SURVEILLANCE REPORT

Annual Epidemiological Report for 2015

# Salmonellosis

## Key facts

- Salmonellosis is the second most commonly reported gastrointestinal infection and an important cause of foodborne outbreaks in the EU/EEA.
- In 2015, 95 595 laboratory-confirmed cases were reported; the EU/EEA notification rate was 22.9 cases per 100 000 population.
- Salmonellosis notification rates have increased in the last two years after a long period that was marked by a declining trend.
- The reported case rate was highest in young children 0–4 years of age: 113.0 cases per 100 000 population were reported in 2015 – six times higher than in adults.

## Methods

This report is based on data for 2015 retrieved from The European Surveillance System (TESSy) on 15 November 2016. 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 2015, 30 EU/EEA countries reported data on salmonellosis. Twenty-four countries reported data, using either the 2008 or the 2012 EU case definition for salmonellosis, which is essentially the same as the one for 2008. Four countries used another definition, and two did not specify the definition they used. The disease is under mandatory notification in 24 countries, voluntary in four, and two countries have a surveillance system that is categorised as 'other'.

The surveillance systems for salmonellosis have national coverage in all Member States except in Belgium, France, the Netherlands and Spain. In 2015, the population coverage was estimated to be 45% in Spain, 48% in France and 64% in the Netherlands. The variation in coverage was taken into consideration when calculating the notification rates. No information on estimated coverage was provided by Belgium, thus no notification rates were calculated. Three countries have active surveillance systems while the rest have passive systems. Twenty-one

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countries have surveillance systems that integrate laboratory and epidemiological data, and four countries submit data from their national reference laboratories via a separate data source.

In addition to case-based surveillance, ECDC coordinates molecular typing-enhanced surveillance on salmonellosis through isolate-based data collection. A typing-based multi-country cluster of *Salmonella* spp. is currently defined as at least two different countries reporting at least one isolate each with matching *Xba*I pulsotypes, or matching multiple locus variable-number of tandem repeat analysis (MLVA) types for *Salmonella enterica* serovar Typhimurium, no more than eight weeks apart.

# Epidemiology

In 2015, 97 114 salmonellosis cases were reported by 30 EU/EEA countries, with 95 595 confirmed cases and an EU/EEA notification rate of 22.9 cases per 100 000 population (Table 1). Compared with 2014 (21.7 cases per 100 000), this represented a 6% increase in the EU/EEA notification rate.

The highest notification rates in 2015 were reported by the Czech Republic (117.7 cases per 100 000 population) and Slovakia (89.3) which both have active surveillance of salmonellosis, followed by Hungary (49.7) and Spain (43.3) (Table 1 and Figure 1). The lowest rates were reported by Portugal and Greece (≤5.0 per 100 000). The large increase in notification rates in Bulgaria (48%) and France (15%) was in line with an increase in the number of Salmonella outbreaks in these countries. In France, the increase was also associated with changes in the laboratory and reporting procedures (N. Jourdan-Da Silva, InVS, France, personal communication July 2016). In Spain, the improved surveillance system for salmonellosis in 2015 resulted in an increase of confirmed cases by 37%.

