

Annual Epidemiological Report

November 2019

Salmonella infection in Ireland, 2018

Key Facts

- 363 salmonellosis cases notified in 2018 (crude incidence rate of 7.6 per 100,000)
- Overall increasing trend in salmonellosis since 2014 (40% increase in four years)
- More than half of salmonellosis notifications were associated with international travel
- Most common serotypes reported were *S. Enteritidis* and *S. Typhimurium* (incl. monophasic *Typhimurium*), with *S. Typhimurium* the most prevalent serotype among cases acquired in Ireland
- Increasing incidence of *S. Enteritidis*, both travel-associated and domestically acquired
- The largest outbreak reported this year was travel-related, and was suspected to be foodborne
- WGS confirmed majority of cases diagnosed in Ireland genetically unrelated to one another, but enabled case clusters and sporadic cases in Ireland to be recognised as being part of larger EU incidents

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Background

Salmonellosis typically presents clinically as an acute enterocolitis, with sudden onset of abdominal pain, diarrhoea, nausea, headache and occasionally vomiting. Fever is almost always present. Dehydration, especially among vulnerable populations such as infants, the immunocompromised and the elderly, may be severe. Invasive infection occurs in a proportion of cases.

The common reservoirs for non-typhoidal *Salmonella* are the intestinal tract of domestic and wild animals (including birds), which may result in a variety of foodstuffs, of both animal and plant origin, becoming contaminated with faecal organisms either directly or indirectly. Infected food handlers may also act as a source of contamination for foodstuffs. The organism may also be transmitted through direct contact with infected animals or humans or faecally contaminated environments. Companion animals are increasingly being reported as sources of infection, in particular for children.

Typhoid (caused by *S. Typhi*) and paratyphoid (caused by *S. Paratyphi*) cause enteric fever, a severe systemic life threatening condition; when reported in Ireland, these are almost invariably travel-associated.

Methods

Disease notification

Salmonellosis, typhoid and paratyphoid are notifiable diseases in Ireland under Infectious Disease Regulations. Consequently, all medical practitioners, including clinical directors of diagnostic laboratories, are required to notify the regional Medical Officer of Health (MOH) of all cases of salmonellosis, typhoid or paratyphoid. Notifications are reported using the Computerised Infectious Disease Reporting system ([CIDR](#)) which is described [here](#). Further information on the process of reporting notifiable infectious diseases is available [here](#). The case definitions in use in 2018 are available [here](#). For this report, data on notified cases of salmonellosis reported to CIDR in 2018 were extracted from CIDR as of 27th September 2019, and data on typhoid and paratyphoid cases were extracted on October 3rd 2019.

Typing of *Salmonella* isolates

The National *Salmonella*, *Shigella* and *Listeria* Reference Laboratory (NSSLRL) undertake whole genome sequencing (WGS) on all *Salmonella* isolates referred from primary laboratories, enabling antimicrobial sensitivities to be predicted and genetically-related clusters to be detected.

Results

Salmonellosis

Overall incidence

During 2018, 363 cases of salmonellosis were notified (349 confirmed and 14 probable). Overall this corresponds to a crude incidence rate (CIR) of 7.6 per 100,000 population.

Strain characteristics

The NSSLRL analysed 351 human non-typhoidal *Salmonella* isolates referred for further typing in 2018.

The top 10 non-typhoidal serotypes identified in 2018 are displayed in Table 1. As usual, *S. Enteritidis* (27%) and *S. Typhimurium* (including monophasic Typhimurium) (31%) were the most common serotypes.

