

Salmonellosis

Salmonellosis is the second most commonly reported gastrointestinal infection and an important cause of foodborne outbreaks in the EU/EEA.

- In 2012, the confirmed case rate of salmonellosis was 21.9 cases per 100 000 population in the EU/EEA.
- Salmonellosis rates continued to decrease with a significant five-year decreasing trend in the EU and decreasing trends in 17 EU/EEA countries. This decrease is mainly attributed to the implementation of successful veterinary control programmes, particularly in poultry.
- The reported case rate is highest in young children: 98.15 cases per 100 000 population in 2012, five times higher than in adults.
- In 2012, the five most commonly reported serotypes were *S. Enteritidis*, *S. Typhimurium*, monophasic *S. Typhimurium*, *S. Infantis*, and *S. Stanley*. The increase in *S. Stanley* was due to the multi-country outbreak related to turkey meat.

Infections by bacteria belonging to the genus *Salmonella* are one of the most common gastrointestinal illnesses reported in the EU/EEA. A range of wild and domesticated animals are reservoirs for *Salmonella* species, and humans are usually infected through ingesting contaminated, undercooked food. In addition to food, other exposures that have been linked to infections are travel, pet products and direct contact with live animals, also including exotic pets. Outbreaks occur frequently and they can have a multinational scope due to cross-border travelling as well as food and animal trade.

Epidemiological situation in 2012

In 2012, 92 438 confirmed salmonellosis cases were reported by 29 EU/EEA countries (Table 1). The overall confirmed case rate was 21.9 per 100 000 population. The highest confirmed case rates were reported in the Czech Republic (97.5 cases per 100 000 population) and Slovakia (85.6). Four countries reported fewer than 10 cases per 100 000 population: Greece, Ireland, Portugal and Romania.

Overall reported cases of salmonellosis have declined steadily for several years (Figure 1) with a statistically significant decline between 2008 and 2012 (linear regression, $p < 0.001$). Seventeen EU/EEA countries had a significant ($p < 0.05$) five-year decreasing trend in reported cases (Austria, Belgium, Cyprus, Denmark, Estonia, Finland, Germany, Greece, Iceland, Ireland, Lithuania, Norway, Portugal, Slovakia, Slovenia, Sweden and the United Kingdom). Significant increasing trends were observed in France and the Netherlands. The increasing trend in France could be explained by an increased proportion of *Salmonella* isolates sent to the national reference centre for *Salmonella* from 2008 and onwards. The increasing trend in the Netherlands could be explained by a very large outbreak of *S. Thompson* in 2012 with 866 confirmed cases [1].

Table 1. Number and rates of confirmed salmonellosis reported cases, EU/EEA, 2008-2012