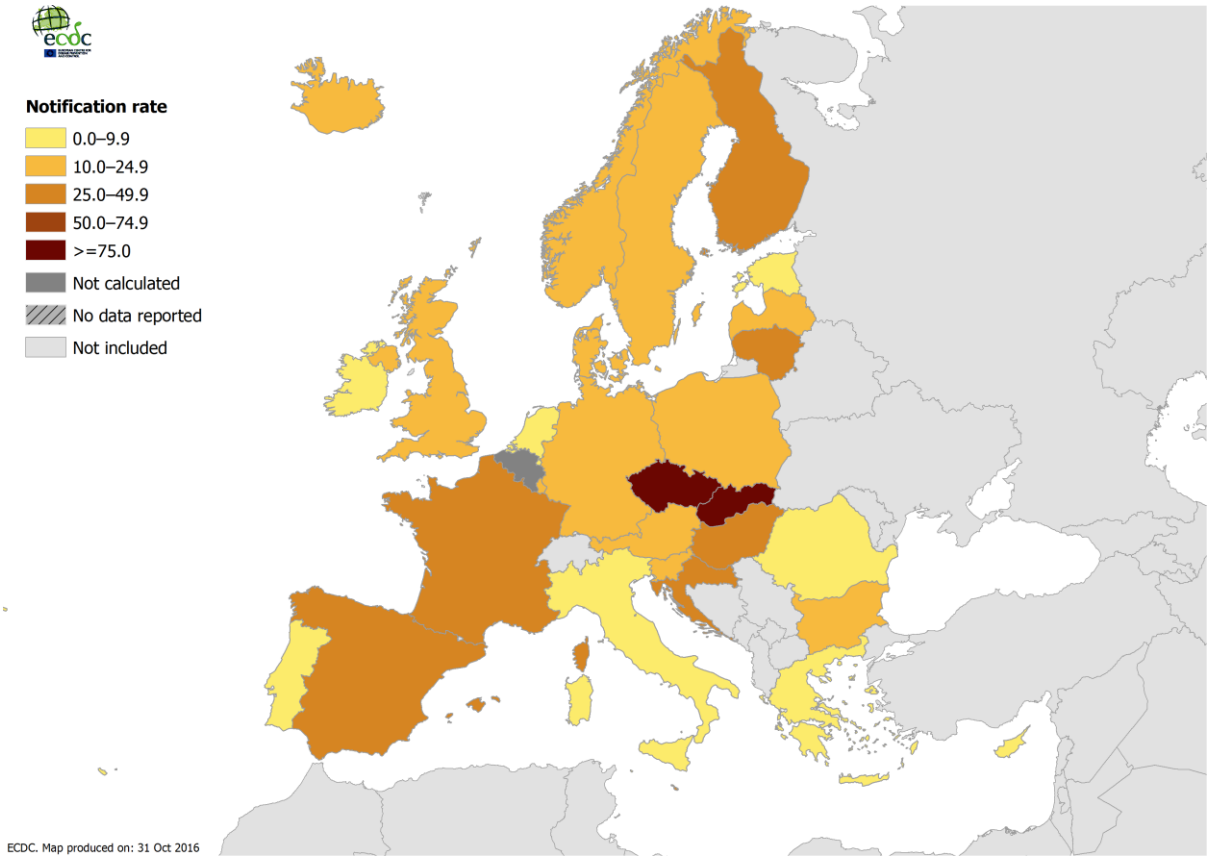
Of 60 485 cases with known travel history, 10 231 (17%) were reported as travel-associated. The proportion of domestic cases versus travel-associated cases varied markedly between countries, with the highest proportions of domestic cases, ranging from 86% to 100%, reported in the Czech Republic, Germany, Greece, Hungary, Latvia, Lithuania, Malta, the Netherlands, Portugal and Slovakia. The highest proportions of travel-related cases were reported by three Nordic countries – Finland (82%), Norway (78%) and Sweden (70%). Turkey, Thailand and Spain were the most frequently stated probable country of infection (15%, 13% and 8%, respectively) mentioned in connection with 9 300 travel-associated cases with known probable country of infection.

