SURVEILLANCE REPORT

Annual Epidemiological Report for 2016

Shiga-toxin/verocytotoxin-producing *Escherichia coli* (STEC/VTEC) infection

Key facts

- In 2016, 6 619 confirmed cases of infections with Shiga-toxin/verocytotoxin-producing *Escherichia coli* (STEC/VTEC) were reported in the EU/EEA.
- The EU/EEA notification rate was 1.8 cases per 100 000 population.
- The highest rates of confirmed cases were observed in 0–4-year-old children (9.0 cases per 100 000 population).
- The EU/EEA notification rate was stable during the period 2012–2016.
- The highest notification rates were reported in Ireland, Sweden, the Netherlands and Denmark.

Methods

This report is based on data for 2016 retrieved from The European Surveillance System (TESSy) on 21 February 2018. TESSy is a system for the collection, analysis and dissemination of data on communicable diseases. For a detailed description of methods used to produce this report, please refer to the *Methods* chapter [1].

An overview of the national surveillance systems is available online [2].

A subset of the data used for this report is available through ECDC's online *Surveillance atlas of infectious diseases* [3].

In 2016, 30 EU/EEA countries reported data on STEC/VTEC infections. Fourteen of the 30 countries used the latest case definition (EU 2012), nine countries reported in accordance with the previous case definition (EU 2008), and seven countries reported using other definitions or did not specify which case definition they used.

The notification of STEC/VTEC infections is mandatory in most EU/EEA countries except for five Member States where notification is either voluntary (France, Italy, Luxembourg and Spain) or based on another type of system (United Kingdom). The surveillance systems for STEC/VTEC infections have full national coverage in all EU/EEA countries except for one (Italy). The majority of EU/EEA countries (25 of 30) have a passive surveillance system, and in 21 countries cases were reported by both laboratories and physicians and/or hospitals. Five countries have only laboratory-based reporting. In France, STEC/VTEC surveillance is based on paediatric haemolytic-uraemic syndrome (HUS) surveillance, and in Italy it is primarily based on the national registry of HUS [2]. Twenty-eight EU/EEA countries reported case-based data, and two countries reported aggregated data.

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In addition to case-based surveillance, ECDC coordinates molecular surveillance of STEC/VTEC through isolate-based data collection. A typing-based multi-country cluster of STEC/VTEC is defined as at least two countries reporting at least one isolate, each with matching XbaI pulsotypes, with reports a maximum of eight weeks apart.

Epidemiology

For 2016, 6 789 cases of STEC/VTEC infections were reported by 30 EU/EEA countries. Of these cases, 6 619 (98%) were confirmed. Twenty-seven countries reported at least one confirmed case, and three countries reported zero cases. The EU/EEA notification rate was 1.8 cases per 100 000 population, which is at the same level as in the previous four years.

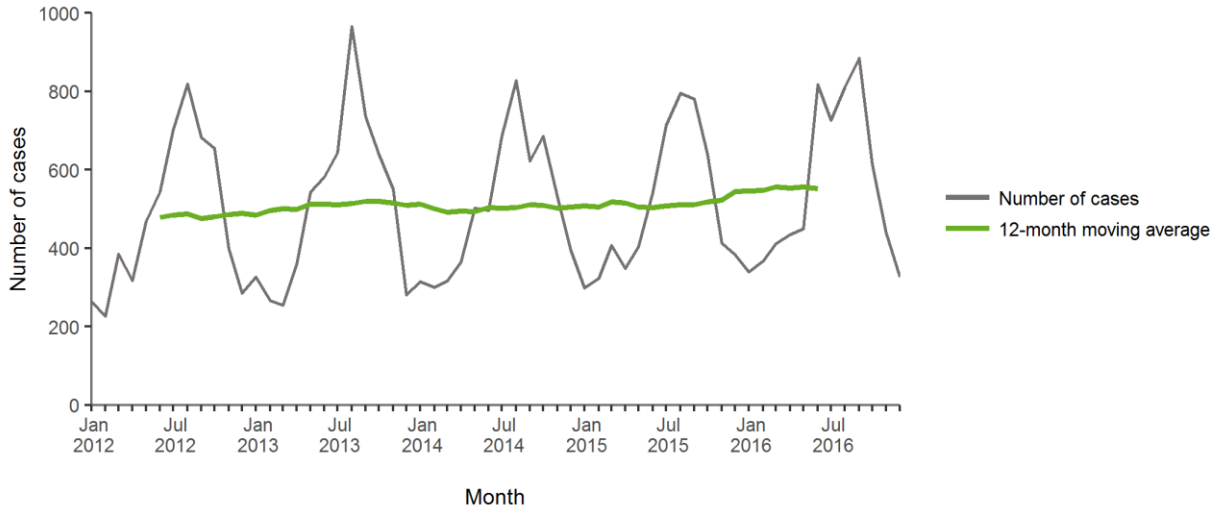
The highest number of confirmed cases was reported by Germany (N=1843) followed by the United Kingdom (N=1373); these two countries accounted for 47.7% of all EU/EEA cases. As in the previous years, the highest country-specific notification rates were observed in Ireland, Sweden, the Netherlands and Denmark, with 15.6, 6.5, 3.9, and 3.7 cases per 100 000 population, respectively. Ten countries reported ≤0.1 cases per 100 000 population.