Table 1: Top ten non-typhoidal *Salmonella* serovars in Ireland, 2018

Serotype	Number of human isolates	%
Enteritidis	95	27.1%
Monophasic Typhimurium	53	15.1%
Typhimurium	56	16.0%
Newport	18	5.1%
Agona	9	2.6%
Kentucky	8	2.3%
Infantis	7	2.0%
Stanley	6	1.7%
Branderup	6	1.7%
Virchow	6	1.7%
Other		24.8%

Data source: NSSLRL

More detail on the typing of human *Salmonella* isolates and their resistance to antimicrobials is reported in the National *Salmonella, Shigella & Listeria* Reference Laboratory of Ireland, Annual Report. ¹

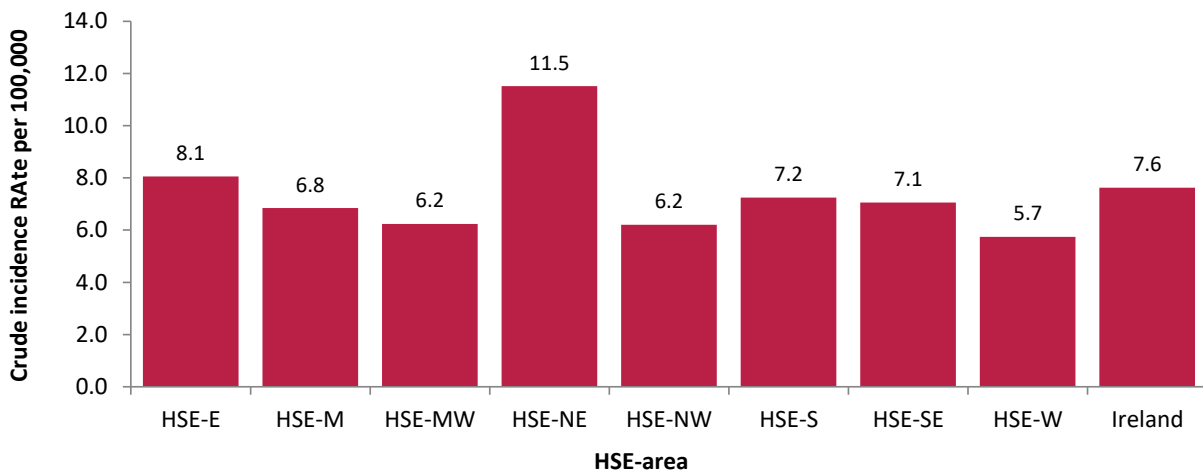
Geographical and age distribution

The crude incidence rates varied very little by HSE-area, with all except the HSE-NE being between 5.7 and 8.1 per 100,000 (Figure 1). The elevated rate in the NE was strongly

influenced by the inclusion of several HSE-NE cases in a travel-associated outbreak described below.

Similar to earlier years, the highest age-specific incidence rate was in children under 5 years of age (19.3/100,000). This is likely to be influenced by clinicians more readily seeking clinical samples in that age group. The next highest rate was in the 20-24 years age group (11.7 per 100,000); the lowest rate this year was in the 15-19 years age group (2.6 per 100,000).

Figure 1: Annual crude incidence rate per 100,000 by HSE area, Ireland 2018



Data source: CIDR

Disease severity

Diarrhoea was the most common symptom (97%) among notified cases in 2018 (Table 2), followed by abdominal pain (84%). Bloody diarrhoea occurred among 32% of cases. Median duration of illness was eight days (range 1-67 days), based on observations for 192 cases. Where recorded, thirty-eight per cent of cases (135/358) were hospitalised.

Table 2: Disease severity of notified *Salmonella* cases in Ireland, 2018

Symptom/disease feature	Number with symptom	Number without symptom	Number symptom unknown	Percentage of cases with symptom (among known)
Diarrhoea	323	11	29	97%
Bloody diarrhoea	94	204	65	32%
Vomiting	135	174	54	44%
Nausea	171	93	99	65%
Abdominal pain	241	47	75	84%
Fever	228	63	72	78%
Headache	91	129	143	41%
Myalgia	65	140	158	32%

Data source: CIDR

Animal contact as a risk factor

Contact with pets (e.g. reptiles), with pet food (e.g. frozen rodents, pig ear treats), with wildlife (e.g. hedgehogs), and with cattle, have all been associated with an increased risk of salmonellosis. Where recorded on CIDR, 32% (97/307) of salmonellosis cases reported contact with pets (four of which were reptiles), 9% (25/288) reported contact with farm animals, 3% (7/202) reported contact with wildlife, and 14% (32/235) reported contact with pet feed (none with frozen feeder rodents or pig ear treats).

