, subtype and lineage, EU/EEA, 2012–2013 (n=15 397)



Antiviral resistance

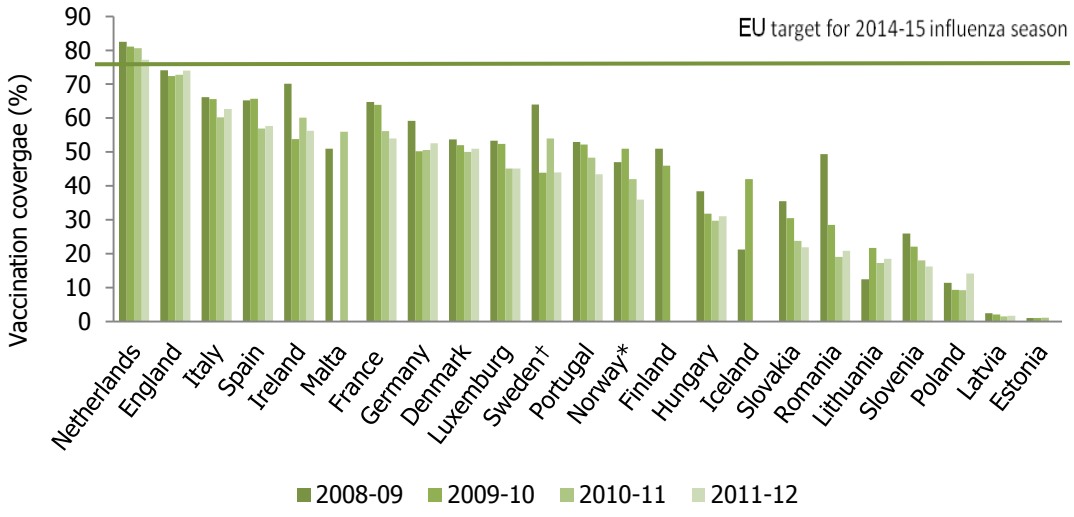
Ten EU countries submitted 975 influenza A and 399 influenza B viruses for antiviral susceptibility testing. Eleven (2%) of the 612 A(H1N1)pdm09 viruses tested carried the mutation associated with reduced inhibition by oseltamivir and one by zanamivir. In addition, one type B virus showed reduced inhibition by oseltamivir.

Vaccine effectiveness and vaccination coverage

Observational studies have provided divergent estimates of vaccine effectiveness: 51% against laboratory-confirmed influenza in the UK and 90% in the Netherlands. Another study conducted in five EU networks has shown a moderate vaccine effectiveness against all influenza types of 50% (CI:-21 to 80%) [2,3,4].

Only one EU country met the EU target of 75% vaccination coverage in the older age groups, but this percentage in this country has been slightly declining since 2008 (Figure 4). A similar decline over time was observed in most EU countries during the same period [5].

Figure 4. Reported seasonal influenza vaccination coverage in the older population (≥ 65 years) across 23 EU/EEA Members States during four seasons, 2008–2012 (annual VENICE survey)



† Sweden - reports were only received for around 60% of the population for the 2009–2010 influenza season.

* Norway - coverage results calculated for those >65 years and clinical risk groups together.

Hospitalised laboratory-confirmed influenza cases

Eight countries reported 3 388 hospitalised laboratory-confirmed influenza cases, including 224 related deaths reported by six countries. Compared to influenza B viruses, the proportion of A viruses in hospitalised cases was significantly higher than in primary care settings in the same eight countries. In addition, the proportion of hospitalised cases infected with A(H1N1)pdm09 was significantly higher in patients under 65 years of age than in older patients (≥ 65 years). Of patients with known vaccination status, 16% were vaccinated, and a similar percentage was observed in fatal cases.

Mortality associated with influenza

Winter all-cause mortality data collected weekly by 14 EU countries (EUROMOMO project) showed excess mortality levels higher than those seen in the past three winters among older people. These excess deaths were possibly related to influenza, but other factors might have contributed [6].

Conclusion

The 2012-2013 influenza season lasted as long as previous seasons but was particularly long in a number of EU/EEA countries. A heterogeneous distribution of influenza viruses was observed across Europe, with a higher proportion of sentinel specimens positive for influenza than in previous seasons. In countries reporting severe influenza cases, the prevalence of influenza A viruses was much higher than in primary care settings. Vaccine effectiveness estimated by different studies was considered low or moderate. Influenza vaccine coverage in older people has been declining continuously in most EU countries since 2008. Excess all-cause mortality in the elderly possibly associated with influenza was reported by 14 countries.