On average, 34.1% of STEC/VTEC cases with known information were hospitalised. Ten cases had a fatal outcome, resulting in a case fatality of 0.3%.

Table 1. Distribution of confirmed cases of Shiga-toxin/verocytotoxin-producing *E. coli* (STEC/VTEC) infection (STEC/VTEC) infection, EU/EEA, 2012–2016

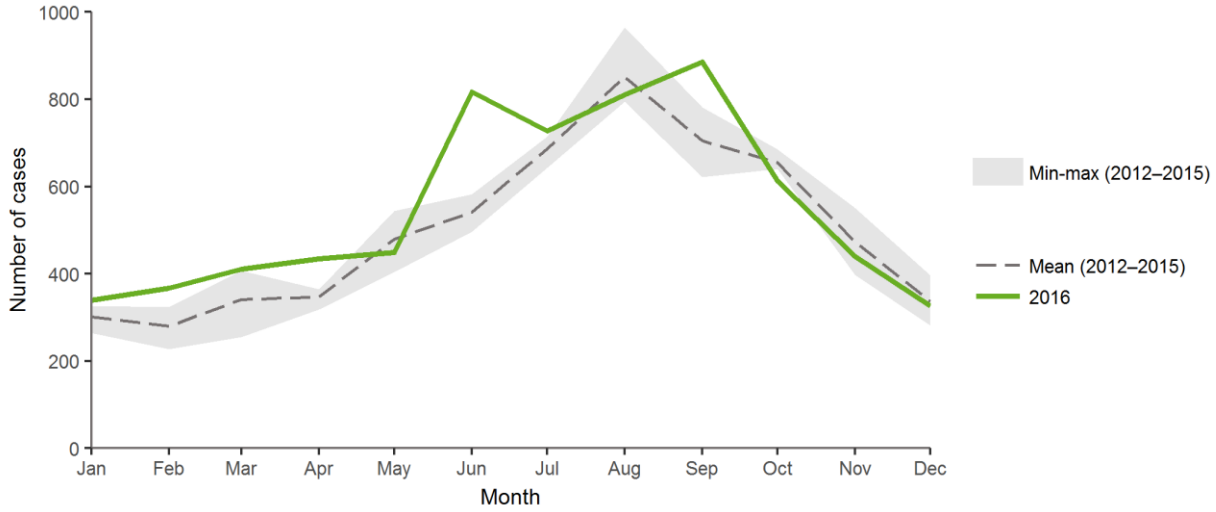
Country	2012		2013		2014		2015		2016			
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Confirmed cases	Rate	ASR	Reported cases
Austria	130	1.5	130	1.5	131	1.5	107	1.2	177	2.0	2.2	177
Belgium	105	0.9	117	1.1	85	0.8	100	0.9	34	0.3	0.3	34
Bulgaria	0	0.0	1	0.0	0	0.0	0	0.0	0	0.0	0.0	0
Croatia	0	0.0	0	0.0	4	0.1	0	0.0	9	0.2	0.2	9
Cyprus	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0
Czech Republic	9	0.1	17	0.2	29	0.3	26	0.2	28	0.3	0.3	28
Denmark	199	3.6	191	3.4	226	4.0	201	3.6	210	3.7	3.7	275
Estonia	3	0.2	8	0.6	6	0.5	8	0.6	5	0.4	0.4	5
Finland	32	0.6	98	1.8	64	1.2	74	1.4	139	2.5	2.7	144
France	208	-	218	-	221	-	262	-	302	-	-	332
Germany	1573	2.0	1639	2.0	1663	2.1	1616	2.0	1843	2.2	2.5	1867
Greece	0	0.0	2	0.0	1	0.0	1	0.0	2	0.0	0.0	2
Hungary	3	0.0	13	0.1	18	0.2	15	0.2	12	0.1	0.1	12
Iceland	1	0.3	3	0.9	3	0.9	1	0.3	3	0.9	0.8	3
Ireland	412	9.0	564	12.3	572	12.4	598	12.9	737	15.6	14.6	745
Italy	50	-	64	-	68	-	59	-	78	-	-	91
Latvia	0	0.0	0	0.0	0	0.0	4	0.2	1	0.1	0.1	1
Liechtenstein	.	.	.	.	.	.	.	.	.	.	.	.
Lithuania	2	0.1	6	0.2	1	0.0	3	0.1	4	0.1	0.1	4
Luxembourg	21	4.0	10	1.9	3	0.5	4	0.7	4	0.7	0.7	4
Malta	1	0.2	2	0.5	5	1.2	4	0.9	4	0.9	0.9	4
Netherlands	1049	6.3	1184	7.1	919	5.5	858	5.1	665	3.9	3.9	665
Norway	75	1.5	103	2.0	151	3.0	221	4.3	239	4.6	4.5	239
Poland	3	0.0	5	0.0	5	0.0	0	0.0	4	0.0	0.0	8
Portugal	-	-	-	-	-	-	0	0.0	0	0.0	0.0	0
Romania	1	0.0	6	0.0	2	0.0	0	0.0	29	0.1	0.1	49
Slovakia	9	0.2	7	0.1	2	0.0	1	0.0	2	0.0	0.0	2
Slovenia	29	1.4	17	0.8	29	1.4	23	1.1	26	1.3	1.3	26
Spain	32	-	28	-	50	-	86	-	51	-	-	51
Sweden	472	5.0	551	5.8	472	4.9	551	5.7	638	6.5	6.5	638
United Kingdom	1337	2.1	1164	1.8	1324	2.1	1328	2.0	1373	2.1	2.1	1374
EU/EEA	**5756**	**1.7**	**6148**	**1.8**	**6054**	**1.7**	**6151**	**1.7**	**6619**	**1.8**	**1.9**	**6789**