Foreign travel as a risk factor for salmonellosis in Ireland

Where country of infection was reported, 51% (166/328) of cases were travel-associated. Travel-associated cases peaked between July and October coinciding with the peak summer holiday period. The seasonal variation among domestically acquired cases was less pronounced (data not shown).

Among travel associated cases (n=166), the most common countries of infection reported were Spain (n=31), Bosnia & Herzegovina (n=27), Thailand (n=13), and India (n=10). The popularity of a country as a travel destination is likely to be an important factor in determining the number of cases associated with each country. In 2018 the atypically high number of notifications linked with travel to Bosnia & Herzegovina represent an outbreak.

Table 3: Salmonellosis notifications acquired in Ireland, Europe and Rest of the World by age group, serotype and quarter, 2018

Characteristic		Ireland	Europe	Rest of the world	Unknown /Not Specified	Total
Age group	<15 yrs	56	10	16	14	96
	15-44 yrs	57	23	46	13	139
	45-64 yrs	23	24	19	6	72
	65+ yrs	26	24	3	2	55
Serotype	Typhimurium	33	12	6	6	57
	Monophasic Typhimurium	25	14	7	2	48
	Enteritidis	34	32	16	6	88
	Other	62	14	51	11	138
	Not specified*	8	10	4	10	32
Quarter	Q1	26	2	9	5	42
	Q2	40	11	22	4	77
	Q3	51	50	36	12	149
	Q4	45	19	17	14	95
Total		162	82	84	35	363

Data source: CIDR

*includes 14 probable cases and 18 notifications for which this variable was not completed

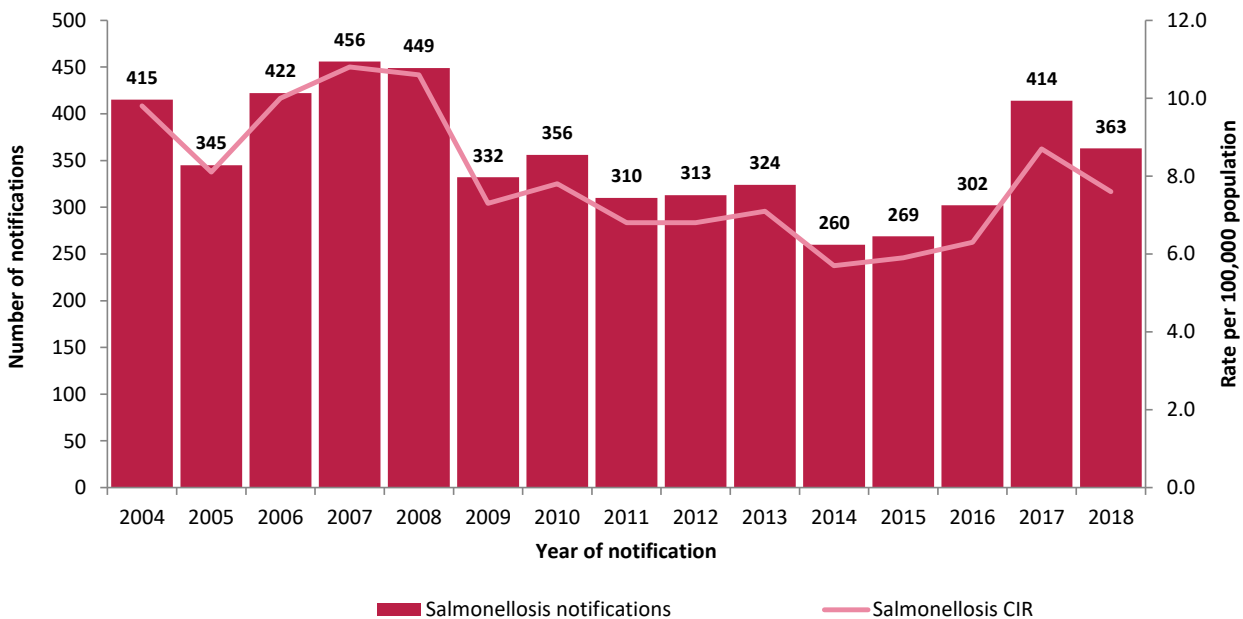
Disease acquired in Ireland was more commonly caused by *S. Typhimurium* and monophasic *Typhimurium* strains (38%) than by *S. Enteritidis* strains (22%), with other strains making up the remaining 40% of cases (Table 3). By contrast, disease acquired in