**Table 1. Distribution of confirmed salmonellosis cases per 100 000 population, EU/EEA, 2011–2015**

| Country | 2011 | | 2012 | | 2013 | | 2014 | | 2015 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Confirmed cases | | Confirmed cases | | Confirmed cases | | Confirmed cases | | National | Reported | Confirmed cases | | |
| | Number | Rate | Number | Rate | Number | Rate | Number | Rate | coverage | cases | Number | Rate | ASR |
| Austria | 1432 | 17.1 | 1773 | 21.1 | 1404 | 16.6 | 1654 | 19.4 | Y | 1546 | 1544 | 18.0 | 18.9 |
| Belgium | 3177 | - | 3101 | - | 2528 | - | 2698 | - | N | 3170 | 3170 | - | - |
| Bulgaria | 924 | 12.5 | 839 | 11.5 | 766 | 10.5 | 730 | 10.1 | Y | 1109 | 1076 | 14.9 | 16.1 |
| Croatia | . | . | 0 | 0.0 | 0 | 0.0 | 1494 | 35.2 | Y | 1593 | 1593 | 37.7 | 39.0 |
| Cyprus | 110 | 13.1 | 90 | 10.4 | 79 | 9.1 | 88 | 10.3 | Y | 65 | 65 | 7.7 | 7.5 |
| Czech Republic | 8499 | 81.0 | 10056 | 95.7 | 9790 | 93.1 | 13255 | 126.1 | Y | 12612 | 12408 | 117.7 | 121.3 |
| Denmark | 1170 | 21.0 | 1207 | 21.6 | 1137 | 20.3 | 1124 | 20.0 | Y | 925 | 925 | 16.3 | 16.3 |
| Estonia | 375 | 28.2 | 249 | 18.8 | 183 | 13.9 | 92 | 7.0 | Y | 118 | 112 | 8.5 | 8.4 |
| Finland | 2095 | 39.0 | 2210 | 40.9 | 1984 | 36.6 | 1622 | 29.8 | Y | 1650 | 1650 | 30.2 | 31.3 |
| France | 8685 | 27.8 | 8705 | 27.8 | 8927 | 28.4 | 8880 | 28.1 | 48% | 10305 | 10305 | 32.3 | 30.9 |
| Germany | 23982 | 29.9 | 20493 | 25.5 | 18696 | 23.2 | 16000 | 19.8 | Y | 13821 | 13667 | 16.8 | 17.9 |
| Greece | 471 | 4.2 | 404 | 3.6 | 414 | 3.8 | 349 | 3.2 | Y | 466 | 466 | 4.3 | 4.4 |
| Hungary | 6169 | 61.8 | 5462 | 55.0 | 4953 | 50.0 | 5249 | 53.1 | Y | 5069 | 4894 | 49.7 | 52.3 |
| Ireland | 311 | 6.8 | 309 | 6.7 | 326 | 7.1 | 259 | 5.6 | Y | 270 | 270 | 5.8 | 5.6 |
| Italy | 4467 | 7.5 | 4829 | 8.1 | 5042 | 8.4 | 4462 | 7.3 | Y | 3840 | 3821 | 6.3 | 6.5 |
| Latvia | 995 | 48.0 | 547 | 26.8 | 385 | 19.0 | 278 | 13.9 | Y | 430 | 380 | 19.1 | 19.9 |
| Lithuania | 2294 | 75.1 | 1762 | 58.7 | 1199 | 40.3 | 1145 | 38.9 | Y | 1082 | 1082 | 37.0 | 37.4 |
| Luxembourg | 125 | 24.4 | 136 | 25.9 | 120 | 22.3 | 110 | 20.0 | Y | 106 | 106 | 18.8 | 18.8 |
| Malta | 129 | 31.1 | 88 | 21.1 | 84 | 19.9 | 132 | 31.0 | Y | 126 | 126 | 29.3 | 29.6 |
| Netherlands | 1284 | 12.0 | 2199 | 20.5 | 979 | 9.1 | 970 | 9.0 | 64% | 974 | 974 | 9.0 | 9.1 |
| Poland | 8404 | 22.1 | 7959 | 20.9 | 7315 | 19.2 | 8042 | 21.2 | Y | 8661 | 8245 | 21.7 | - |
| Portugal | 174 | 1.6 | 185 | 1.8 | 167 | 1.6 | 244 | 2.3 | Y | 333 | 325 | 3.1 | 3.4 |
| Romania | 989 | 4.9 | 698 | 3.5 | 1302 | 6.5 | 1512 | 7.6 | Y | 1518 | 1330 | 6.7 | 6.8 |
| Slovakia | 3897 | 72.3 | 4627 | 85.6 | 3807 | 70.4 | 4078 | 75.3 | Y | 5103 | 4841 | 89.3 | 91.3 |
| Slovenia | 400 | 19.5 | 392 | 19.1 | 316 | 15.3 | 597 | 29.0 | Y | 401 | 401 | 19.4 | 19.9 |
| Spain | 3786 | 32.5 | 4224 | 36.1 | 4537 | 32.4 | 6633 | 31.7 | 45% | 9047 | 9045 | 43.3 | 44.6 |
| Sweden | 2887 | 30.7 | 2922 | 30.8 | 2842 | 29.7 | 2211 | 22.9 | Y | 2312 | 2312 | 23.7 | 24.0 |
| United Kingdom | 9454 | 15.0 | 8812 | 13.9 | 8465 | 13.2 | 8099 | 12.6 | Y | 9490 | 9490 | 14.6 | 14.4 |
| EU | 96685 | 23.6 | 94278 | 23.2 | 87747 | 21.5 | 92007 | 21.7 | . | 96142 | 94623 | 23.0 | 23.4 |
| Iceland | 45 | 14.1 | 38 | 11.9 | 48 | 14.9 | 40 | 12.3 | Y | 44 | 44 | 13.4 | 14.3 |
| Liechtenstein | . | . | . | . | . | . | . | . | . | . | . | . | . |
| Norway | 1290 | 26.2 | 1371 | 27.5 | 1361 | 26.9 | 1118 | 21.9 | Y | 928 | 928 | 18.0 | 18.1 |
| EU/EEA | 98020 | 23.6 | 95687 | 23.3 | 89156 | 21.5 | 93165 | 21.7 | . | 97114 | 95595 | 22.9 | 23.4 |