Figure 1. Distribution of confirmed cases of Shiga-toxin/verocytotoxin-producing *E. coli* (STEC/VTEC) infection by month, EU/EEA, 2012–2016



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

Figure 2. Distribution of confirmed cases of Shiga-toxin/verocytotoxin-producing *E. coli* (STEC/VTEC) infection by month, EU/EEA, 2016 and 2012–2015



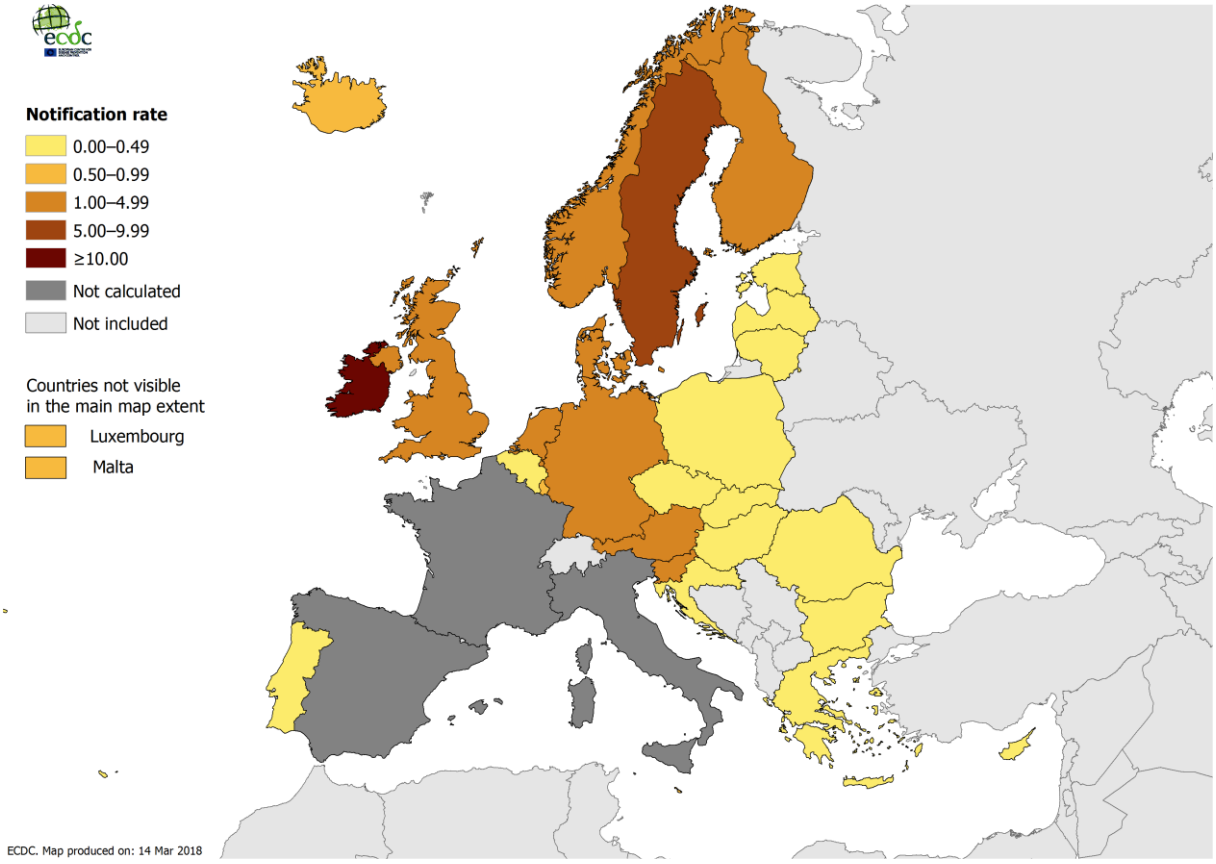
Source: Country reports from Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, and the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

