Annual threat report

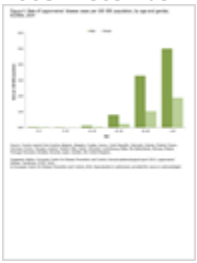
Descriptive analysis of current and emerging threats

Threats monitored through daily epidemic intelligence

The threats described in this report are identified through threat detection carried out by the ECDC Epidemic Intelligence (EI) team, either by screening various information sources or via notification by formal sources, e.g. the Early Warning and Response System (EWRS). Identified threats are discussed at the daily ECDC round table (RT) meeting, and an initial assessment on appropriate ECDC actions is carried out. The assessment is based on an analysis by the first-line duty officer, using epidemic intelligence, IHR and EWRS filtering criteria, and expert opinions expressed during the meeting. Possible actions include preparing or updating a rapid risk assessment (RRA), continued monitoring of the event, sharing information through the EPIS platform, launching an urgent inquiry (UI), preparing an epidemiological update ('epi update'), posting a news item on the ECDC website, or offering technical assistance to the affected Member State.

From 1 June 2005 until 31 December 2015, ECDC monitored 1 108 threats, with the number of threats ranging from 29 newly opened threats in 2013 to 228 threats in 2008 (Figure 1). In 2015, ECDC monitored 36 threats. The relatively stable number of threats since 2010/2011 can be ascribed to the standardisation of EI procedures, i.e. the adoption of the definitions of what constitutes a threat in the EI standard operating procedures and internal procedures.

Figure 1. Number of newly opened threats monitored through epidemic intelligence by ECDC per year, June 2005–December 2015

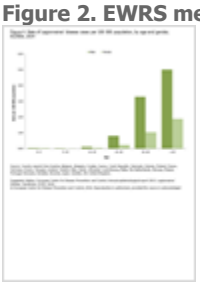


The decrease in the number of newly opened threats from 2008 to 2015 can be explained by several factors. First, ECDC implemented more robust criteria to open and monitor threats in 2009. Second, EPIS was launched in 2010/2011, and many threats that used to be monitored by ECDC EI are now monitored in EPIS. Finally, in 2011 and 2012, ECDC decided that threats are monitored either monthly or weekly, which resulted in a reduction of tracked threats.

Messages circulated in EWRS

From January 2005 until the end of 2015, 4 475 messages and comments were posted in EWRS, 264 of which were posted in 2015 (Table 3.1.1). The highest numbers occurred in 2009, with 1 400 messages and comments (31% of the total for the period 2005–2015). Most of these messages and comments in 2009 were related to the influenza A(H1N1) pandemic (Figure 2). EWRS postings usually serve as triggers for ECDC to open and monitor a threat, but since EWRS postings are often a combination of initial threat messages and follow-up postings, not all EWRS portal postings automatically lead to the opening of a threat.

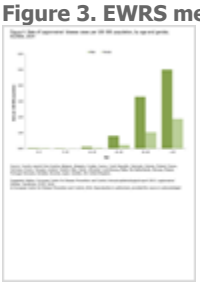
Figure 2. EWRS messages and comments, January 2005–December 2015



The peak observed in 2009 was due to the high number of EWRS messages and comments related to the 2009–2010 A(H1N1) pandemic. In 2011, the Shiga toxin-producing *E. coli* (STEC) serotype O104:H4 outbreak resulted in the increased use of the EWRS platform.

The Ebola outbreak in 2014 and 2015 did not lead to a particular increase of EWRS messages and comments as only a few cases were detected in Europe.

Figure 3. EWRS messages and comments, January 2015–December 2015 (n=264)



The high number of messages and comments posted in August 2015 is due to the meningococcal disease in Scouts returning from the World Jamboree. This mass gathering event, attended by over 33 000 scouts from 162 countries, was held from 28 July to 8 August in Yamaguchi City, Japan. By 21 August 2015, Sweden (4 cases) and the UK (4 cases) reported cases, while 11 countries (Austria, the Czech Republic, Denmark, Estonia, Malta, Norway, Portugal, Romania, Slovakia, Slovenia and Spain) reported that they did not receive any notifications about cases. ECDC produced a rapid risk assessment.

Threats by disease group

Between 1 June 2005 and 31 December 2015, ECDC monitored 1 108 threats. During these 10.5 years, the number of threats related to food- and waterborne diseases decreased from 38 threats in 2005 to 7 threats in 2010, then increased in 2011 (30 threats) and declined in 2015 (11 threats).

