



**EPIDEMIOLOGICAL DATA FOR SALMONELLOSIS (NON-TYPHOID/PARATYPHOID)
IN GREECE, 2004-2024
MANDATORY NOTIFICATION SYSTEM**

Main points

- Based on the data for the period 2004-2024:
 - The notification rate of the disease was higher among children <15 years old and especially in the age group of 0-4 years old.
 - A seasonal pattern was apparent: the mean annual notification rate increased during summer, reaching a peak in August.
 - 16% of the cases reported one or more people with similar symptoms among their contacts.
 - *S. Enteritidis* and *S. Typhimurium* were the most frequently reported serovars.
 - The low notification rate of salmonellosis in Greece during the period 2020-2021, may be explained by the COVID-19 pandemic.
 - In 2024, the notification rate of salmonellosis increased by 12,6% compared to 2023.

Salmonella spp. is one of the etiological agents of foodborne infections, as well as the main bacterial cause of foodborne disease outbreaks, in many European countries. It is an important cause of diarrheal illness among children and the elderly [1].

Time trend

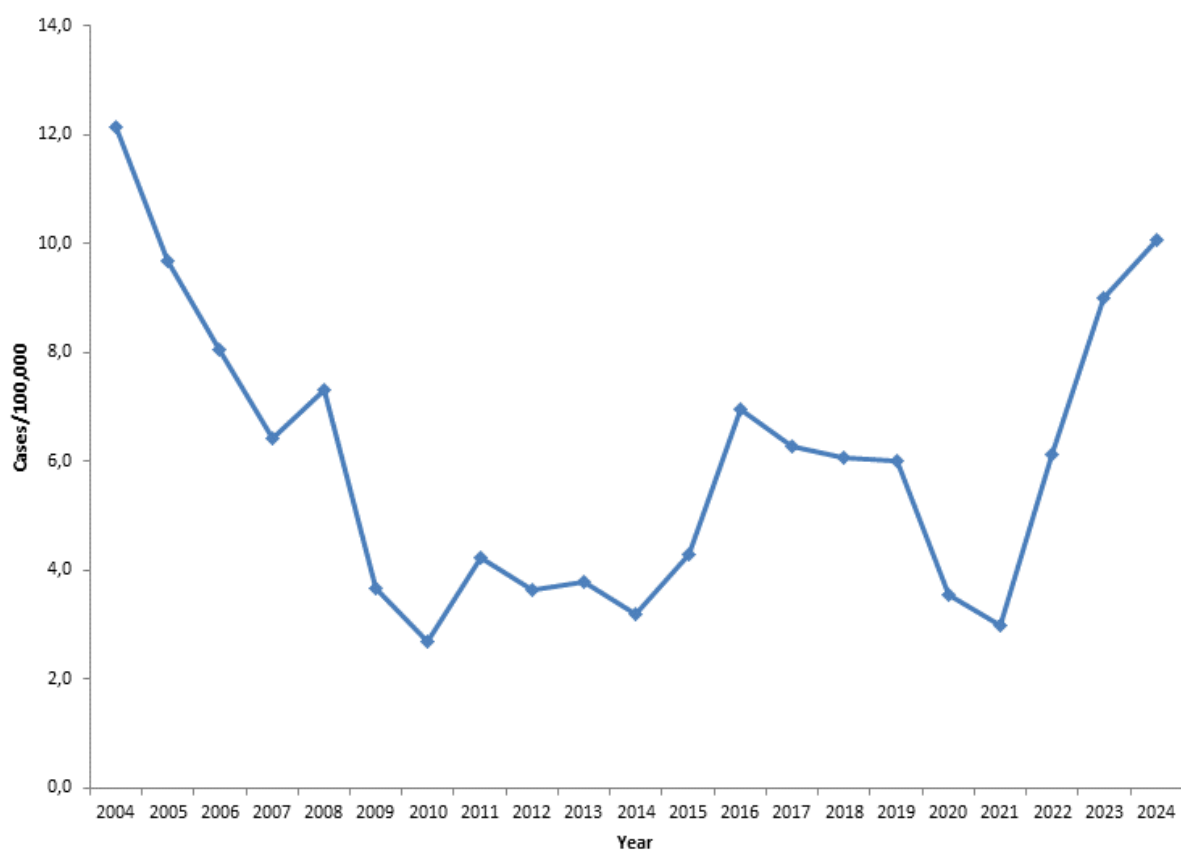
During 2004-2024, 13,654 salmonellosis cases were reported in Greece. The mean annual notification rate of salmonellosis was 6,01 cases per 100,000 population (SD: 2,6). The number of reported cases with the respective notification rate per year is presented in **Table 1**.