Between 2012 and 2016, the number of confirmed STEC/VTEC cases remained stable at the EU/EEA-level (Figure 1).

A clear seasonal trend in the number of confirmed STEC/VTEC cases was observed between 2012 and 2016, with substantially more cases reported in the summer months (June to September).

The majority (86.8%) of STEC/VTEC cases with information regarding the country of infection were domestically acquired.

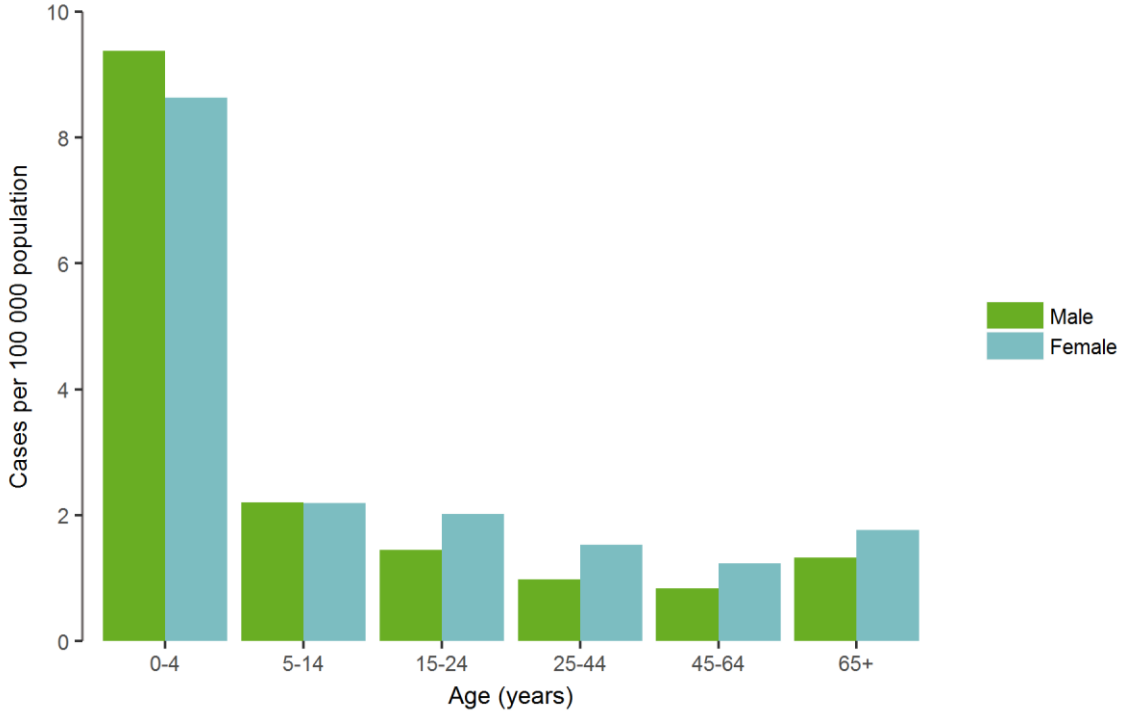
Figure 3. Distribution of confirmed cases of Shiga-toxin/verocytotoxin-producing *E. coli* (STEC/VTEC) infection per 100 000 population by country, EU/EEA, 2016