*Source: Country reports. Legend: Y = yes, N = no, C = case based, A = aggregated, · = no data reported, ASR = age-standardised rate, - = no notification rate calculated.*

**Figure 1. Distribution of confirmed cases of non-typhoidal salmonellosis per 100 000 population, EU/EEA, 2015**



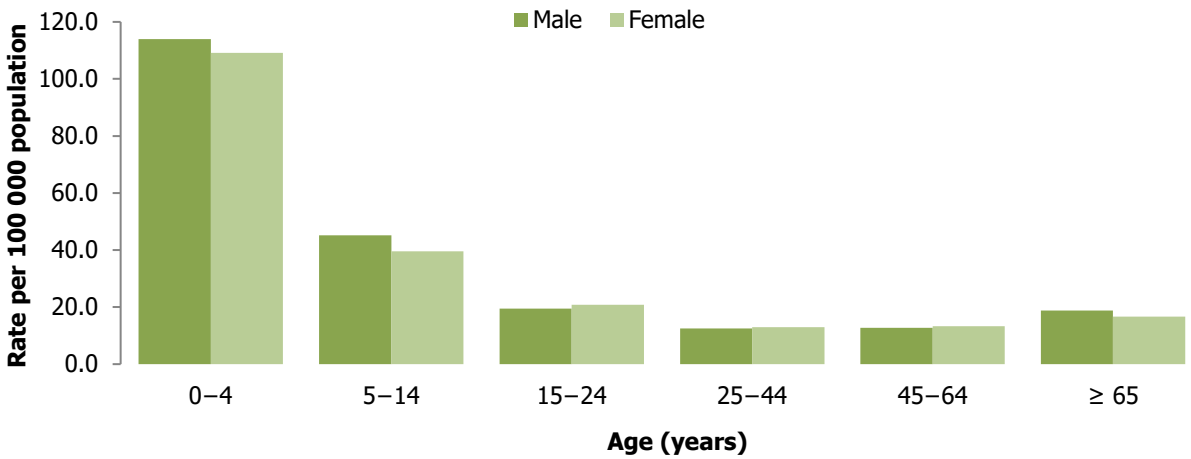

*Source: Country reports from Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden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

The highest notification rate of salmonellosis was observed among young children 0–4 years of age, with 113.0 cases per 100 000 population (Figure 2). The rate in young children was almost three times higher than in older children and at least six times as high as in the remaining age groups. In some countries, the rate among young children was 30 to almost 100 times higher than the rate among adults 25–44 years of age, for example in Bulgaria (31 times), Cyprus (64 times), Greece (41 times), Italy (30 times) and Portugal (99 times). In these countries, the proportions of hospitalised cases were very high in all age groups (average 74–86%, no data available for Bulgaria and Italy) while the salmonellosis notification rates were low. There were no differences in the overall rates between males and females.

There is a clear seasonal variation in the number of reported salmonellosis cases (Figure 3), with case numbers increasing over the summer months, peaking in August and September, and then decreasing.