Europe was most commonly associated with *S. Enteritidis* (44%), followed this year by *S. Typhimurium* (incl. monophasic Typhimurium) strains (36%), with other strains accounting for 19% of cases. For cases associated with acquisition in the Rest of the World, non-Enteritidis, non-Typhimurium cases predominated (64%), with *S. Enteritidis* accounting for 20% and *S. Typhimurium* (incl. monophasic Typhimurium) strains accounting for 23% of cases (Table 3).

Trends

The 363 cases notified in 2018 represent a 12% decrease compared to 2017; when only confirmed cases are compared, the 349 cases in 2018 represent an 8% decrease on the number in 2017 (Figure 2). Overall, notifications have increased 40% from a low of 260 cases notified in 2014, but remain well below levels notified in 2007-2008..

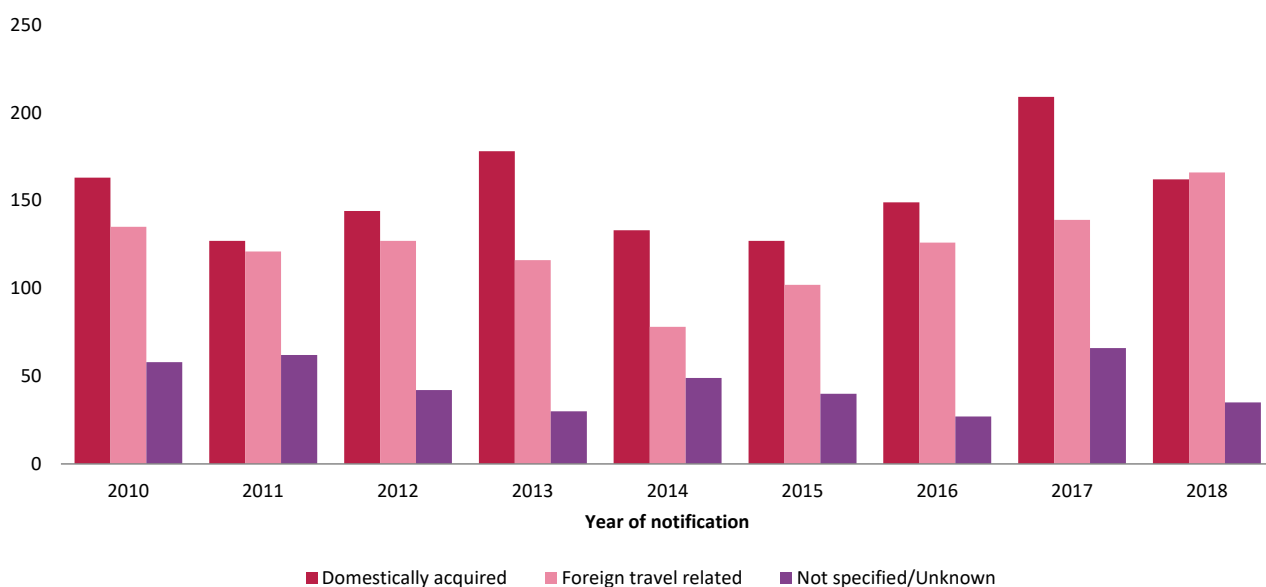
Figure 2: Annual number of notifications and crude incidence rate per 100,000, Ireland 2004-2018



Data source: CIDR

The increase in notifications since 2014 is more pronounced among travel-associated cases (up 113%), with a more modest increase of 22% among domestically-acquired cases (Figure 3).