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

Of 6 602 confirmed cases with known gender in 2016, 55% were female. The male-to-female ratio was 0.8:1. The highest rate of confirmed cases was reported in the age group 0–4 years (9.0 cases per 100 000 population), and particularly in males (9.4 cases per 100 000 population). The notification rate in the age group 0–4 years was four to nine times higher than the rate in the older age groups.

Figure 4. Distribution of confirmed cases of Shiga-toxin/verocytotoxin-producing *E. coli* (STEC/VTEC) infection per 100 000 population, by age and gender, EU/EEA, 2016



Outbreaks and other threats

In 2016, eight countries submitted STEC/VTEC typing data to ECDC's TESSy molecular typing database. No multi-country clusters were detected trough molecular typing data collection.

One STEC/VTEC-related multi-country outbreak was detected by event-based surveillance in 2016. Two countries, Romania and Italy, were involved in an outbreak in January–March 2016. Overall, 25 cases were identified as associated with this outbreak, 19 of which developed HUS; three of the HUS patients died. Most of the cases were in children under two years of age. The cases occurred over an eight-week period, suggesting a persistent common source outbreak, possibly associated with different vehicles of infection. Epidemiological evidence linked some of the Romanian cases and the Italian case to a Romanian milk-processing facility. Cheese produced in this facility was suspected as a possible source of the infections [4].

Discussion

In 2016, STEC/VTEC was the fourth most commonly reported zoonosis in the EU [5]. In 2012–2016, the overall trend of reported cases remained stable, but at a markedly higher level than at the beginning of the STEC/VTEC surveillance in 2007 and before a large outbreak in 2011 [6]. Part of the increase may be explained by improved clinical awareness of STEC/VTEC infection following the 2011 outbreak. Other contributing factors could be the increasing number of laboratories that were testing for serogroups other than O157 and the shift in diagnostic methods from cultures to culture-independent methods, with PCR being more commonly used. The proportion of serogroup O157 continued to decrease while the proportion of non-O157 STEC/VTEC serogroups increased in 2016 [5]. Reporting of STEC O26 infections has been steadily increasing in the EU since 2007 (both in human and food samples), and in 2016 STEC O26 infection was – for the first time – the most common cause of haemolytic-uraemic syndrome (HUS) after O157 infections, which previously held this position [3,5].

Surveillance of STEC/VTEC infections is mandatory and in most EU/EEA countries covers the entire population. In two countries, however, surveillance only covers HUS cases, which mainly affects small children and is characterised by acute kidney failure requiring hospital care. In 2016, the average proportion of hospitalised STEC/VTEC cases was relatively high (34%). The highest proportions of hospitalised cases were reported in those countries that reported only HUS cases and had the lowest number of cases/lowest notification rates, a fact that indicates that their surveillance systems focus only on the most severe cases.

The age group most affected by STEC/VTEC were infants and children up to four years of age, who accounted for almost one-third of all confirmed cases in 2016. This was also seen in the HUS cases, where two thirds of the cases were reported in patients 0–4 years old [5].