Table 1. Annual number of notified cases and notification rate of salmonellosis per year, Mandatory Notification System, Greece, 2004-2024.

Year	Number of cases	Annual notification rate (per 100,000 population)
2004	1,327	12.13
2005	1,062	9.68
2006	886	8.05
2007	708	6.42
2008	810	7.32
2009	406	3.66
2010	299	2.69
2011	471	4.23
2012	404	3.64
2013	417	3.79
2014	349	3.19
2015	465	4.28
2016	750	6.95
2017	677	6.29
2018	652	6.07
2019	643	6.00
2020	381	3.55
2021	318	2.98
2022	640	6.12
2023	936	8.99
2024	1,053	10.07
Total	13,654	6.01*

*Mean annual notification rate for the period 2004-2024

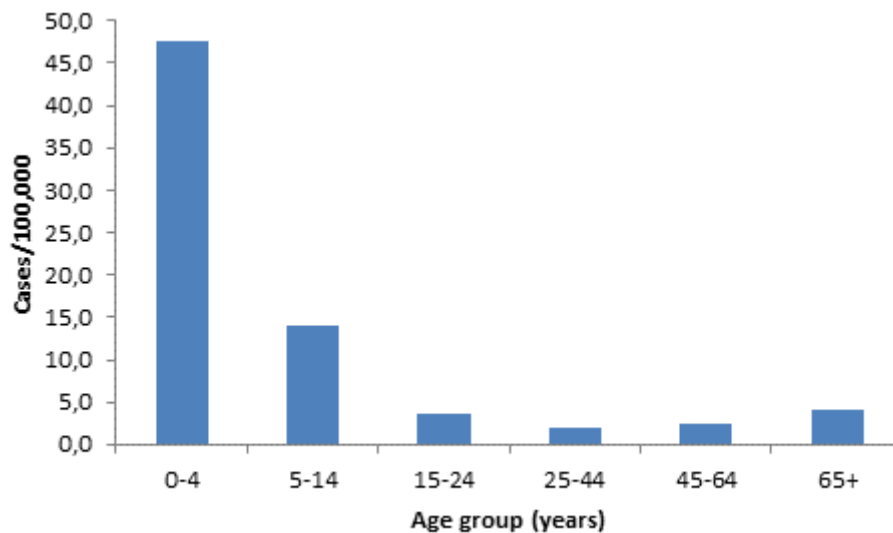
In 2024 and 2023, the notification rates of salmonellosis increased by 12.6% and 47% compared to the previous year, respectively. The temporal distribution of salmonellosis notification rate is depicted in **Graph 1**.



Graph 1. Time trend of salmonellosis notification rate, Mandatory Notification System, Greece, 2004-2024.

Age and gender distribution

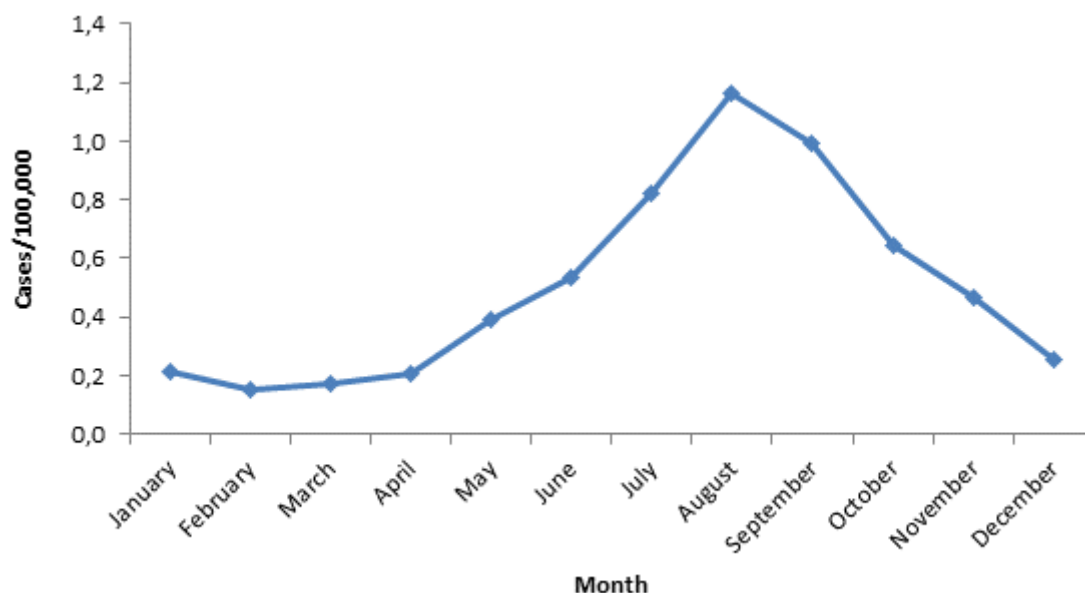
For the period 2004-2024, disease was more frequently reported among children, especially in the 0-4 years age group (**Graph 2**). In this age group, the mean annual notification rate was 47.6/100,000 population, whereas it was less than 14,1/100,000 in the rest of the population. The notification rate among males and females was 6.4 and 5.6 cases per 100,000 population, respectively.