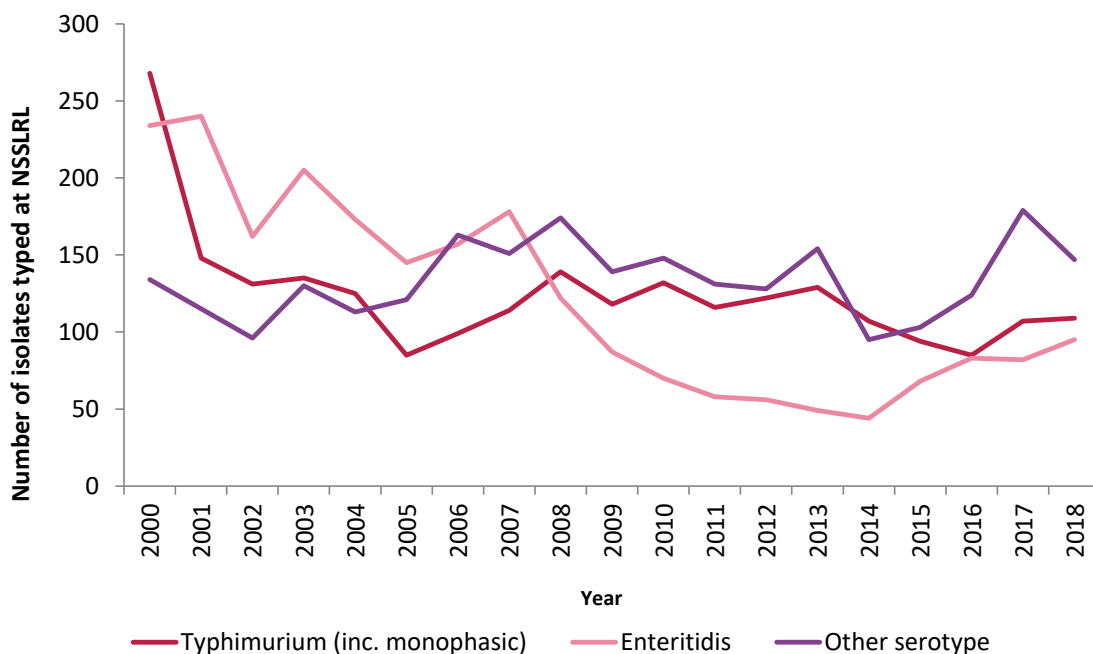
Figure 3: Salmonellosis notifications by year of notification and travel-status, 2010-2018



Data source: CIDR

Figure 4 shows the distribution of serotypes identified by NSSLRL over the period 2000-2018. Compared to 2017, the number of cases due to *S. Enteritidis* increased by 14%, *S. Typhimurium* remained similar (up 2%), while those due to other serotypes decreased by 22%. The increasing trend in *S. Enteritidis* cases since 2014 is observed among both domestically-acquired and travel-associated notifications (Figure 5).

Figure 4: Annual number of non-typhoidal *Salmonella* isolates referred to NSSLRL by serotype in Ireland, 2000-2018



Data source: NSSLRL data

Figure 5: Annual number of *S. Enteritidis* isolates by country of infection and year, 2008-2018

Data source: CIDR

Outbreaks and clusters of salmonellosis

During 2018, two general outbreaks and three family outbreaks of salmonellosis were notified. The largest was an international outbreak of *Salmonella* monophasic Typhimurium, sequence type 19 identified initially by the HSE NE among members of a pilgrimage group returning from Medjugorje, Bosnia and Herzegovina in September 2018.² Further cases of salmonellosis in travellers returning from Medjugorje were reported from five other HSE-areas, and from another EU Member State, indicating this was a wider event. In total 29 outbreak cases were identified among Irish residents; 18 (62%) of whom were laboratory-confirmed. The source was not identified, but a continuing foodborne source was suspected given the distribution of cases over a one month period.²

The second largest outbreak notified was a foodborne family outbreak in the HSE-E with seven reported ill; a family meal was the suspected vehicle of transmission.