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Avian and swine influenza

Avian and swine influenza in humans

Avian influenza A(H7N7)

In 2013, one outbreak of highly pathogenic avian influenza (HPAI) A(H7N7) in five commercial poultry holdings and one backyard farm in the Emilia-Romagna region were reported by the Italian authorities. Active surveillance identified three humans with conjunctivitis due to A(H7N7). The infected persons had been working in an affected farm or participated in the culling. After the eye swabs were found to be positive, the infected workers were isolated at home. The cases with conjunctivitis recovered after five-to-six days without complications. One case had chills and muscle aches in addition to conjunctivitis. No human-to-human transmission was reported. ECDC published an epidemiological update [2].

Avian influenza A(H7N9)

On 31 March 2013, Chinese authorities announced the identification of a novel reassortant A(H7N9) influenza virus isolated from three unconnected fatal cases of severe respiratory disease in the Shanghai and Anhui provinces. In the following months, the outbreak affected 13 areas of China including Taiwan, and resulted in 148 cases of human infection including 48 deaths (case fatality rate = 32%) in 2013 [3]. Most cases had developed severe respiratory disease. Subtyping and sequence analysis revealed low pathogenic avian origin of this new virus which differs genetically from A(H7) and A(N9) viruses detected in Europe and elsewhere. This was the first time human infection with low pathogenic avian influenza A(H7N9) virus was identified and associated with a fatal outcome in humans.

The Chinese health authorities responded to this public health event with enhanced surveillance, epidemiological and laboratory investigation and contact tracing. The animal health sector intensified investigations into the possible sources and reservoirs of the virus. The authorities reported to the World Organization for Animal Health (OIE) that avian influenza A(H7N9) was detected in samples from pigeons, chickens and ducks and in environmental samples from live bird markets ('wet markets') [4]. The closing of markets and culling of poultry in affected areas resulted in a reduction of human cases. The mode of transmission to humans and the spectrum of disease are not yet fully understood. Zoonotic transmission from poultry to humans is the most likely scenario and association with wet markets has been considered. Sustained person-to-person transmission has not been observed.

ECDC published a rapid risk assessment on 3 April 2013 [5] and two subsequent updates on 12 April and 8 May 2013 [6,7]. A case detection algorithm and an EU case definition have been developed and shared with EU Member States and a study on lab diagnostic capabilities has been performed (unpublished). ECDC guidance to support diagnostic preparedness for detection of avian influenza A(H7N9) viruses in Europe was published on 24 April 2013 [8].

Influenza A(H10N8)

On 17 December 2013, one human case of influenza A(H10N8) virus was reported by the authorities in Jiangxi province in China. The 73-year-old female with multiple underlying medical conditions was admitted to hospital on 30 November 2013 and died on 6 December 2013. According to local authorities, she had visited a local live poultry market shortly before illness onset [9-12].

Influenza A(H6N1)

In May 2013, the first human case of influenza A(H6N1) was reported in Taiwan. The case was a healthy 20-year-old woman who developed shortness of breath and persistent fever and was diagnosed with an acute lower respiratory tract infection after detection of bilateral infiltrates on radiographic examination of her thorax. She was admitted to hospital for a few days and treated with antiviral and antibiotic medication, after which she was discharged. Tracing of 36 contacts and 12 healthcare workers involved in treatment of the patient did not identify additional cases [13].

Swine influenza A(H3N2)v

In 2011, a triple-reassortant A(H3N2) variant swine influenza virus, containing one surface protein (M2) of the A(H1N1)pdm09 virus was detected in humans in the United States. By 1 October 2013, the US Centers for Disease Control and Prevention had reported 18 human cases from four US States including one hospitalisation. This was a decrease in the total of reported cases as well as a lower number of States reporting cases than in 2012. Infection was mostly associated with exposure to pigs at agricultural fairs. So far A(H3N2)v viruses have neither been detected in humans nor in pigs in Europe [14-16].