Graph 2. Annual notification rate (cases/100,000 population) of salmonellosis by age group, Mandatory Notification System, Greece, 2004-2024.

Seasonality

There was an apparent seasonal pattern of the disease frequency, with the mean annual notification rate increasing during summer, reaching a peak in August and gradually decreasing in autumn (**Graph 3**).



Graph 3. Mean annual notification rate (cases/100,000 population) of salmonellosis by month, Mandatory Notification System, Greece, 2004-2024.

Geographical distribution

The geographical area of Northern Aegean islands had the highest mean annual notification rate (9,1/100,000 population) and that of Southern Aegean islands the lowest (3.0/100,000 population). **Figure 1** depicts the mean annual notification rate of salmonellosis by region for the period 2004-2024.

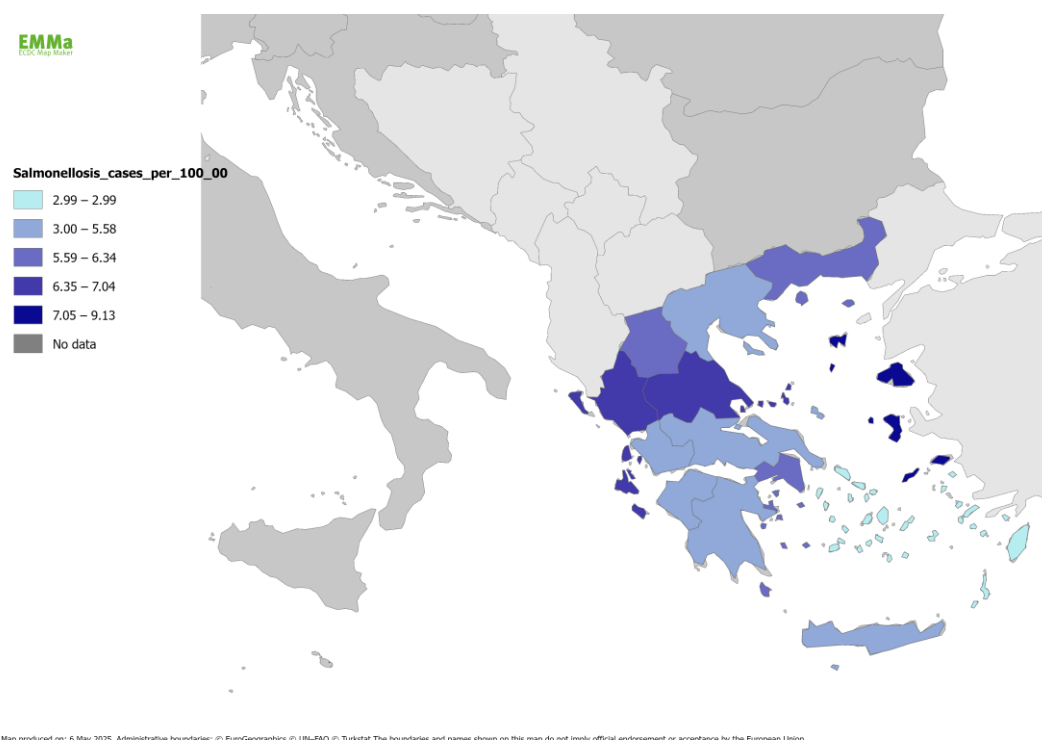
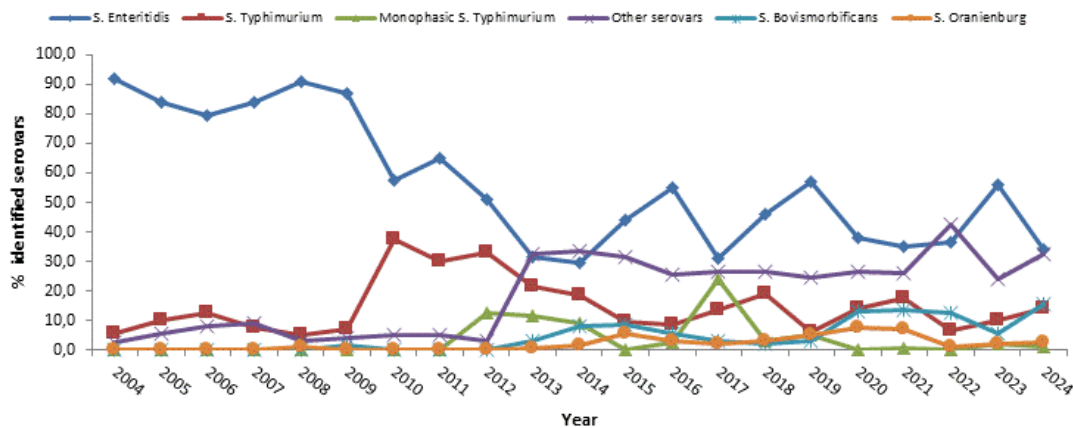