In 2015, ECDC tracked 36 new threats, in addition to threats carried over from previous years, such as avian influenza (H5N1), MERS-CoV and poliomyelitis. Changes in the proportion of new threats per disease group are shown in Table 1.

Table 1. Percentage of threats monitored on the Threat Tracking Tool platform (TTT), by year and disease group, June 2005–December 2015

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Legend: ELDSNet (European Legionnaires' Disease Surveillance Network), FWD (food- and waterborne diseases and zoonoses), EVD (emerging and vector-borne diseases), VPD (vaccine-preventable diseases), IRV (influenza and other respiratory viruses) and STI (sexually transmitted infections)

Figure 4. Proportion of threats monitored in the Threat Tracking Tool platform (TTT), by year and disease group, June 2005–December 2015 (n=36)

In 2015, for the second consecutive year, emerging and vector-borne diseases (EVD) represented the disease group for which most of the new threats were opened. In 2014, this was due to the emergence of Ebola virus disease (EVD) in West Africa and Zika virus in the Pacific, while in 2015 the dominance of monitored EVD threats was mainly due to the emergence of Zika virus in Latin America and Asia.
In 2015, two of the open threats were not directly linked to infectious diseases. One was related to the disease surveillance for the 2015 World Expo in Italy, a mass gathering event; the other was linked to the movement of refugees from the Middle East, central Asia, and Africa.

Nine rapidly evolving clusters of Legionnaires' disease were included in the threat tracking tool (TTT) as separate threats. The proportion of food- and waterborne disease threats (FWD) recorded in the TTT diminished due to the fact that since the launch of EPIS FWD, food- and waterborne threats have mainly been followed through EPIS (Epidemic Intelligence Information System). These threats are discussed at the ECDC round table if an urgent inquiry is launched in EPIS or if there is an EWRS posting.

Monitored signals

Since 2005, a large number of signals have been monitored by ECDC, but only few of them were classified and registered as a threat.

In 2015, 438 signals were monitored, discussed at the daily round table meeting. Thirty-six led to the monitoring of a new threat. Of all signals, 240 (56%) originated in the EU (See Figure 5).

Figure 5. Number of events detected through epidemic intelligence which met EWRS criteria, by week of reporting, 2015 (excludes threats already monitored)

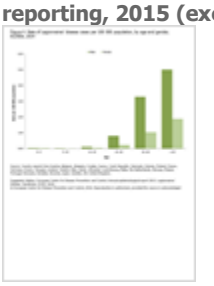

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Table 2. ECDC risk assessments by subject and month of publication, January–December 2015
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The majority (7) of epidemiological updates concerned MERS coronavirus. Risk assessments, their updates and the epidemiological updates were published throughout the year.

Table 3. List of published ECDC epidemiological updates, by subject and number of publications, January–December 2015
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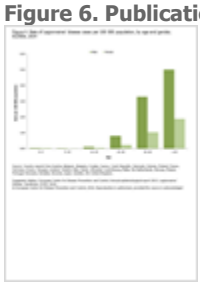
Figure 6. Publication of risk assessments, by month, January–December 2015



All outputs were published on the ECDC website. All outputs, with the exception of epidemiological updates (which are not intended to be distributed through EWRS), were shared with the Member States and the European Commission through EWRS.

Mobilisation of expertise

At the request of EU/EEA Member States and countries outside the EU, ECDC can provide support in the coordination of the investigation of outbreaks and threats. Support is also offered for preparedness activities related to communicable diseases, and, also if related to communicable diseases, antimicrobial resistance and healthcare-associated infections. In 2015, several missions were organised, first and foremost the missions in West Africa to fight the Ebola epidemic.

The Ebola epidemic that emerged in West Africa in March 2014 was the first emergency event addressed by ECDC and its partners under Decision 1082/2013. In November 2014, when Guinea was still experiencing a significant number of local Ebola outbreaks, the US Centers for Disease Control and Prevention and the World Health Organization requested ECDC to support surveillance control activities in Guinea through the deployment of French-speaking experts. Four weeks later, ECDC sent the first experts to Guinea. All deployments of ECDC experts were coordinated through WHO's Global Outbreak and Response Network (GOARN) and coordinated with the European Commission. By the time the mission officially ended in October 2015, ECDC had mobilised 89 ECDC experts, EPIET/EUPHEM fellows and Member State experts for deployment in West Africa.