Avian influenza in poultry and wild birds

Since 1996, strains of highly pathogenic avian influenza, mainly A(H5N1) and to a lesser extent A(H7), have continued to cause outbreaks in bird populations. In 2013, one outbreak of highly pathogenic A(H7N7) was reported in five commercial poultry holdings and one backyard farm in Italy, with three cases of documented avian-to-human transmission. In 2013, outbreaks of highly pathogenic avian influenza due to subtype A(H5N1) were reported from Bangladesh, Bhutan, Cambodia, China, India, North Korea and Nepal. Other highly pathogenic influenza virus outbreaks were reported from Taiwan and South Africa (H5N2), Australia (H7N7) and Mexico (H7N3) [17]. Antibodies against influenza H10 and N8 or A(H10N8) viruses have been found in different bird species, mostly migrating birds and water fowls, around the world [18-21]. Before the occurrence of the human cases, only two A(H10N8) viruses with low pathogenicity in chicken had been reported in China: one environmental isolate from a water sample in Hunan province, China, in 2007, and one from a duck at a live poultry market in Guangdong Province in southern China in January 2012 [19,22]. Viruses from wild birds may have been transmitted to poultry in live bird markets [19]. Live bird markets seem to be the focus for dissemination of avian influenza virus among the different bird species and a source of human infections [23,24].

Conclusion

Avian-to-human transmission of influenza was well documented in 2013. Highly pathogenic avian influenza viruses remain a concern for human health in Europe because of the continuing genetic evolution; the risk of genetic re-assortment with influenza viruses better adapted to and transmissible among humans and close human contact with infected birds. The emergence of new avian influenza viruses, as seen recently with A(H7N9) and A(H10N8), having the potential to infect humans and cause severe disease with high mortality underlines the importance of surveillance for both humans and animals.

To be better prepared for a new pandemic arising from any of these new strains, WHO has published a list of candidate vaccines for clinical trials [25,26].

Severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS) coronaviruses

SARS - epidemiological situation in 2012 and 2013

Severe acute respiratory syndrome (SARS) is a respiratory disease in humans caused by the SARS coronavirus (SARS-CoV). In 2002–2003, an epidemic originating in Foshan, Guangdong Province, China, spread globally with over 8 000 cases reported in eight months from 33 countries on five continents, 21%of which were healthcare workers. The case-fatality rate was about 10%. The last known community case occurred in USA in July 2003, but another localised SARS-related crossover from animals occurred in 2004 [27]. The incomplete knowledge of the epidemiology and ecology of SARS coronavirus infection, the unpredictable risks of re-emergence and the rapid spread of SARS worldwide were the driving forces for maintaining surveillance, despite an absence of the disease since 2003.

Ongoing surveillance of human SARS cases in 29 EU and EEA countries (no reports from Liechtenstein) revealed no reports in 2012 and 2013. Since 2003 there have been no reports of any SARS virus infection in humans worldwide.

MERS - epidemiological situation 2012 and 2013

On 13 June 2012, a previously healthy 60-year-old man was admitted to a hospital in Saudi Arabia with respiratory symptoms [28]. The cause of this fatal respiratory disease was subsequently identified as a new coronavirus that has been named Middle East respiratory syndrome coronavirus (MERS-CoV). It belongs to lineage C within the *Betacoronavirus* genus (*Coronavirinae* subfamily), along with several viruses detected in bats in Europe and China [29]. Retrospective investigations revealed that cases of this disease had already occurred in a cluster of hospital-associated cases in Jordan in April 2012 [30]. Nine cases were reported in 2012, six of which died by the end of the year. In 2013, national health authorities reported 177 confirmed MERS-CoV cases including 74 with fatal outcome (case-fatality ratio=42%). Distribution of cases by place of reporting: Jordan (two cases/two deaths); Saudi Arabia (141 cases/ 57 deaths); Germany (two cases/one death); UK (four cases/three deaths); France (two cases/one death); Tunisia (three cases/one death); Italy (one case/no deaths); United Arab Emirates (11 cases/three deaths); Qatar seven cases/four deaths); Oman (two cases/two deaths) and Kuwait (two cases/no deaths).

All nine European cases can be traced to the Middle East (Jordan, Saudi Arabia and United Arab Emirates). Three primary cases were medically evacuated from the Middle East for specialised treatment in Europe. Three other cases were patients who had been traveling in the Middle East and were hospitalised after developing symptoms while in Europe; one case was a nosocomial contact of a hospitalised patient and the last two were close contacts of primary cases [31-36]. Of these nine cases, five died. Studies provide some evidence that MERS-CoV might be a zoonotic disease [37-39]. The virus has been detected in dromedary camels and bats indicating a potential role of these species in the transmission or as animal reservoir. [40,41]

The emergence of MERS-CoV revealed the importance of close collaboration between laboratories in promptly arranging capacity for detection and characterisation, and of appropriate biosafety measures using lessons learnt from the SARS outbreak in 2002–2003 [28,42-46]. The results of an ECDC-coordinated survey on laboratory capacity for testing MERS-CoV in Europe were published in Eurosurveillance [46].

