



NATIONAL PUBLIC
HEALTH ORGANIZATION

**EPIDEMIOLOGICAL DATA FOR FOODBORNE/WATERBORNE
CLUSTERS/OUTBREAKS
IN GREECE 2004-2025
MANDATORY NOTIFICATION SYSTEM**

Key points

- For the period 2004-2025:
 - In total, 775 foodborne/waterborne clusters/outbreaks were reported
 - Most of the reported clusters/outbreaks were caused by bacteria, with *Salmonella* spp. being the most frequently reported causative agent
 - There is a seasonal pattern, with an increase in summer months, a peak in August and a subsequent decrease
 - More than half of the reported clusters/outbreaks regarded only one household (domestic)
 - In 2025, the notification rate decreased by 12.3% compared to 2024.

The term foodborne/waterborne cluster refers to two or more cases with similar symptoms, usually gastrointestinal (diarrhoea and/or vomiting), which can be attributed to the consumption of the same food item or water of the same origin. The term foodborne/waterborne outbreak refers to a situation where the observed number of cases of a foodborne/waterborne disease exceeds the expected number in a specific population and in a specific area [1]. In Greece, the surveillance of foodborne/waterborne clusters/outbreaks was introduced to the mandatory notification system in 2004.

Time trend

During 2004-2025, 775 foodborne/waterborne clusters/outbreaks were notified. The total number of reported clusters/outbreaks per year is presented in **Table 1**. The median annual number of reported clusters/outbreaks was 35 (min: 6, max: 72).

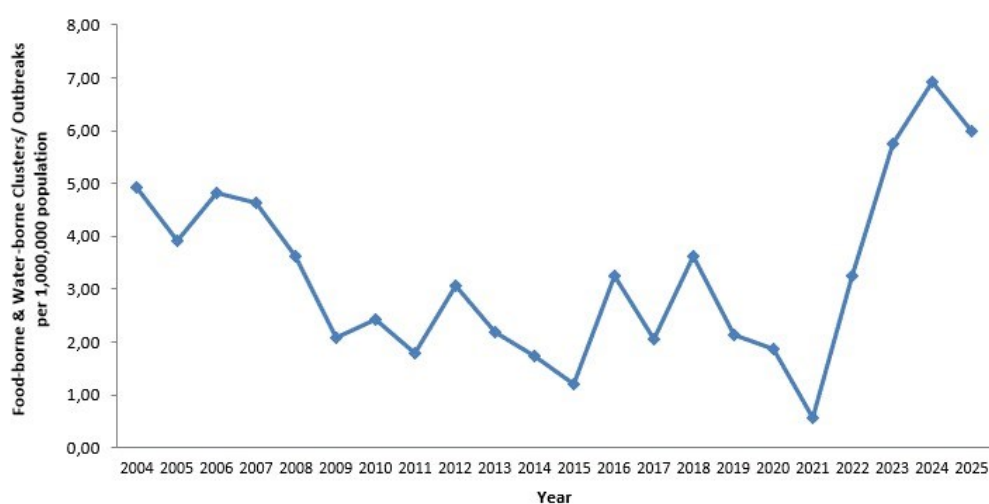
Table 1. Distribution of the reported clusters/outbreaks by year, Greece, Mandatory Notification System, 2004-2025*.

Year	Foodborne clusters/outbreaks	Waterborne clusters/outbreaks	Total
2004	48	5	53
2005	41	2	43
2006	50	2	52
2007	49	0	49
2008	40	0	40
2009	21	2	23
2010	26	1	27
2011	18	1	19
2012	29	4	33
2013	18	5	23
2014	17	2	19
2015	10	3	13
2016	31	3	34
2017	21	1	22
2018	37	1	38
2019	17	5	22
2020	19	1	20
2021	5	1	6
2022	31	3	34
2023	57	1	58
2024	68	2	70

2025	58	5	63
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*Fourteen travel related clusters/outbreaks were excluded