Country	2012						2011		2010		2009		2008	
	National data	Report type	Total cases	Confirmed cases	Rate	ASR	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Austria	Y	C	1 778	1 773	21.09	21.75	1 432	17.04	2 179	26.02	2 775	33.21	2 312	27.79
Belgium	N	C	3 101	3 101	-	-	3 177	-	3 169	-	3 113	-	3 831	-
Bulgaria	Y	A	839	839	11.45	12.37	924	12.54	1 154	15.55	1 247	16.70	1 516	20.17
Cyprus	Y	C	90	90	10.44	10.29	110	13.10	136	16.60	134	16.82	169	21.77
Czech Republic	Y	C	10 397	10 245	97.53	99.35	8 499	81.05	8 209	78.47	10 480	100.53	10 707	103.52
Denmark	Y	C	1 207	1 207	21.63	21.34	1 170	21.04	1 608	29.05	2 130	38.65	3 669	67.00
Estonia	Y	C	287	249	18.67	18.70	375	28.07	381	28.48	261	19.49	647	48.24
Finland	Y	C	2 199	2 199	40.71	41.55	2 098	39.03	2 421	45.24	2 327	43.69	3 127	59.00
France	Y	C	8 705	8 705	13.34	12.55	8 685	13.37	7 184	11.12	7 153	11.12	7 186	11.23
Germany	Y	C	20 848	20 493	25.10	26.55	23 982	29.40	24 833	30.43	31 395	38.37	42 885	52.27
Greece	Y	C	404	404	3.63	3.75	471	4.23	297	2.66	403	3.60	792	7.08
Hungary	Y	C	5 867	5 462	55.24	57.83	6 169	62.85	5 953	60.42	5 873	59.47	6 637	67.05
Ireland	Y	C	315	309	6.74	6.24	311	6.80	349	7.81	335	7.53	447	10.03
Italy ¹	N	C	1 453	1 453	-	-	4 464	7.36	5 305	8.79	5 715	9.52	6 662	11.17
Latvia	Y	C	556	547	26.75	27.52	995	47.96	877	41.36	795	36.76	1 229	56.08
Lithuania	Y	C	1 762	1 762	58.67	60.02	2 294	75.16	1 962	62.45	2 063	64.80	3 308	102.98
Luxembourg	Y	C	136	136	25.91	25.35	125	24.42	211	42.03	162	32.83	153	31.64
Malta	Y	C	88	88	21.08	19.74	129	31.09	160	38.65	125	30.42	161	39.48
Netherlands	N	C	2 198	2 198	-	-	1 284	-	1 447	-	1 204	-	1 627	-
Poland	Y	A	8 444	7 952	20.64	-	8 400	21.80	9 257	24.26	8 529	22.37	9 149	24.01
Portugal	Y	C	190	185	1.76	1.90	174	1.68	205	1.98	220	2.12	332	3.20
Romania	Y	C	775	698	3.47	3.52	989	4.96	1 285	6.41	1 105	5.47	624	3.06
Slovakia	Y	C	4 965	4 627	85.62	86.49	3 897	72.27	4 942	91.69	4 182	77.70	6 849	127.40

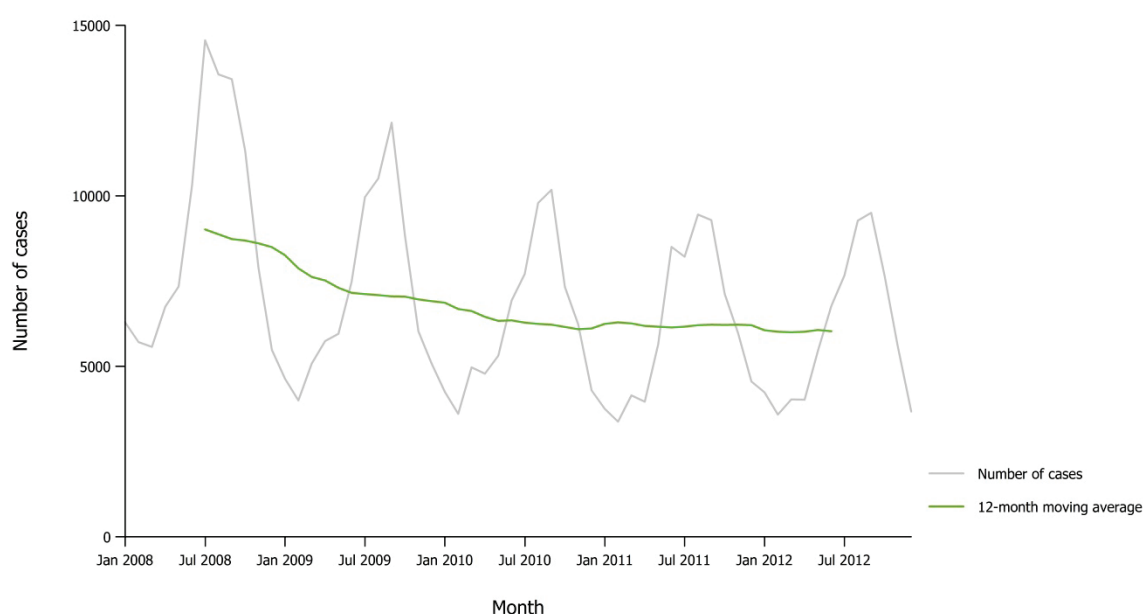
Country	2012						2011		2010		2009		2008	
	National data	Report type	Total cases	Confirmed cases	Rate	ASR	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Slovenia	Y	C	392	392	19.07	19.62	400	19.51	363	17.73	616	30.31	1 033	51.39
Spain	N	C	4 181	4 181	-	-	3 786	-	4 420	-	4 304	-	3 833	-
Sweden	Y	C	2 922	2 922	30.81	30.70	2 887	30.66	3 612	38.67	3 054	32.99	4 185	45.57
United Kingdom	Y	C	8 812	8 812	13.99	13.51	9 455	15.12	9 670	15.58	10 479	17.00	11 511	18.82
EU Total	-	-	92 911	91 029	21.82	21.82	96 682	20.75	101 589	21.78	110 179	23.94	134 581	29.61
Iceland	Y	C	38	38	11.89	12.23	45	14.13	34	10.70	35	10.96	134	42.48
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-	-	0	0.00
Norway	Y	C	1 371	1 371	27.50	27.22	1 290	26.22	1 370	28.20	1 235	25.73	1 941	40.97
EU/EEA Total	-	-	94 320	92 438	21.89	21.88	98 017	20.80	102 993	21.84	111 449	23.95	136 656	29.74