Five interim case definitions have been published by WHO so far [47-50]. ECDC published a rapid risk assessment on 26 September 2013 [51], with eight subsequent updates, the most recent on 7 November 2013 [52], public health developments and epidemiological updates [53].

Conclusion

SARS-CoV is believed to have been an animal virus that recently crossed the species barrier to infect humans. Bats have been identified as potential reservoir hosts of coronaviruses associated with SARS [54]. The SARS outbreak illustrated the importance of sensitive detection tools in the preparedness for and response to emerging health threats. Other key preparedness activities include advance planning, communication, education and training, and stockpiling supplies of personal protective equipment [55-57]. The emergence in 2012 of a novel coronavirus in humans in the Middle East associated with early detection of imported cases to Europe showed that SARS and related viruses need to be closely monitored worldwide and capacity needs to be maintained to respond accordingly.

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Legionnaires' disease

- Legionnaires' disease remains an uncommon, mainly sporadic respiratory infection with low notification rates in EU and EEA countries (overall 1.1 per 100 000 inhabitants).
- Six countries: Italy, France, Spain, Germany, the United Kingdom and the Netherlands accounted for 84% of all notified cases.
- One large outbreak occurred in Warstein (Germany), with approximately 160 cases recorded.
- Regular checks for *Legionella* and appropriate control measures in man-made water systems may prevent a significant proportion of Legionnaires' disease cases.

Legionnaires' disease is a pneumonia often associated with systemic symptoms and caused by gram-negative bacteria, *Legionella* spp., which are found in freshwater environments worldwide [1]. Humans are infected by inhalation of aerosols containing *Legionella* bacteria, which may result in severe pneumonia with a fatal outcome. Outbreaks commonly arise from contaminated man-made water systems e.g. cooling towers. Cases of Legionnaires' disease are mainly reported in persons in older age groups, especially males.

Epidemiological situation in 2012

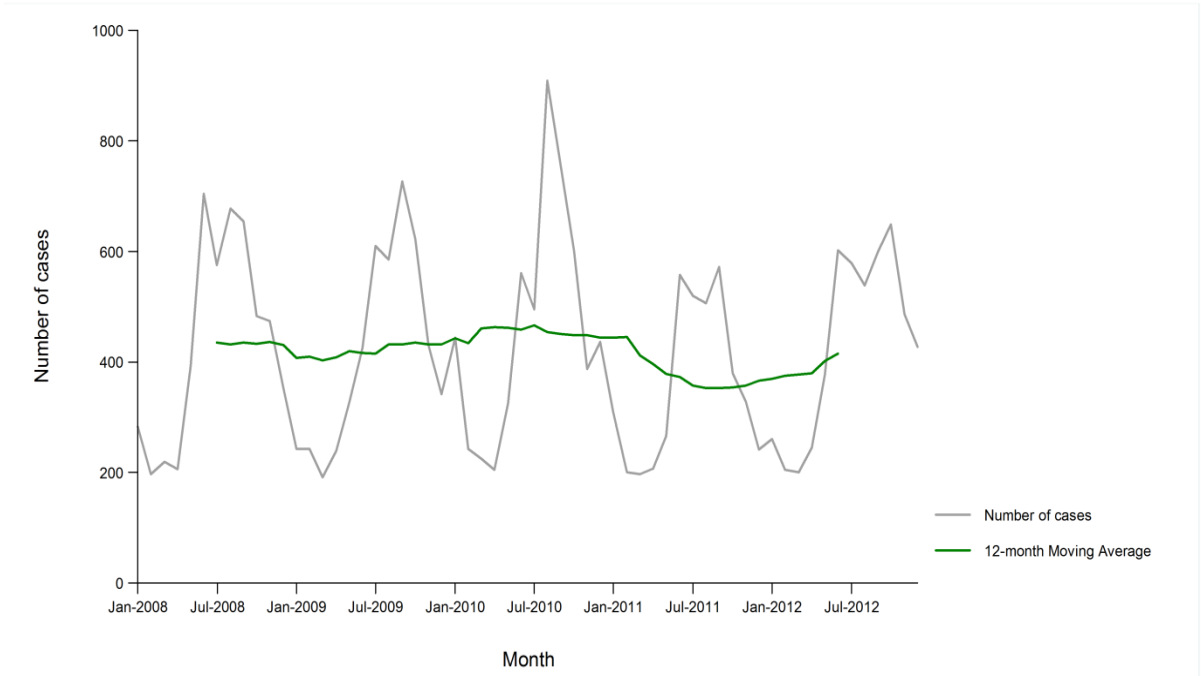
In 2012, 5 856 cases were reported by 30 countries. Six countries (Italy, France, Spain, Germany, the United Kingdom and the Netherlands) in descending order of magnitude, accounted for 84% of all notified cases (Table 1). The overall notification rate was 1.1 per 100 000 inhabitants, remaining at the same level as in previous years (2008–2011). Very few cases were reported by eastern European countries such as Bulgaria, Poland or Romania. With the notable exception of an August peak in 2010, the average monthly number of reported cases has remained stable over the past five years (Figure 5). As in previous years, most cases were community-acquired (69%) while 20% were travel-associated, 8% were associated with healthcare facilities and 3% were associated with other settings. Of 4 149 cases with known outcome, 419 were reported to have died, giving a case fatality ratio (CFR) of 10%.