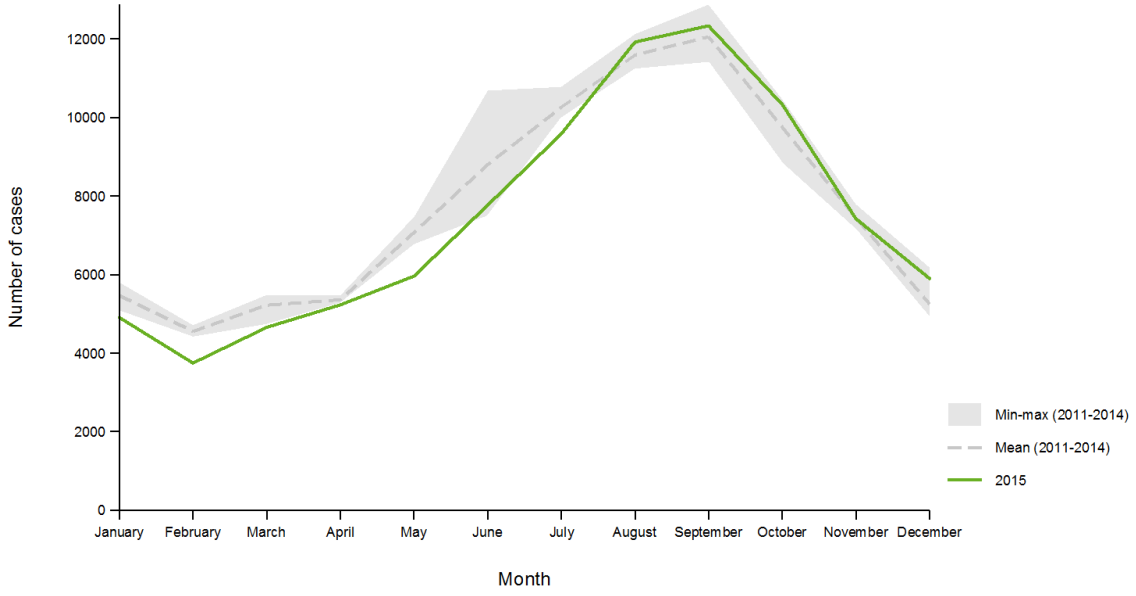
The decreasing trend of salmonellosis observed in the EU/EEA for many years seemed to subside at the end of the five-year period 2011–2015; case numbers increased in 2014–2015 (Figure 4).

**Figure 2. Distribution of confirmed cases of non-typhoidal salmonellosis per 100 000 population, by age and gender, EU/EEA, 2015**