ASR: Age-standardised rate

¹ Data from Italy for 2012 are provisional as not all regions had reported data at the time of report production.

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

Figure 1. Distribution of confirmed salmonellosis reported cases by month, EU/EEA, 2008–2012

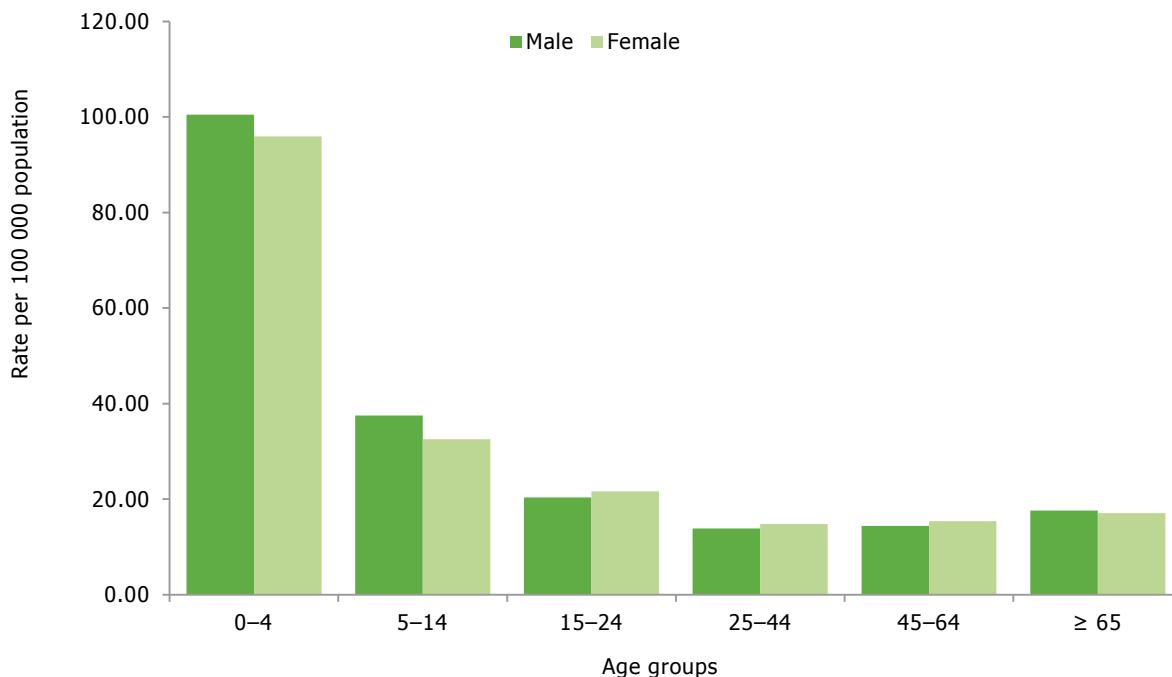


Source: Country reports from Austria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Lithuania, Luxembourg, Malta, Norway, Portugal, Slovakia, Slovenia, Sweden and United Kingdom.