Figure 1. Mean annual notification rate (cases/100,000 population) of salmonellosis by region, Mandatory Notification System, Greece, 2004-2024.

Laboratory data

The proportion of *Salmonella* serovars (out of the total number of identified serovars), for the period 2004-2024, is depicted in **Graph 4**. *Salmonella* Enteritidis, *S. Typhimurium*, *S. Bovismorbificans*, monophasic *S. Typhimurium* and *S. Oranienburg* were the most frequently identified serovars. In 2023, the isolation rate of *S. Enteritidis* increased by 52.5% compared to 2022. However, in 2024, this rate decreased by 38.8% compared to 2023. In contrast, the isolation rates of the *S. Typhimurium* and *S. Bovismorbificans* serotypes increased, compared to those of 2023, by 40.9% and 181.6%, respectively.



Graph 4. Annual percentage of identified *S. Enteritidis*, *S. Typhimurium*, monophasic *S. Typhimurium*, *S. Bovismorbificans*, *S. Oranienburg* and other serovars, Mandatory Notification System & National Salmonella Shigella Reference Centre, Greece, 2004-2024.

The frequency of the reported serovars for the period of interest is presented in **Table 2**. It should be noted that the data presented in this report regards the cases reported via the Mandatory Notification System. For some of them the respective information from the National Salmonella Shigella Reference Centre (SSRC) is available while for others it is not. Data on the total number of isolates serotyped at the SSRC and on antimicrobial resistance can be found at: <http://www.mednet.gr/whonet/>.

Table 2. Frequency distribution of *S. Enteritidis*, *S. Typhimurium*, monophasic *S. Typhimurium*, *S. Bovismorbificans*, *S. Oranienburg* and other serovars per year, Mandatory Notification System & National Salmonella Shigella Reference Centre, Greece, 2004-2024.

Year	<i>S. Enteritidis</i> n (%)	<i>S. Typhimurium</i> n (%)	Monophasic <i>S. Typhimurium</i> n (%)	<i>S. Bovismorbificans</i> n (%)	<i>S. Oranienburg</i> n (%)	Other serovars n (%)	Total n (%)
2004	347 (92)	22 (6)	0 (0)	0 (0)	0 (0)	9 (2)	378 (100)
2005	305 (84)	37 (10)	0 (0)	0 (0)	0 (0)	21 (6)	363 (100)
2006	228 (80)	36 (12)	0 (0)	0 (0)	0 (0)	23 (8)	287 (100)
2007	170 (84)	15 (7)	0 (0)	0 (0)	0 (0)	18 (9)	203 (100)
2008	168 (91)	9 (5)	0 (0)	0 (0)	2 (1)	6 (3)	185 (100)
2009	60 (87)	5 (7)	0 (0)	1 (1)	0 (0)	3 (4)	69 (100)
2010	68 (58)	44 (37)	0 (0)	0 (0)	0 (0)	6 (5)	118 (100)
2011	140 (65)	65 (30)	0 (0)	0 (0)	0 (0)	11 (5)	216 (100)
2012	97 (51)	63 (33)	24 (13)	0 (0)	0 (0)	6 (3)	190 (100)
2013	75 (32)	51 (21)	27 (11)	7 (3)	1 (0)	77 (32)	238 (100)