Seventy-four 74 experts and EPIET/EUPHEM fellows were deployed in Guinea, four EPIET/EUPHEM fellows were sent to Liberia, one EPIET/EUPHEM fellow worked in Burkina Faso, Senegal hosted one ECDC expert, and five experts and fellows were deployed in Sierra Leone. In addition, four EPIET/EUPHEM fellows carried out assignments with international non-governmental organisations in Sierra Leone.

The missions in Guinea were mostly six-week missions to support GOARN surveillance and response activities, mainly in the province of Guinée Forestière.

In Europe, two ECDC experts were deployed to assess the situation in Ukraine after an outbreak of vaccine-derived poliovirus. Two ECDC experts were sent to Riga, Latvia, to coordinate the multi-country outbreak of *Salmonella* Enteritidis infections linked to the 2015 Riga Cup ice hockey tournament.

The Epidemic Intelligence Information Systems

EPIS is a web-based communication platform that allows appointed public health experts to exchange technical information in order to assess whether current and emerging public health threats have a potential impact in the European Union.

The system aims to ensure the transparent and timely sharing of information among participating public health authorities in order to detect public health threats at an early stage, coordinate response activities, and facilitate reporting under Decision 1082/2013/EU.

Below is a summary of the activities of five EPIS subsystems in 2015.

Food- and Waterborne Diseases and Zoonoses (EPIS-FWD)

EPIS-FWD facilitates the early detection and assessment of multi-country/multinational molecular typing clusters and outbreaks of FWDs. In 2015, the platform connected epidemiologists and microbiologists from 45 countries: 28 EU Member States, three countries of the European Economic Area (EEA) – Iceland, Norway and Liechtenstein – and 14 non-EU countries (Albania, Australia, Bosnia and Herzegovina, Canada, Japan, Kosovo [this designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence], New Zealand, South Africa, Serbia, Switzerland, the Former Yugoslav Republic of Macedonia, Montenegro, the United States of America, and Turkey).

Urgent inquiries (UI) are events launched by participating countries or ECDC to assess the multi-country dimension of events occurring at the national level. Since 2010, UI are launched and coordinated through EPIS-FWD. During 2015, 57 UIs were initiated by 17 participating countries or ECDC. Most frequently reported were salmonellosis (35), followed by verotoxigenic *Escherichia coli* infection (19), shigellosis (11) and listeriosis (9). In 29 UI (51%) the vehicle of infection remained unknown. For two UI, exotic pets were the vehicle of infection. Two UI were also reported through EPIS-STI (shigellosis outbreak in men having sex with men).
In 2015, 21 UIs reported affecting more than one country, of which 10 affected two countries and 11 potentially affected more than two countries. The largest number of countries potentially involved in one UI was seven. This resulted in ECDC preparing two rapid risk assessments.

Sexually transmitted infections (EPIS-STI)

EPIS-STI supports the rapid reporting and dissemination of unusual events related to STI transmission across the EU and assesses their EU relevance. The appointed contact points for STI surveillance in EU/EEA countries submit reports. All 31 EU/EEA Member States have access to EPIS-STI. Posting in EPIS-STI is voluntary and structured by infection and type of event; it also possible to post 'null reports' (i.e. nothing of EU significance in a selected month) on EPIS-STI.
In 2015, Lithuania used the platform for reporting of three cases of congenital syphilis, notified to national authorities in January, March and December. In May, the United Kingdom informed the network about an outbreak of high-level azithromycin-resistant gonorrhoea (HL-AziR) (MIC>256 mg/L) in northern England. Cases were reported among young heterosexual men and women. A complete description of the outbreak can be found in a report published by Public Health England (Outbreak of high-level azithromycin resistant gonorrhoea in England. Health Protection Report 2016;10(15). Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/516990/hpr1516_gnrrh.pdf). Sixty-one monthly 'null reports' were posted by five countries: Bulgaria, Estonia, Latvia, Lithuania and Malta.
In 2015, EPIS-STI was used to disseminate two urgent inquiries initiated in EPIS FWD to STI experts, one in relation to a cluster of extended-spectrum beta-lactamases producing and macrolide resistant *Shigella sonnei* in men who have sex with men in London, and one regarding an increase in shigellosis among men having sex with men in Ireland. EPIS-STI general forum was used for sharing reports or scientific publications of relevance for STI experts.