The three remaining outbreaks were small in size (2-3 cases each); two were suspected foodborne travel-related outbreaks and person-to-person transmission was reported for the remaining outbreak.

While WGS at NSSLRL has confirmed that the majority of non-typhoidal *Salmonella* isolates are not genetically linked, a further 24 non-typhoidal salmonella genetic clusters were identified by NSSLRL in 2018 in addition to the five notified outbreaks. The median number of cases in these clusters was two, and cases in eleven of these clusters reported foreign travel.^{1,3,4} Many clusters were too diffuse geographically or temporally to require further public health action. However, one cluster of six cases of *S. Enteritidis* in 2018 was genetically linked to a salmonellosis outbreak at European level associated with Polish

eggs.⁴ In addition, two apparently sporadic salmonellosis cases were genetically linked to other international outbreaks identified in Europe.^{4,5}

Typhoid/Paratyphoid:

In 2018, eleven cases of typhoid were notified. Eight were associated with travel to Asia, principally Pakistan (n=3), India (n=2), and Bangladesh (n=2), one was associated with Africa. Country of infection was not specified for one case. Six cases occurred in children aged 15 years or less.

Five paratyphoid cases were notified; all were adults and all were associated with travel to India.

Discussion

The overall incidence of salmonellosis in Ireland remains low compared to other parts of Europe.⁵ Although the CIR reported in 2018 decreased slightly compared to 2017, there was a large outbreak in 2017 which temporarily elevated the rate, and the rate in 2018 is consistent with an overall increasing trend since 2014.

The occurrence of travel-associated cases of salmonellosis remains a large contributor to the overall burden of salmonellosis in Ireland, in particular in summer months. This year, for the first time, the number of travel acquired salmonellosis cases exceeded the number of domestically acquired cases, coinciding with increasing foreign travel among Irish residents as the economic recession recedes.

Because a high proportion of Irish salmonellosis cases are travel-related, they can appear to be sporadic when viewed in isolation in the Irish dataset. However, WGS has enabled some travel-associated Irish cases to be linked with outbreaks at European level.^{3,4} Collaboration with European colleagues is key for identifying and solving such internationally distributed outbreaks.

Between 2009 and 2014, the number of *S. Enteritidis* cases was much lower than the number of *S. Typhimurium* cases, but in recent years, there has been an increasing number of infections due *S. Enteritidis* reported such that now they almost match the number reported for *S. Typhimurium*. The increase in *S. Enteritidis* was observed among both domestically-acquired and travel-associated infections.

Food remains an important transmission route for salmonellosis. Eggs and egg products' were a significant source of human infection due to *Salmonella* in Europe and accounted for over a third of outbreaks reported to the European Food Safety Authority for 2017.⁶ Various meat and meat products, and bakery products accounted for another one third of outbreaks between them at European level.⁶ In the United States in 2019, foodborne salmonellosis outbreaks have been associated with tahini, pre-cut melon, papayas, and minced turkey.⁷

Contact with pets (e.g. reptiles), with pet food (e.g. frozen rodents), with wildlife (e.g. hedgehogs), and with cattle, have all been associated with an increased risk of salmonellosis. In the United States in 2019, pig ear dog treats, contact with pet hedgehogs, and chicks and ducks kept as pets have been implicated in outbreaks. ⁷ In the UK, frozen mice produced as feed for pet reptiles have also been reported as a source of salmonellosis in humans. ⁸

Further information available on HPSC website

Further information about salmonellosis is available at <https://www.hpsc.ie/a-z/gastroenteric/salmonellosis/>

Publications on salmonellosis in Ireland available at <https://www.hpsc.ie/a-z/gastroenteric/salmonellosis/publications/>

Acknowledgements

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Report prepared by:

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