Year	S. Enteritidis n (%)	S. Typhimurium n (%)	Monophasic S. Typhimurium n (%)	S. Bovismorbificans n (%)	S. Oranienburg n (%)	Other serovars n (%)	Total n (%)
2014	62 (30)	39 (19)	19 (9)	17 (8)	3 (1)	70 (33)	210 (100)
2015	145 (44)	32 (10)	1 (0,3)	28 (9)	19 (6)	104 (32)	329 (100)
2016	202 (55)	32 (9)	9 (2)	21 (6)	11 (3)	94 (25)	369 (100)
2017	106 (31)	46 (13)	82 (24)	10 (3)	8 (2)	92 (27)	344(100)
2018	97 (46)	40 (18)	7 (3)	4 (2)	7 (3)	56 (27)	211(100)
2019	93 (57)	10 (6)	8 (5)	5 (3)	8 (5)	40 (24)	164 (100)
2020	40 (38)	15 (14)	0 (0)	14 (13)	8 (8)	28 (27)	105 (100)
2021	46 (35)	23 (18)	1 (1)	18 (14)	9 (7)	34 (26)	131 (100)
2022	55(37)	10(7)	0(0)	19(13)	2(1)	64(42)	150(100)
2023	194 (56)	35(10)	8(2)	19(6)	7(2)	84(24)	347 (100)
2024	142 (34)	59 (14)	5 (1)	64 (15)	11 (3)	134 (32)	415 (100)

Risk factors

During the period 2004-2024, 16% of the notified cases reported the presence of at least one person with similar symptoms among their contacts, whereas 414 (3.4%) reported they had travelled abroad within the incubation period.

Conclusion

Salmonellosis is the most frequently reported foodborne disease in Greece (10.07 cases per 100,000 population, in 2024). The mean notification rate reported by the EU and EEA/EFTA countries (excluding UK) was 18.15 cases per 100,000 population for the year 2023 [2]. When interpreting this difference, the surveillance systems’ probable under-reporting should be considered.

The decreasing trend of salmonellosis notification rate, in the period preceding the COVID-19 pandemic, can probably be attributed to the actual decrease of the disease incidence, which was a common finding among EU countries [2]. This decrease could be possibly explained by the implementation of the national salmonella control programmes in the different poultry species (breeding, laying and broiler hens of *Gallus gallus*, as well as breeding and fattening turkeys), which was initiated in Greece in 2007 in compliance with the requirements of EU Regulation No 2160/2003. The aim of these programmes is to reduce the prevalence of specific *Salmonella* serotypes (targeted *Salmonella* serotypes) that have an important impact on public health. These serotypes are S. Enteritidis and S. Typhimurium (including monophasic S. Typhimurium) and the programmes’ objectives are achieved through the implementation of intensive surveillance of the disease in the different poultry species and the application of

restrictive measures during the disposal of products (meat and eggs) originating from infected flocks.

The fact that *S. Enteritidis* and *S. Typhimurium* were the most frequently reported *Salmonella* serovars in humans is in accordance with the findings of other European countries [2,3]. The reported increase of monophasic *S. Typhimurium* in 2017 can be partially explained by two outbreaks caused by this serovar [4].

The seasonal pattern of the disease occurrence and the fact that the highest notification rate was reported in the 0-4 years age group was also consistent with the findings from other European countries [2].

The decrease in salmonellosis notification rate in the period 2020-2021 may be explained by COVID-19 pandemic and the implemented public health measures and is compatible with other European countries' data [3].

The increase in the isolation rate of the *S. Bovismorbificans*, observed in 2024, is explained, among other factors, by an outbreak caused by this serotype, which occurred in a Regional Unit of the country in May 2024.

NPHO is in close collaboration with the other competent bodies for the monitoring of the increase of salmonellosis notification rate that has been noticed recently for the implementation of public health measures.

References

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Last updated: May 2025