European Legionnaires' Disease Surveillance Network (EPIS-ELDSNet)

EPIS-ELDSNet collects data on Legionnaires' disease, with a focus on the detection and follow-up of travel-associated clusters, and the investigation of community outbreaks (in an ad hoc forum with restricted access). This allows for risk assessment and timely risk communication to public authorities in charge of risk management. In addition to the 31 EU/EEA Member States, 31 non-EU countries currently have access to EPIS-ELDSNet.
In 2015, 1 141 cases of travel-associated Legionnaires' disease were reported by 22 EU/EEA and three other countries. Compared with 2014, this was an increase of 188 cases (2014: 953 cases), a similar increase as during the previous year. The United Kingdom, Italy, France and the Netherlands reported two thirds of the cases. Similar to previous years, there were twice as many male cases than female cases, and the median age was 62

years. One hundred-fifty-five standard clusters (clusters associated with only one accommodation site) were detected, 17 more than in the previous year. This increase in the number of clusters was in line with the increased number of cases.
Control measures were implemented in all but eight notified clusters, with ELDSNet receiving feedback from a first risk assessment within two weeks and a final assessment within six weeks. Eight accommodation site names were published on the ECDC website in 2015.

In 2015, 60 standard clusters of travel-associated Legionnaires' disease involved cases from more than one country and would probably not have been detected without the international collaboration in ELDSNet.

Vaccine-preventable diseases (EPIS-VPD)

EPIS-VPD facilitates the early detection and sharing of information on outbreaks of VPDs and adverse events from vaccinations, and allows for the exchange of information on technical topics related to vaccinations and the control of vaccine-preventable diseases. The platform connects vaccination programme managers, vaccine experts, epidemiologists and microbiologists from the 31 EU/EEA Member States and the WHO Regional Office for Europe.

Events of public health relevance are launched through the urgent inquiries (UI) or disease discussion functionalities of EPIS-VPD. The posts in EPIS-VPD are launched by participating countries or ECDC to discuss and assess the cross-border dimension of events occurring at the regional or national level.

In 2015, fourteen urgent inquiries were posted on EPIS-VPD, generating 57 follow-up postings; three posts – with four follow-up posts – were made through the disease discussion functionalities.

Diseases discussed through EPIS-VPD were measles, diphtheria, meningococcal disease and polio. One post was related to a shortage of pertussis-containing vaccines in the EU. All diseases discussed in EPIS VPD were subsequently covered by ECDC rapid risk assessments.

EPIS-VPD is also used to share a weekly list of vaccine-related publications.

Antimicrobial resistance and healthcare-associated infections (EPIS-AMR-HAI)

EPIS-AMR-HAI supports the rapid reporting and dissemination of information related to bacterial pathogens with previously unseen or emerging antimicrobial resistance and healthcare-associated infections which are, or may become, relevant for public health in the EU/EEA. All 31 EU/EEA Member States have access to EPIS-AMR-HAI.

In 2015, three new urgent inquiries were launched through EPIS-AMR-HAI. Two of these urgent inquiries referred to the cross-border spread of multidrug-resistant bacteria by patient transfer or returning travellers; one inquiry was related to a new resistance mechanism. The types of bacteria/resistance mechanisms discussed were carbapenem-resistant *Acinetobacter baumannii*, carbapenem and multidrug-resistant *Enterobacteriaceae*, methicillin-resistant *Staphyloccus aureus* and plasmid-mediated colistin resistance. In addition, an urgent inquiry from 2014 related to invasive infection by *Mycobacterium chimaera* associated with heater-cooler units used during cardiothoracic surgery was followed up with multiple postings and an ECDC rapid risk assessment.