Most human STEC/VTEC cases are sporadic. The latest systematic review found undercooked ground beef or other meat to be a significant risk factor for acquiring sporadic STEC infection and indicated that infections from contaminated meat occur most often because of serogroup O157 [7]. The recent outbreaks of serogroup O26 emphasise an emerging risk of infection associated with milk products [8 9]. In 2016, nine STEC outbreaks, accounting for 0.3% of all the foodborne outbreaks at the EU level, were reported with known causative agent. The two largest STEC outbreaks occurred in Finland (237 cases) and in the United Kingdom (170 cases, STEC O157). In both outbreaks, leafy green vegetables were implicated as the vehicle of infection. Three smaller outbreaks were caused by bovine meat and products thereof (STEC O157), two outbreaks were caused by cheese (STEC O157 and O26), and one outbreak was connect to milk (STEC O80) [4,5].

Public health implications

As STEC/VTEC infection is mainly acquired by consuming contaminated food and by contact with animals and/or their faeces, good hygiene practices in premises dealing with animals and food processing can decrease the risk of infection. The STEC/VTEC serogroups most frequently found in food samples are those most commonly reported in human infections, highlighting the importance of contaminated food as a source of human infections. Raw meat, unpasteurised milk and dairy products are well-known potential sources of STEC/VTEC infections. Even though rarely reported, these products have been implicated in multicountry outbreaks. This points toward a potential risk associated with international food trade. Adequate cooking of food, particularly beef, and using pasteurised milk may reduce the risk of foodborne STEC/VTEC infections.

References

1. European Centre for Disease Prevention and Control. Introduction to the Annual epidemiological report for 2016. In: ECDC. Annual epidemiological report for 2016. Stockholm: ECDC; 2017. Available from: https://ecdc.europa.eu/en/annual-epidemiological-reports-2016/methods.

2. European Centre for Disease Prevention and Control. Surveillance systems overview [internet, downloadable spreadsheet]. Stockholm: ECDC; 2018. Available from: https://ecdc.europa.eu/en/publications-data/surveillance-systems-overview-2016.

3. European Centre for Disease Prevention and Control. Surveillance atlas of infectious diseases [internet]. Stockholm: ECDC; 2017 [cited 30 Jan 2018]. Available from: http://atlas.ecdc.europa.eu/public/index.aspx?Dataset=27&HealthTopic=59

4. European Centre for Disease Prevention and Control/European Food Safety Authority. Multi-country outbreak of STEC infection associated with HUS – 5 April 2016. Stockholm: ECDC; 2016. Available from: https://ecdc.europa.eu/sites/portal/files/media/en/publications/Publications/RRA-Escherichia-coli-O26-Romania-Italy-April2016.pdf

5. European Food Safety Authority and European Centre for Disease Prevention and Control. The European Union summary report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2016. EFSA Journal; 2017. Available from: https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2017.5077

6. European Centre for Disease Prevention and Control. Surveillance of seven priority food- and waterborne diseases in the EU/EEA 2010−2012. Stockholm: ECDC; 2015. Available from: http://ecdc.europa.eu/en/publications/Publications/food-and-waterborne-diseases-surveillance-report-2015.pdf

7. Kintz E, Brainarda J, HooperL, Hunter P. Transmission pathways for sporadic Shiga-toxin producing *E. coli* infections: A systematic review and meta-analysis. Int J Hyg Environ Health. 2017 Jan; 220 (1): 57-67. Available from: https://www.sciencedirect.com/science/article/pii/S143846391630205X?via%3Dihub

8. Severi E, Vial F, Peron E, Mardh O, Niskanen T, Takkinen J. Community-wide outbreaks of haemolytic uraemic syndrome associated with Shiga toxin-producing *Escherichia coli* O26 in Italy and Romania: a new challenge for the European Union. 2016;21(49). Available from: http://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2016.21.49.30420

9. Germinario C, Caprioli A, Giordano M, Chironna M, Gallone MS, Tafuri S, et al. all participants of the Outbreak investigation team. Community-wide outbreak of haemolytic uraemic syndrome associated with Shiga toxin 2-producing Escherichia coli O26:H11 in southern Italy, summer 2013. Euro Surveill. 2016;21(38):30343 Available from: https://www.ncbi.nlm.nih.gov/pubmed/27684204