Table 1. Number and rates of Legionnaires' disease reported cases, EU/EEA, 2008–2012

Country	2012						2011		2010		2009		2008	
	National data	Report type	Total cases	Confirmed cases & rates			Confirmed cases & rates		Confirmed cases & rates		Confirmed cases & rates		Confirmed cases & rates	
				Cases	Crude rate	Std rate	Cases	Crude rate	Cases	Crude rate	Cases	Crude rate	Cases	Crude rate
Austria	Y	C	104	97	1.15	1.09	74	0.88	76	0.91	83	0.99	97	1.17
Belgium	Y	C	106	85	0.77	0.47	72	0.66	89	0.82	64	0.60	0	0.00
Bulgaria	Y	C	0	0	0.00	0.00	0	0.00	1	0.01	2	0.03	1	0.01
Cyprus	Y	C	7	7	0.81	0.97	1	0.12	2	0.24	3	0.38	9	1.16
Czech Republic	Y	C	56	53	0.51	0.49	50	0.48	28	0.27	11	0.11	13	0.13
Denmark	Y	C	127	90	1.61	1.57	79	1.42	99	1.79	100	1.81	103	1.88
Estonia	Y	C	3	3	0.23	0.24	7	0.52	0	0.00	6	0.45	7	0.52
Finland	Y	C	10	4	0.07	0.07	9	0.17	10	0.19	8	0.15	5	0.09
France	Y	C	1298	1268	1.94	1.92	1150	1.77	1508	2.33	1181	1.84	1205	1.88
Germany	Y	C	628	454	0.56	0.49	468	0.57	550	0.67	378	0.46	406	0.50
Greece	Y	C	29	29	0.26	0.24	18	0.16	9	0.08	15	0.13	26	0.23
Hungary	Y	C	33	23	0.23	0.22	19	0.19	19	0.19	14	0.14	20	0.20
Ireland	Y	C	15	15	0.33	0.42	6	0.13	11	0.25	7	0.16	9	0.20
Italy	Y	C	1332	1307	2.20	1.92	990	1.63	1188	1.97	1159	1.93	1143	1.92
Latvia	Y	C	48	16	0.78	0.78	19	0.92	6	0.28	3	0.14	5	0.23
Lithuania	Y	C	9	9	0.30	0.31	2	0.07	1	0.03	0	0.00	2	0.06
Luxembourg	Y	C	5	4	0.76	0.82	6	1.17	10	1.99	5	1.01	4	0.83
Malta	Y	C	4	4	0.96	0.93	9	2.17	6	1.45	5	1.22	2	0.49
Netherlands	Y	C	304	265	1.58	1.55	266	1.60	412	2.49	214	1.30	309	1.88
Poland	Y	C	8	5	0.01	0.01	8	0.02	6	0.02	4	0.01	6	0.02
Portugal	Y	C	140	132	1.25	1.18	88	0.85	125	1.21	93	0.90	91	0.88
Romania	Y	C	3	3	0.02	0.02	0	0.00	1	0.01	1	0.01	1	0.01
Slovakia	Y	C	4	0	0.00	0.08	6	0.11	4	0.07	1	0.02	5	0.09
Slovenia	Y	C	81	81	3.94	3.74	44	2.15	50	2.44	61	3.00	44	2.19
Spain	Y	C	972	968	2.07	1.99	701	1.50	1142	2.46	1205	2.61	1220	2.67
Sweden	Y	C	102	77	0.81	0.77	83	0.88	87	0.93	114	1.23	153	1.67
United Kingdom	Y	C	401	376	0.60	0.59	243	0.39	369	0.59	374	0.61	394	0.64
EU Total	**-**	**-**	**5829**	**5375**	**1.07**	**1.01**	**4418**	**0.88**	**5809**	**1.16**	**5111**	**1.03**	**5280**	**1.07**
Iceland	Y	C	2	2	0.63	0.66	3	0.94	2	0.63	6	1.88	2	0.63
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Norway	Y	C	25	20	0.40	0.41	28	0.57	43	0.89	32	0.67	35	0.74
EU/EEA Total	**-**	**-**	**5856**	**5397**	**1.07**	**1.00**	**4449**	**0.88**	**5854**	**1.16**	**5149**	**1.02**	**5317**	**1.06**