Threats of particular interest

Epidemic of Ebola virus disease in West Africa

In February 2014, ECDC reported an outbreak of undiagnosed haemorrhagic illness in Guinea. On 22 March 2014, the outbreak was confirmed as Ebola virus disease (EVD) by virological tests. This was the first time an Ebola outbreak was reported in West Africa. ECDC published its first RRA on 23 March 2014 and continued to publish updated RRAs and epidemiological updates during 2015, in addition to numerous technical documents. By August 2014, the outbreak had taken epidemic proportions and spread to Guinea's capital Conakry and to two neighbouring countries, including the capital cities of Freetown (Sierra Leone) and Monrovia (Liberia). On 8 August 2014, WHO declared the Ebola epidemic in West Africa a public health emergency of international concern.
The disease brought devastation to families, communities and the health and economic systems of all three countries. By the end of 2015, the Ebola epidemic had claimed the lives of more than 11 300 people and infected over 28 500. Outside of the three most affected countries, cases were reported from Mali (eight cases), Nigeria (20 cases), Spain (three cases, including two repatriated cases), the United Kingdom (three cases, including two repatriated cases), Senegal (one case infected in Guinea), Norway (one repatriated case), France (two repatriated cases), the Netherlands (one repatriated case), Switzerland (one repatriated case), USA (11 cases, seven repatriated) and Italy (one case infected in Sierra Leone).
The number of cases peaked in autumn 2014 and slowly decreased until the end of 2015. Sierra Leone was declared Ebola-free by WHO on 7 November 2015. Liberia was first declared free of Ebola transmission in May 2015, but the virus was re-introduced twice, with the latest flare-up in November 2015. Guinea was declared Ebola-free on 29 December 2015.

The following countries reported importation-related cases or clusters, with or without local transmission, excluding repatriated cases: United Kingdom (one case), Spain (one case), United States (four cases), Mali (eight cases including six deaths), Nigeria (20 cases including eight deaths, Senegal (one case), Italy (one case). These cases were in patients who developed symptoms and were diagnosed with EVD in the country under which they are listed, irrespective of whether they were exposed in a third country (imported cases) or in the country under which they are listed (local transmission). Patients who were repatriated with established disease are not included.

As of 28 December 2015, 881 confirmed EVD cases (including 513 deaths) have been reported among healthcare workers in the three most affected countries. Infected healthcare workers were also reported from Mali (two), Nigeria (11), Spain (one, infected in Spain while caring for an evacuated EVD patient), UK (three, infected in Sierra Leone), USA (nine cases, including one death; two of the cases were infected in the USA), and Italy (one, infected in Sierra Leone). The last confirmed infection in a healthcare worker diagnosed and treated outside of the most affected countries was in Italy on 12 May 2015. The last confirmed EVD case among healthcare workers in the most-affected countries was reported in week 34 (17–23 August) in Guinea.
Deployments of ECDC experts took place in Guinea (74 experts and EPIET/EUPHEM fellows), Liberia (four fellows), Burkina Faso (one fellow), Senegal (one expert), and Sierra Leone (five experts and fellows). In addition, four EPIET/EUPHEM fellows took on assignments with international non-governmental organisations in Sierra Leone.
As of 24 December 2015, ECDC has deployed 89 experts (on a rotating basis) from within and outside the EU in response to the Ebola outbreak. This includes an ECDC-mobilised contingent of experts to Guinea.
Throughout 2015, ECDC continued to monitor the epidemiological situation through epidemic intelligence activities with a special focus on healthcare workers.

Monitoring public health during refugee movements

According to the International Organization for Migration, 1 046 599 refugees arrived in Europe in 2015, mainly from the Middle East, Africa and central Asia. The influx of refugees was of public health concern not because it represented a significant disease burden for the host countries, but because refugees were at an increased risk of contracting diseases due to crowded reception facilities with compromised hygiene and sanitation arrangements. In addition, many refugees were subject to specific risks related to infectious diseases in their country of origin or in the countries visited during their migration.
In 2015, several EU/EEA countries reported a number of infectious diseases that could be directly linked to the influx of refugees, e.g. louse-borne relapsing fever (LBRF) and diphtheria.

Between July and October 2015, 27 confirmed cases of LBRF were diagnosed in EU countries and Switzerland. Two cases of LBRF in refugees who had been living in Italy since 2011 were reported; both cases had no recent travel history to endemic regions, making it likely that they became infected in the same overcrowded facility as the newly arrived infected cases. A rapid risk assessment on louse-borne relapsing fever in the EU was posted on ECDC's website on 17 November 2015.

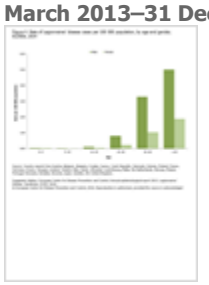
Figure 7. Distribution of the 27 cases of louse-borne relapsing fever in Europe 2015, by reporting country and main migration routes

Three countries, Denmark, Germany and Sweden, reported seven cases of toxigenic cutaneous diphtheria and two cases of non-toxigenic cutaneous diphtheria among refugees in 2015. The cases of cutaneous diphtheria among refugees and asylum seekers were not unexpected because many refugees came from endemic countries and fled under difficult and crowded conditions. Many of them continued to be exposed to overcrowding and poor hygiene after arriving in the EU. A rapid risk assessment on cutaneous diphtheria in the EU was posted on ECDC's website on 30 July 2015.