Age and gender distribution

As in previous years, the age-specific confirmed case rate in 2012 was highest in young children, in particular in the 0–4-year-old age group: 98.15 per 100 000 population (Figure 2). The rate in young children was almost three times higher than in older children and about five times as high or more as in the other age groups. There were no differences in the overall rates between males and females (male-female ratio 1.0:1.0).

Figure 2. Rates of confirmed salmonellosis reported cases by age and gender, EU/EEA, 2012

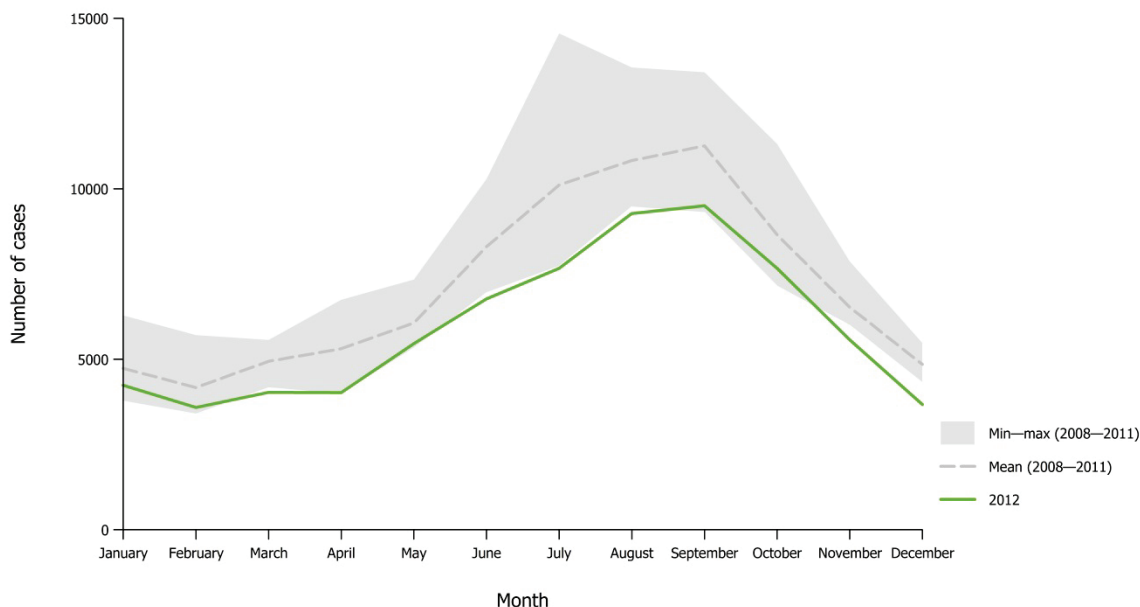


Source: Country reports from Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom.

Seasonality

There is a clear seasonal trend for reported salmonellosis cases (Figure 3), with rates increasing over the summer months, peaking in August and September, and then decreasing. Compared with the previous four years, the number of cases reported by month was generally lower in 2012.

Figure 3. Distribution of confirmed salmonellosis reported cases by month in 2012 compared with 2008–2011 data, EU/EEA



Source: Country reports from Austria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Lithuania, Luxembourg, Malta, Norway, Portugal, Slovakia, Slovenia, Sweden and United Kingdom.

Enhanced surveillance in 2012

The two most common *Salmonella* serotypes in 2012 in EU/EEA countries were *S. Enteritidis* and *S. Typhimurium*, accounting for 41% and 22% of all reported serotypes, respectively (Table 2). In 2012, the number of cases with *S. Enteritidis* decreased by 6% compared with 2011, while cases with *S. Typhimurium* decreased by 8%. The decrease in *S. Typhimurium* could however be explained by the introduction of a separate code in TESSy for reporting of monophasic *S. Typhimurium* 1, 4, [5], 12:i:- in 2010. When adding the monophasic *S. Typhimurium* to the other *S. Typhimurium*, there was instead a 3% increase in 2012 compared with 2011. New on the list of top ten serovar in 2012 were *S. Thompson* and *S. Panama* with 1 100 and 706 cases reported, respectively (Table 2). The majority of *S. Thompson* cases were reported by the Netherlands linked to an outbreak with smoked salmon as the suggested vehicle [1]. The increase in *S. Panama* cases were primarily focused in one German federal state from where an outbreak was reported and one Italian region [2].