Source: Country reports; Y: Yes; N: No; A: Aggregated data report; C: Case-based data report; –: No report; U: Unspecified.

Figure 5. Distribution of confirmed Legionnaires' disease reported cases, EU/EEA, 2008–2012

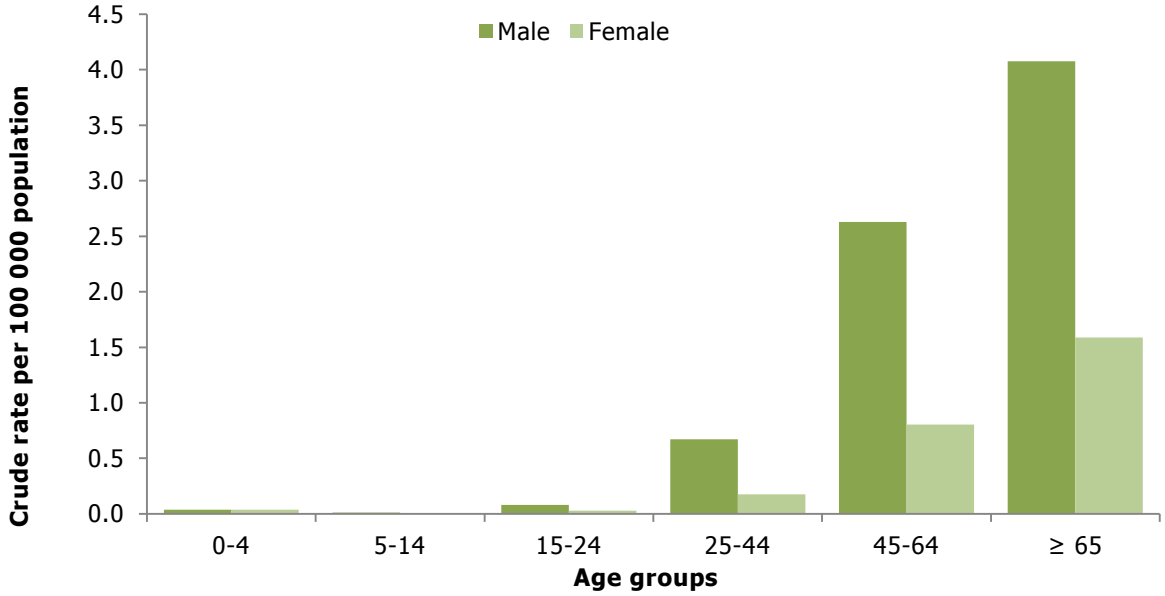


Source: Country reports from Austria, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Malta, Netherlands, Norway, Poland, Slovakia, Slovenia, Spain, Sweden and United Kingdom.

Age and gender distribution

In 2012, people aged 65 years and older accounted for 2 386 (44%) of 5 399 cases with known age. The male-to-female ratio was 2.5:1. Notification rate increased with age, from < 0.1 per 100 000 in those under 25 years of age to 2.6 in persons aged 65 years and above (4.1 per 100 000 in males and 1.6 in females) (Figure 6).

Figure 6. Rates of confirmed Legionnaires' disease, reported cases by age and gender, EU/EEA, 2012