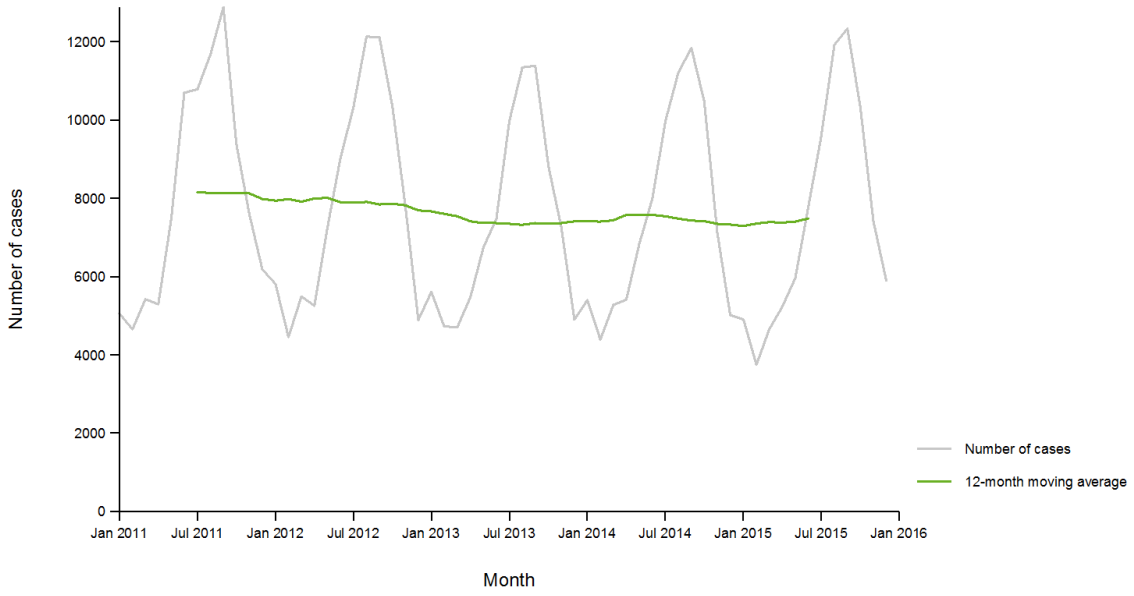

*Source: Country reports from Austria, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.*

**Figure 3. Distribution of cases of non-typhoidal salmonellosis by month, EU/EEA, 2015 and 2011–2014**




*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, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, the United Kingdom.*

**Figure 4. Distribution of cases of non-typhoidal salmonellosis by month, EU/EEA, 2011–2015**




*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, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, the United Kingdom.*

# Molecular typing-enhanced surveillance

In 2015, 17 countries submitted *Salmonella* typing data; 71 molecular typing cluster investigations (MTCIs) were initiated after typing, all using MLVA. Two of the MTCIs were escalated to 'urgent inquiries'. The three most commonly reported *S.* Typhimurium MLVA types were 3-12-10-NA-211, 3-13-9-NA-211, and 3-12-9-NA-211.

# Threats description for 2015

In 2015, a multi-country outbreak of *S.* Enteritidis was linked to an international youth ice hockey tournament in Latvia with about 5 000 participants from 19 countries. The outbreak investigation identified 154 suspected and 96 confirmed cases from seven countries [4]. Consuming sauce Bolognese and salad at one of the event arenas were linked to a significantly higher risk of developing illness [4]. Breaches in hygiene and food storing practices were found in the kitchen of this arena.

# Discussion

The rate of salmonellosis reported in young children was six times higher than among adults. This may be due to the higher proportion of symptomatic infections among the young and an increased likelihood for parents to bring their children to see a doctor, where it is common practice to take samples from small children. Countries with very large differences in the rates of young children and adults also reported high proportions of hospitalised cases. This indicates that the surveillance systems in those countries are mainly capturing the most severe infections. The degree of underreporting and underascertainment in salmonellosis in the EU/EEA is generally high and varies by country, as shown in a large European study on salmonellosis seroincidence [5]. The study concluded that seroincidence was not correlated with the reported national incidence of *Salmonella* infections but rather with prevalence data of *Salmonella* in laying hens, broilers and slaughter pigs, as assessed in the EU baseline surveys by EFSA. Seroincidence also correlated with Swedish data on the country-specific risk of travel-associated salmonellosis [5]. One output of the study was a seroincidence tool which can be used to estimate the frequency of exposure to *Salmonella*, which is much closer to the true incidence of *Salmonella* in the population than the reported number of cases [6].

Over the last eight years, EU Member States showed a statistically significant decreasing trend in salmonellosis cases and in the reported number of foodborne outbreaks due to *Salmonella* [7]. This decrease is thought to be connected with the implementation of *Salmonella* control programmes in the poultry industry, particularly in laying hens and broilers [8]. Nonetheless, salmonellosis remains the second most common zoonosis in humans in the EU/EEA. In 2015, *Salmonella* was the most common cause of foodborne outbreaks, accounting for 22% of all reported foodborne outbreaks (953 outbreaks) [7]. Eggs and egg products continued to be the most commonly

identified vehicle in these outbreaks, and in 2015 *S*. Enteritidis was again the most frequently identified serotype in laying hens, after two years of non-regulated serotypes being more frequent [7].

# Public health implications

The rates of non-typhoidal salmonellosis vary between EU/EEA countries, reflecting differences in, for example, prevalence in foodstuffs and animals used for food production, animal trade between countries, the proportion of travel-associated cases, and the quality and coverage of surveillance systems. Salmonellosis has been decreasing in the EU/EEA since 2004 due to control programmes targeting specific serotypes in the animal population. It is important to point out, though, that any *Salmonella* serotype can cause infections in humans and result in outbreaks.

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