Table 2. Number of *Salmonella* most frequently reported serotypes, EU/EEA, 2011–2012

Serotype	2012	Change 2011–2012
<i>S. Enteritidis</i>	34 019	-6%
<i>S. Typhimurium</i>	18 248	-8%
<i>S. Typhimurium</i> , monophasic 1,4,[5],12:i:-*	5 932	59%
<i>S. Infantis</i>	2 021	15%
<i>S. Stanley</i>	1 128	114%
<i>S. Thompson</i>	1 100	353%
<i>S. Newport</i>	777	-4%
<i>S. Derby</i>	735	3%
<i>S. Panama</i>	706	173%
<i>S. Kentucky</i>	651	12%

* A separate serotype code for *S. Typhimurium*, monophasic 1, 4, [5], 12:i:- was introduced in 2010; eleven countries reported cases with the new serotype code in 2012 compared with ten in 2011.

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

Four multi-country outbreaks affecting several Member States were investigated in FWD EPIS in 2012 [3]. These were caused by *S. Stanley* associated with turkey meat, *S. Thompson* associated with smoked salmon, *S. Newport* associated with watermelons and monophasic *S. Typhimurium* phage type U323 from an unknown source. Of the foodborne outbreaks reported by Member States to the European Food Safety Authority (EFSA), *Salmonella* remained the most frequently detected causative agent in 2012 [2]. As many as 1 531 outbreaks were reported to be caused by this pathogen (28.5% of reported outbreaks including those with an unknown agent), accounting for almost 12 000 cases out of which 2 237 were hospitalised and ten cases fatal.

In 2012, 19% of confirmed cases in the EU/EEA with known importation status (n= 61 606) were reported to be associated to travel outside of the reporting country. The percentage of imported cases was highest in the Nordic countries of Finland, Sweden and Norway (around 80%), between 45–57% in Denmark, Iceland, Ireland and the UK, and in the remaining countries, *Salmonella* infections were mainly reported as domestically acquired.

Updates from epidemic intelligence in 2013

At the production of this report, only one multi-country outbreak due to *Salmonella* had been identified through the Epidemic intelligence Information System for Food- and Waterborne Diseases (EPIS-FWD), a platform for information exchange between Member States. These are summarised below.

Multi-country outbreak of non-travel-related Salmonella Stanley, 2011–2013

Between August 2011 and December 2012, 688 cases of non-travel-related *S. Stanley* infections were identified in ten EU countries (Hungary, Austria, Germany, Belgium, the United Kingdom, Czech Republic, Sweden, Italy, Slovak Republic, and Greece). The investigations, including the identical PFGE pattern in isolates from humans, animals, food, and animal feed implied that turkey meat was the primary source of the outbreak [4]. In July 2013, ECDC asked the Member States to provide an update of the situation. Between 1 January and 19 July 2013, 155 *S. Stanley* cases had been identified and 40% of them in Hungary. Although the monthly number of non-travel-related cases in 2013 had decreased compared with the peak of the outbreak in August 2012 it was still higher than what was seen prior to the start of the outbreak (during 2007–2011 the average number of cases was 9 per month). This indicated that *S. Stanley* was still circulating in the turkey-related food chain in some EU Member States.

Discussion

The rate of salmonellosis reported in young children is five times as high as among adults. This may be due to the higher proportion of symptomatic infections among the young, as well as an increased likelihood of parents bringing their children to the doctor and doctors requesting samples from small children.