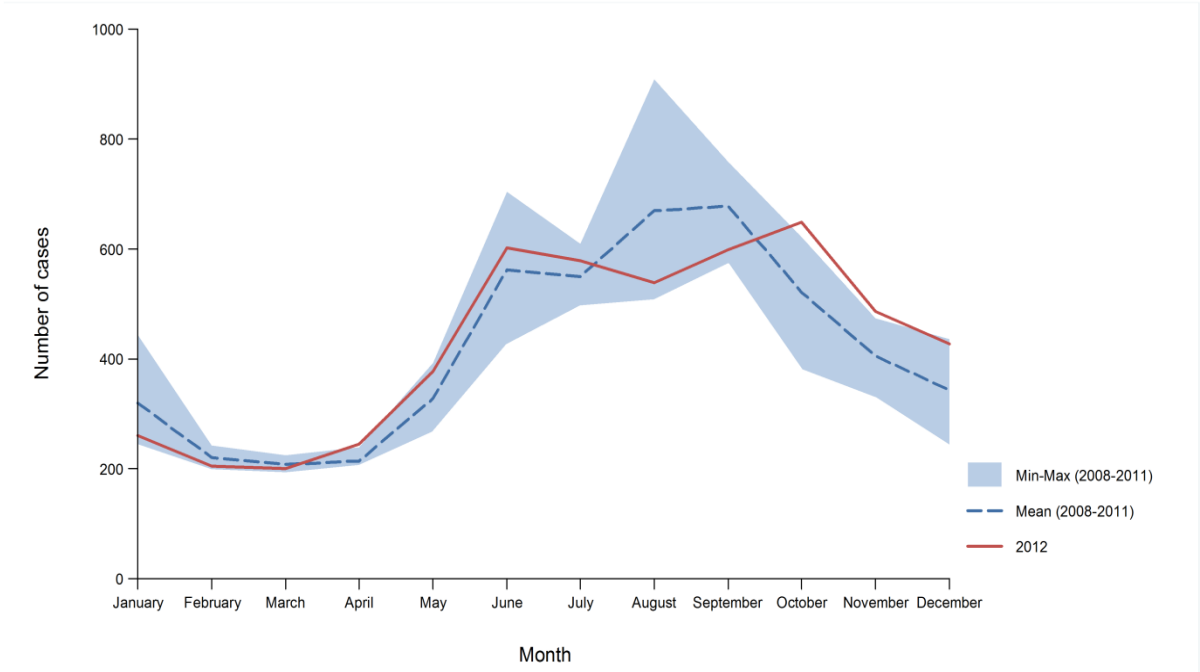


Source: Country reports from Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom.

Seasonality

The distribution of cases by month of onset showed a peak in summer, with 57% of all cases having a date of onset between June and October (Figure 7).

Figure 7. Seasonal distribution of Legionnaires' disease reported cases, EU/EEA, 2008–2012



Source: Country reports from Austria, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Malta, Netherlands, Norway, Poland, Slovakia, Slovenia, Spain, Sweden and United Kingdom.

Enhanced surveillance in 2012

In addition to retrospective surveillance of Legionnaires' disease, the European Legionnaires' Disease Surveillance Network (ELDSNet) conducts daily surveillance of travel-associated cases. In 2012, 831 travel-associated cases were reported, which was 9% more than the number of cases reported in 2011 [2,3]. Ninety-nine new travel-associated clusters[i] were notified in 2012. In 44% of these clusters, the first two reported cases were from different countries, and the clusters were therefore unlikely to have been detected without ELDSNet. *Legionella* was found in 56 environmental cluster investigations. One of the 99 accommodation sites associated with clusters had its name published on the ECDC website due to unsatisfactory control measures.

Updates from epidemic intelligence in 2013

Between 1 January and 14 October 2013, ECDC monitored three threats related to Legionnaires' disease. In April 2013, a travel-associated rapidly evolving cluster[ii] comprising three cases associated with the same hotel in Almeria, Spain was reported through ELDSNet. In August, a large outbreak of approximately 160 community-acquired cases was reported in Warstein, Germany. Investigations pointed at cooling towers as the source of infection. ECDC also monitored a rapidly evolving cluster of seven travel-associated cases in Sardinia, Italy through ELDSNet.

Discussion

Following two unusual years, 2010 and its notable August–September peak and 2011 with its relatively low notification rate, 2012 was an average year for the epidemiology of Legionnaires' disease in Europe. At 1.1 cases per 100 000 population, the notification rate in 2012 was well within the 2008–2011 range. The demographics of cases, the seasonality and the distribution of probable settings of infection were all very similar to what has been observed in previous years. It is still not entirely clear if the variations observed over the years are merely random fluctuations or are due to external factors, the most likely being environmental conditions more favourable to *Legionella* spp [4,5]. Again, the number of cases reported in eastern European countries remains far below what would be expected.

[i] A cluster is defined as two or more cases that stayed at the same accommodation site in the two to ten days before onset of illness and whose onsets were within the same two-year period.
[ii] A rapidly evolving cluster is defined as at three or more cases with dates of onset within a period of three months during the last six months.