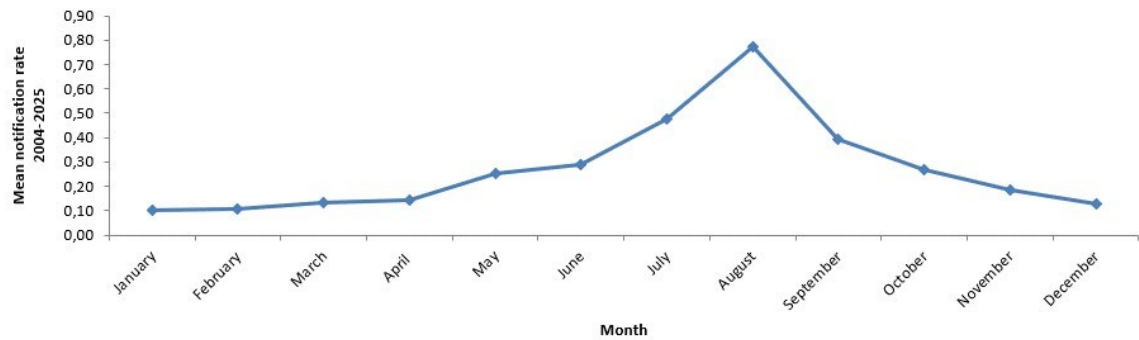
In the years 2024 and 2023, the notification rate of the clusters/outbreaks increased by 20.1% and 77.3% respectively compared to the previous years, 2023 and 2022. In the year 2025, the notification rate decreased by 12.3%, compared to the previous year. The foodborne/waterborne clusters/outbreaks notification rate for the period of interest is depicted in **Graph 1**.



Graph 1. Mean annual notification rate of clusters/outbreaks (number of reported clusters/outbreaks per 1,000,000 population), Mandatory Notification System, Greece, 2004-2025.

Seasonality

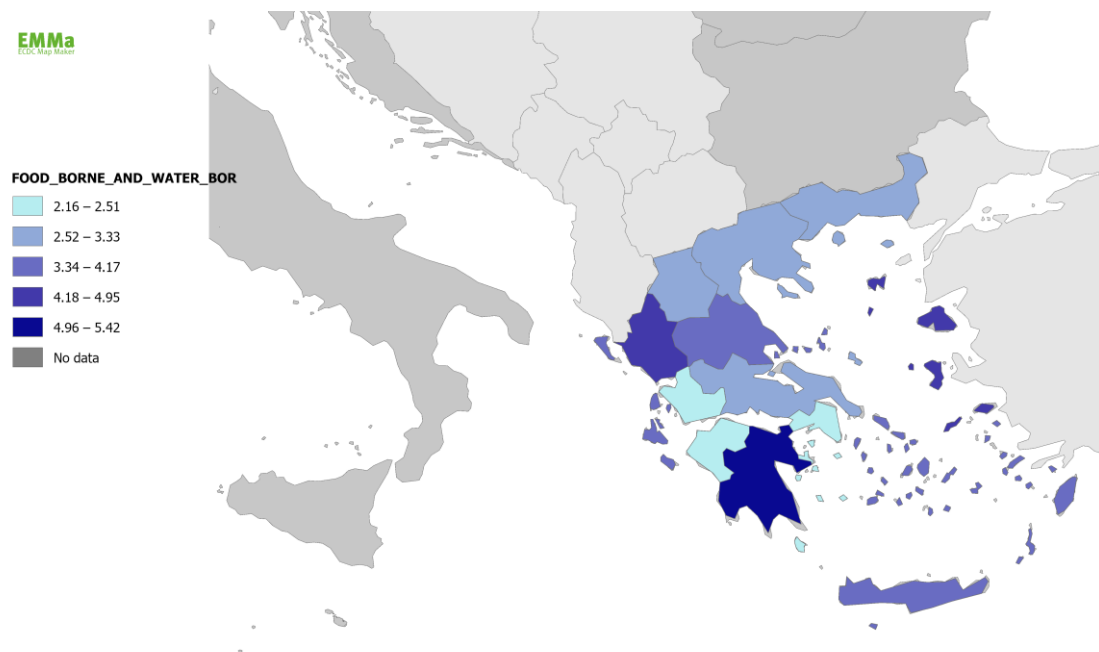
The number of reported clusters/outbreaks, for the period 2004-2025, increased during summer reaching a peak in August, and decreased in the following months. The mean monthly notification rate of clusters/outbreaks per 1,000,000 population is depicted in **Graph 2**.



Graph 2. Mean notification rate of foodborne/waterborne clusters/outbreaks (number of clusters/outbreaks per 1,000,000 population) by month, Mandatory Notification System, Greece, 2004-2025.

Geographical distribution

The highest mean annual notification rate for the period 2004-2025 was recorded for the region of Peloponnese (5.42 clusters/outbreaks per 1,000,000 population) and the lowest for Western Greece (2.16 clusters/outbreaks per 1,000,000 population). The mean annual notification rate of reported clusters/outbreaks by region is depicted in **Figure 1**.



Map produced on: 7 Jul 2026. Administrative boundaries: © EuroGeographics © UN-FAO © Turkstat. The boundaries and names shown on this map do not imply official endorsement or acceptance by the European Union.

Figure 1. Mean annual notification rate (clusters/outbreaks per 1,000,000 population) of reported clusters/outbreaks by region, Mandatory Notification System, Greece, 2004-2025.