The steady decrease in reported human salmonellosis cases at the EU/EEA level continued in 2012 and decreasing trends were also observed in seventeen EU/EEA countries. The decrease is thought to be attributed to the implementation of *Salmonella* control programmes in the poultry industry, particularly in laying hens and broilers [2]. The continuous decline in *S. Enteritidis* cases supports this observation as the serotype is most frequently found in poultry and eggs. An illustrative example is from the UK where the incidence of non-typhoidal salmonellosis rose by >170% between 1981 and 1991, driven primarily by an epidemic of *Salmonella* Enteritidis phage type 4, which peaked in 1993 [5]. Several measures were introduced to control the epidemic including legislation, food safety advice and an industry-led vaccination program in broiler-breeder and laying poultry flocks. Since then, the incidence of *S. Enteritidis* has been decreasing and the levels of *S. Enteritidis* PT4 have fallen to pre-epidemic levels in UK [5].

The annual number of reported *Salmonella* outbreaks within the EU has also decreased markedly during recent years [2]. From 2008 to 2012, the total number of *Salmonella* outbreaks decreased by 19%, from 1 888 to 1 531 outbreaks. *Salmonella* is however still the second most commonly reported zoonoses in humans and the most important cause of foodborne outbreaks with known source in the EU as it accounted for 28% of all outbreaks reported to EFSA. Eggs and egg products accounted for almost half of the *Salmonella* outbreaks with strong evidence reported to EFSA [2].

One large multinational *Salmonella* outbreak, due to *S. Stanley*, was detected in 2012 involving ten EU countries with almost 700 human cases reported from August 2011 to December 2012 and continuing in 2013. The outbreak related to the turkey-production chain and was difficult to pinpoint as it involved not only cross-border trade of meat but also cross-border trade of breeding animals. The fact that it took nine months from the first cases being detected in one Member State until the outbreak was identified at the EU level underlines the need to continuously strengthen timely detection, and for coordinated investigations and implementation of appropriate control measures across and in the Member States and at the European level. It also highlights the complexity of multi-country *Salmonella* outbreaks, and stresses the need for intensive collaboration between human, veterinary and food safety organisations and networks across Europe and beyond.

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					Case definition used
						Laboratories	Physicians	Hospitals	Others	National coverage	
Austria	AT-Epidemiegesetz	Cp	Co	P	C	Y	Y	Y	Y	Y	EU-2008
Belgium	BE-REFLAB	V	Se	A	C	Y	N	N	N	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-LAB	Cp	Co	P	C	Y	N	N	N	Y	Other
Estonia	EE-SALMONELLOSIS	Cp	Co	P	C	Y	Y	Y	Y	Y	EU-2008
Finland	FI-NIDR	Cp	Co	P	C	Y	N	N	N	Y	Not specified/unknown
France	FR-NATIONAL_REFERENCE_CENTRES	V	Co	P	C	Y	N	N	N	Y	Other
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-Zoonoses	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-2008
Italy	IT-NRS	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

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			
Luxembourg	LU-LNS-Microbio	V	Co	P	C	Y	N	Y	N	Y	Y	Not specified/unknown
Malta	MT-DISEASE_SURVEILLANCE	Cp	Co	P	C	Y	Y	Y	Y	Y	Y	EU-2008
Netherlands	NL-LSI	V	Se	P	C	Y	N	N	N	-	Y	EU-2008
Norway	NO-MSIS_A	Cp	Co	P	C	Y	Y	Y	N	Y	Y	EU-2012
Poland	PL-NATIONAL_SURVEILLANCE	Cp	Co	P	C	Y	Y	Y	N	Y	Y	EU-2008
Portugal	PT-SALMONELLOSIS	Cp	Co	P	C	N	Y	N	N	Y	Y	EU-2008
Romania	RO-RNSSy	Cp	Co	P	C	Y	N	Y	N	Y	Y	EU-2008
Slovakia	SK-EPIS	Cp	Co	A	C	Y	Y	Y	Y	Y	Y	EU-2012
Slovenia	SI-SURVIVAL	Cp	Co	P	C	Y	Y	Y	N	Y	Y	EU-2008
Spain	ES-MICROBIOLOGICAL	V	Se	P	C	Y	N	N	N	N	Y	EU-2008
Sweden	SE-SMINET	Cp	Co	P	C	N	Y	N	N	Y	Y	EU-2012
United Kingdom	UK-SALMONELLOSIS	O	Co	P	C	Y	N	Y	Y	Y	Y	EU-2012

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