The number of travel-associated Legionnaires' disease cases notified in 2012 was also within the range observed in previous years. With 44% of notified clusters unlikely to have been detected without ELDSNet, the daily surveillance of travel-associated cases continues to add European public health value.

Regular checks for the presence of *Legionella* bacteria and appropriate control measures in man-made water systems may prevent cases of Legionnaires' disease at tourist accommodation, in hospitals, long-term healthcare facilities or other settings which host an important population at higher risk [6]. However, sporadic community-acquired cases, which represent the majority of cases, cannot be easily prevented because sources are seldom identified, especially in rural settings. With an ageing European population, the number of cases is expected to rise in the coming years.

Surveillance systems overview

Country	Data source	Compulsory (Cp)/Voluntary (V)/Other(O)	Comprehensive (Co)/Sentinel (Se)/Other(O)	Active (A)/Passive (P)	Case-Based (C)/Aggregated (A)	Data reported by				National coverage	Case definition used
						Laboratories	Physicians	Hospitals	Others		
Austria	AT-Epidemiegesetz	Cp	Co	P	C	Y	Y	Y	Y	Y	EU-2008
Belgium	BE-FLA_FRA_LABNET_REFLAB	Cp	O	A	C	Y	Y	Y	-	Y	Not specified/unknown
Bulgaria	BG-NATIONAL_SURVEILLANCE	Cp	Co	P	A	Y	Y	Y	Y	Y	EU-2008
Cyprus	CY-NOTIFIED_DISEASES	Cp	Co	P	C	N	Y	N	N	Y	EU-2008
Czech Republic	CZ-EPIDAT	Cp	Co	A	C	N	Y	Y	N	Y	EU-2008
Denmark	DK-MIS	Cp	Co	P	C	N	Y	N	N	Y	Other
Estonia	EE-LEGIONELLOSIS	Cp	Co	P	C	Y	Y	Y	Y	Y	EU-2008
Finland	FI-NIDR	Cp	Co	P	C	Y	Y	N	N	Y	Not specified/unknown
France	FR-MANDATORY_INFECTIOUS_DISEASES	Cp	Co	P	C	Y	Y	Y	Y	Y	Not specified/unknown
Germany	DE-SURVNET@RKI-7.1	Cp	Co	P	C	Y	N	N	Y	Y	Other
Greece	GR-NOTIFIABLE_DISEASES	Cp	Co	P	C	Y	Y	Y	N	Y	EU-2008
Hungary	HU-EFRIR	Cp	Co	P	C	Y	Y	Y	N	Y	EU-2008
Iceland	IS-SUBJECT_TO_REGISTRATION	Cp	Co	P	C	Y	Y	Y	N	Y	EU-2008
Ireland	IE-CIDR	Cp	Co	P	C	Y	Y	Y	N	Y	EU-2012
Italy	IT-LEGIONELLOSIS	Cp	Co	P	C	N	Y	Y	N	Y	Other
Latvia	LV-BSN	Cp	Co	P	C	Y	Y	Y	Y	Y	EU-2012
Lithuania	LT-COMMUNICABLE_DISEASES	Cp	Co	P	C	Y	Y	N	N	Y	EU-2008
Luxembourg	LU-SYSTEM1	Cp	Co	P	C	N	Y	N	N	Y	EU-2002
Malta	MT-DISEASE_SURVEILLANCE	Cp	Co	P	C	Y	Y	Y	Y	Y	EU-2008
Netherlands	NL-OSIRIS	Cp	Co	P	C	Y	Y	N	N	Y	EU-2008
Norway	NO-MSIS_A	Cp	Co	P	C	Y	Y	Y	N	Y	EU-2012
Poland	PL-NATIONAL_SURVEILLANCE	Cp	Co	P	C	Y	Y	Y	N	Y	Other
Portugal	PT-LEGIONELLOSIS	Cp	Co	P	C	Y	Y	N	N	Y	EU-2008
Romania	RO-RNSSy	Cp	Co	P	C	N	N	Y	N	Y	EU-2008
Slovakia	SK-EPIS	Cp	Co	A	C	Y	Y	Y	N	Y	EU-2008
Slovenia	SI-SURVIVAL	Cp	Co	P	C	Y	Y	Y	N	Y	EU-2008
Spain	ES-STATUTORY_DISEASES	Cp	Co	P	C	N	Y	Y	N	Y	EU-2008
Sweden	SE-SMINET	Cp	Co	P	C	N	Y	N	N	Y	EU-2012
United Kingdom	UK-LEGIONELLOSIS	O	Co	A	C	Y	N	Y	Y	Y	EU-2012

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