Severe respiratory disease associated with Middle East respiratory syndrome coronavirus (MERS-CoV)

In 2015, ECDC continued to regularly monitor the severe respiratory disease associated with Middle East respiratory syndrome coronavirus (MERS-CoV) first reported in 2012. As of 31 December 2015, 1 644 laboratory-confirmed cases of MERS-CoV have been reported worldwide, including 638 deaths. All cases either occurred in the Middle East or had direct links to a primary case infected in the Middle East. The source of the virus remains unknown, but the pattern of transmission and virological studies point towards dromedary camels in the Middle East as a reservoir from which humans sporadically become infected through zoonotic transmission. Human-to-human transmission is amplified among household contacts and in healthcare settings.

Figure 8. Distribution of confirmed cases of MERS-CoV by first available date and place of probable infection, March 2013–31 December 2015 (n=1 646)



In 2015, South Korea, China and Thailand reported cases for the first time.

Table 4. Number of MER-CoV cases and deaths by country of reporting, March 2012–31 December 2015 (n=1 644)

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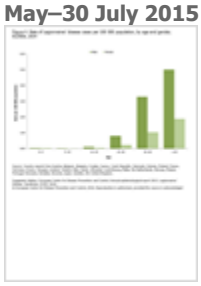
Between May and July 2015, 186 MERS-CoV cases, including 36 deaths, were reported in a nosocomial outbreak in South Korea. The index case had onset of symptoms on 11 May and was diagnosed and isolated on 20 May 2015. During the 10-day period from onset of illness until isolation (Figure 9, yellow box), the index case visited several healthcare facilities. Transmission occurred in 15 healthcare facilities. On 17 July 2015, the Samsung Medical Centre was the last of the initial 15 facilities to be released from strict control measures.

Figure 9. Distribution of confirmed cases of MERS by date of onset or reporting, South Korea and China, 11 May–30 July 2015 (n=186)



ECDC published several updates of the risk assessment on MERS-CoV during 2015.

Zika virus infection

Zika virus disease is a mosquito-borne viral disease caused by the Zika flavivirus with two main lineages: the African lineage and the Asian lineage. Disease symptoms are usually mild and last for two to seven days. Infection may go unrecognised or be misdiagnosed as dengue, chikungunya or other viral infections, with symptoms of fever and rash. Asymptomatic infections are common, and only one in four people infected with Zika virus is believed to develop symptoms.

In 2013 and 2014, Zika virus outbreaks were notified in several island countries of the Pacific region. Cases of Zika virus infection continued to be reported even in 2015 in Samoa, Fiji, New Caledonia, Solomon Islands and Vanuatu.

Following detection of indigenous circulation of Zika virus on Easter Island, Chile, in 2014 – the first detection in the Americas – Zika virus infections spread rapidly and reached 12 countries in the region by the end of 2015. As of 24 December 2015, locally acquired cases of Zika virus infection have been reported in Brazil, Colombia, El Salvador, Guatemala, Mexico, Paraguay, Suriname, Venezuela, Honduras, Martinique, French Guiana and Panama.

Outside of the Americas, autochthonous cases have also been reported from Cape Verde in 2015.

Possible links between Zika virus infection during pregnancy and microcephaly of the foetus came under investigation in October 2015 when the Brazilian Ministry of Health reported an unusual increase in cases of microcephaly after the Zika virus outbreak in the north-eastern states. As of 31 December 2015, 2 975 suspected

cases of microcephaly have been notified in Brazil, including 40 deaths, affecting 656 municipalities in 20 states. An association of Zika virus with Guillain–Barré syndrome and other neurological complications was already suspected during the 2013–2014 outbreak in French Polynesia following an increase in the number of Guillain–Barré syndrome cases and the detection of 17 cases of central nervous system malformations in foetuses and infants.

In 2015, only a few travel-associated cases of Zika virus infection were reported in the EU/EEA Member States.

ECDC published several rapid risk assessments and epidemiological updates on microcephaly in Brazil linked to the Zika virus epidemic during 2015.

Figure 10. Countries with reported confirmed autochthonous cases of Zika virus infection in 2015, as of 24 December