Causative agents

The causative agent was known for 605 (78.1%) of the clusters/outbreaks for the period 2004-2025. The majority (n=568, 94.0%) were caused by bacteria, and *Salmonella* spp. was the most frequently identified pathogen. *Salmonella* Enteritidis was responsible for 123 (25.2%) of the 489 (86.1%) reported salmonellosis clusters/outbreaks. Hepatitis A virus, norovirus and rotavirus were the most identified viruses. **Table 2** presents the distribution of reported clusters/outbreaks, including travel related, by year and causative agent for the years 2004-2025.

Table 2. Distribution of the reported clusters/outbreaks by year and causative agent, Greece, Mandatory Notification System, 2004-2025.

	<i>Salmonella</i> spp.	Other bacteria	Viruses	Parasites	Unknown	Total
2004	36	1	0	0	17	54
2005	33	0	2	0	8	43
2006	40	1	1	0	11	53
2007	29	4	6	0	12	51
2008	34	1	0	0	5	40
2009	18	4	0	0	1	23
2010	12	4	1	1	9	27
2011	16	1	1	0	2	20
2012	20	5	5	0	4	34
2013	10	3	1	0	10	24
2014	6	2	0	0	11	19
2015	4	2	4	0	3	13
2016	22	1	1	0	11	35
2017	16	2	0	0	4	22

2018	29	2	2	0	6	39
2019	13	2	2	0	6	23
2020	13	3	0	0	4	20
2021	4	1	0	0	1	6
2022	21	5	0	0	8	34
2023	39	10	1	1	9	60
2024	42	10	2	1	17	72
2025	34	13	4	1	11	63

Type and size of the clusters/outbreaks

During 2004-2025, the median number of cases per cluster/outbreak was 3 (min: 2, max: 702). The median number of cases for the 674 (87.3%) of them that referred to closed populations was 3 (min: 2, max: 213). Out of these 674 clusters/outbreaks, 430 (63.8%) were domestic (affecting only members of the same household). Ninety-eight (12.7%) clusters/outbreaks, in open populations, were reported. In those, the median number of cases was 17.5 (min: 2, max: 702).

Cluster/Outbreak investigation

Descriptive epidemiology: Descriptive data (number of cases, symptoms, date of disease onset, etc.) were collected for all reported clusters/outbreaks through telephone communications with physicians and/or patients.

Analytical epidemiology: An analytical epidemiological study was conducted in 51 (6.7%) clusters/outbreaks [2-13]. In specific, in 28 (54.9%) a cohort study and in 21 (41.2%) a case-control study was conducted, while in one (2.0%) cluster/outbreak both study designs were performed. Finally, on one (2.0%) occasion a case-control and a case-crossover study were conducted. **Table 3** summarizes the characteristics of the clusters/outbreaks for which the analytical study resulted in a possible vehicle of transmission.

Laboratory investigation: Laboratory investigation of clinical samples (stool/blood culture, multiplex PCR or other test) was conducted in 660 (85.6%) of the reported clusters/outbreaks.

Environmental investigation: The competent bodies conducted an environmental investigation by visiting the place of preparation or consumption of the suspected foodstuff/meal in 65 (70.7%) clusters/outbreaks in open populations and 194 (34.6%) involving closed populations. The Regional Public Health Directorates investigated 199 (75.4%) clusters/outbreaks, the National Food Agency 13 (4.9%), whereas teams from both bodies participated in the environmental investigation of 30 (11.4%).

Table 3. Main characteristics of foodborne/waterborne clusters/outbreaks for which an analytical epidemiological study was conducted, Greece, 2004-2025.

Pathogen – Year*	Number of cases ^a	Number of lab-confirmed cases [‡]	Region	Type of study	Implicated foodstuff
<i>Salmonella</i> spp. - 2004	17	4	Attica	Cohort	Cheese pie
Unknown - 2004	73	0	Crete	Cohort	Veal
<i>S. Typhimurium</i> - 2004	37	35	Crete	Case - Control	Tap water
Unknown – 2005	39	0	Thessaly	Cohort	Egg
<i>Salmonella</i> spp. - 2005	38	2	Central Greece	Cohort	Lamp
<i>Salmonella</i> spp. - 2005	30	12	Attica	Cohort	Dessert
<i>S. Enteritidis</i> - 2005	67	11	Attica	Cohort	Egg
<i>S. Enteritidis</i> - 2005	133	70	Crete	Case - Control	Cheese
<i>S. arizonae</i> - 2006	31	6	Peloponnese	Cohort	Side dish
<i>Brucella melitensis</i> - 2008	131	104	Eastern Macedonia - Thrace	Case - Control	Raw cheese
<i>Campylobacter jejuni</i> - 2009	54	54	Crete	Case – Control & Case - crossover	Tap water
Unknown - 2010	16	0	Central Macedonia	Cohort	Carbonara sause spaghetti
Unknown - 2010	62	0	Northern Aegean	Cohort	Seafood

Norovirus/ Adenovirus - 2011	36	2	Attica	Case-Control	Salad
Norovirus/ Adenovirus-2012	80	4	Central Macedonia	Cohort	Tap water
Rotavirus-2012	986	29	Thessaly	Case-Control	Tap water
Unknown-2012	19	0	Attica	Cohort	Pork
Unknown-2013	8	0	Attica	Cohort	Dessert
Unknown-2013	42	0	Attica	Cohort	Pork
Unknown-2014	13	0	Ionian Islands	Cohort	Spaghetti bolognese
Norovirus-2015	256	7	Central Macedonia	Case-Control	Tap water
S. Enteritidis - 2016	23	6	Western Greece	Case-Control	Spaghetti
S. Enteritidis - 2016	83	22	Central Greece	Case-Control	Mac and cheese
<i>Salmonella</i> Typhimurium 1,4 [5],12:i:- -2017	40	40	Thessaly and Central Macedonia	Case-Control	Pork
<i>Salmonella</i> Typhimurium 1,4 [5],12:i:- -2017	42	42	Attica and Central Macedonia	Case-Control	Milk
S. Enteritidis - 2018	15	7	Central Macedonia	Cohort	Dessert/Cake
Unknown-2018	24	0	Central Greece	Cohort	Tap water
Mixed aetiology: Norovirus, <i>Campylobacter jejuni</i> , EHEC, EPEC-2019	638	10	Western Macedonia	Case-Control & Cohort	Tap water
<i>Clostridium</i> <i>perfringens</i> -2019	58	0	Central Macedonia	Cohort	Spaghetti bolognese
VTEC O157, <i>Salmonella spp.</i> , EPEC, <i>E.coli</i> O157-2020	58	7	Peloponnese	Case-Control	Tap water
<i>Clostridium</i> <i>perfringens</i> -2021	30	2	Northern Aegean	Cohort	Spaghetti bolognese
<i>Salmonella</i> Bovismorbificans2022	40	8	Peloponnese	Case-Control	Tap water
<i>Salmonella</i> Enteritidis-2023	69	5	Epirus	Cohort	Chicken

S. Bovismorbificans- 2024	144	20	Thessaly	Case-Control	Tap water
<i>Staphylococcus aureus</i> , (SEB)-2024	38	4	Attica	Cohort	Meat product
Norovirus GII-2025	62	5	Central Greece	Case-Control	Tap water

*In some clusters/outbreaks the identification of the causative agent was not possible, either because the notification of the cluster/outbreak was delayed or because the laboratory capacity of local health care services was limited

*Total number of cases (possible and laboratory confirmed cases)

‡ Number of laboratory- confirmed cases

Results of cluster/outbreak investigation

Fourteen (1.8%) clusters/outbreaks were travel related. In 711 (95.7%) of the remaining clusters/outbreaks the results of the epidemiological investigation indicated foodborne transmission, while 50 (9.8%) were attributed to water consumption.

Household was the place of consumption of the suspected foodstuff in 298 (46.4%) clusters/outbreaks, a restaurant/fast food in 202 (31.4%), and a hotel in 40 (6.2%).

Poultry (162 clusters/outbreaks), eggs (117 clusters/outbreaks) and dairy products (42 clusters/outbreaks) were the most frequently incriminated foodstuffs. In most cases, information was derived from descriptive epidemiological data without laboratory confirmation or analytical epidemiological studies.

Discussion

A significant number of food-borne/water-borne clusters/outbreaks are reported and investigated every year in Greece. The fact that *Salmonella* spp. is the prevailing causative agent is consistent with data from other European countries (1,238 of 6,558 (18.9%) foodborne clusters/outbreaks were caused by *Salmonella* spp. in EU in 2024) [14]. This finding could also explain the similar seasonal distribution of the number of clusters/outbreaks and of salmonellosis sporadic cases. Epidemiological, laboratory and environmental investigation provide valuable information regarding the most common vehicles of transmission, causative agents and contributing factors for the occurrence of foodborne/waterborne clusters/outbreaks in our country.

The decrease in the number of reported clusters/outbreaks, in 2021, is probably associated with the COVID-19 pandemic. This is a finding compatible with those of other European countries [14].

The observed increase in the notification rate of foodborne/waterborne diseases clusters/outbreaks after the COVID-19 pandemic in Greece is a concern for other European countries as well, and it is likely attributed to multiple factors, such as the more frequent use of multiplex PCR technology, the rising temperatures within the context of climate change, food safety issues, and the enhancement of event based surveillance systems for the early detection of outbreaks, that require further investigation [14].

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