SCIENTIFIC REPORT OF EFSA AND ECDC

The European Union Summary Report on Trends and Sources of Zoonoses, Zoonotic Agents and Food-borne Outbreaks in 2011[1]

European Food Safety Authority[2, 3]

European Centre for Disease Prevention and Control[2, 3]

European Food Safety Authority (EFSA), Parma, Italy

European Centre for Disease Prevention and Control (ECDC), Stockholm, Sweden

ABSTRACT

The European Food Safety Authority and the European Centre for Disease Prevention and Control analysed the information submitted by 27 European Union Member States on the occurrence of zoonoses and food-borne outbreaks in 2011. Campylobacteriosis was the most commonly reported zoonosis with 220,209 confirmed human cases. The occurrence of *Campylobacter* continued to be high in broiler meat at EU level. The decreasing trend in confirmed salmonellosis cases in humans continued with a total of 95,548 cases in 2011. Most Member States met their *Salmonella* reduction targets for poultry, and *Salmonella* is declining in these populations. In foodstuffs, *Salmonella* was most often detected in meat and products thereof. The number of confirmed human listeriosis cases decreased to 1,476. *Listeria* was seldom detected above the legal safety limit from ready-to-eat foods. A total of 9,485 confirmed verotoxigenic *Escherichia coli* (VTEC) infections were reported. This represents an increase of 159.4 % compared with 2010 as a result of the large STEC/VTEC outbreak that occurred in 2011 in the EU, primarily in Germany. VTEC was also reported from food and animals. The number of human yersiniosis cases increased to 7,017 cases. *Yersinia enterocolitica* was isolated also from pig meat and pigs; 132 cases of *Mycobacterium bovis* and 330 cases of brucellosis in humans were also reported. The prevalence of bovine tuberculosis in cattle increased, and the prevalence of brucellosis decreased in cattle and sheep and goat populations. Trichinellosis and echinococcosis caused 268 and 781 human cases, respectively and these parasites were mainly detected in wildlife. The numbers of alveolar and of cystic echinococcosis respectively increased and decreased in the last five years. One imported human case of rabies was reported. The number of rabies cases in animals continued to decrease. Most of the 5,648 reported food-borne outbreaks were caused by *Salmonella*, bacterial toxins, *Campylobacter* and viruses, and the main food sources were eggs, mixed foods and fish and fishery products.

KEY WORDS

Zoonoses, surveillance, monitoring, *Salmonella, Campylobacter*, *Listeria*, rabies, parasites, food-borne outbreaks, food-borne diseases

---

1 On request of EFSA, Question No EFSA-Q-2012-00428, approved on 28 February 2013.
2 Correspondence: in EFSA zoonoses@efsa.europa.eu; in ECDC FWD@ecdc.europa.eu
3 Acknowledgement: EFSA and ECDC wish to thank the members of the Task Force on Zoonoses Data Collection and the Food and Waterborne Diseases and Zoonoses Network who provided the data and reviewed the report. Also the contributions of the following for their support provided to this scientific output are gratefully acknowledged: EFSA staff members Pia Mäkelä, Frank Boelaert, Valentina Rizzi, Marios Georgiadis, Elena Mazzolini, Giusi Amore, Francesca Riolo, Kenneth Mulligan; ECDC staff members Therese Westrell, Taina Niskanen, Angela Lahuerta Marin, Joana Gomes Dias and Johanna Takkinen; and reviewer Hein Imberechts.

Suggested citation: EFSA, (European Food Safety Authority), ECDC (European Centre for Disease Prevention and Control), 2013. The European Union Summary Report on Trends and Sources of Zoonoses, Zoonotic Agents and Food-borne Outbreaks in 2011; EFSA Journal 2013;11(4):3129, 250 pp. doi:10.2903/j.efsa.2013.3129.

Available online: www.efsa.europa.eu/efsajournal

THE EUROPEAN UNION SUMMARY REPORT

Trends and Sources of Zoonoses, Zoonotic Agents and Food-borne Outbreaks in 2011

Issued on 28 February 2013

Published on 9 April 2013

Suggested citation: EFSA, (European Food Safety Authority), ECDC (European Centre for Disease Prevention and Control), 2013. The European Union Summary Report on Trends and Sources of Zoonoses, Zoonotic Agents and Food-borne Outbreaks in 2011; EFSA Journal 2013;11(4):3129, 250pp. doi:10.2903/j.efsa.2013.3129.

Available online: www.efsa.europa.eu/efsajournal

About EFSA

The European Food Safety Authority (EFSA), located in Parma, Italy, was established and funded by the European Union as an independent agency in 2002 following a series of food scares that prompted the European public to voice concerns about food safety and the ability of regulatory authorities to protect consumers. EFSA provides objective scientific advice on all matters, in close collaboration with national authorities and in open consultation with its stakeholders, with a direct or indirect impact on food and feed safety, including animal health and welfare and plant protection. EFSA is also consulted on nutrition in relation to EU legislation. EFSA's work falls into two areas: risk assessment and risk communication. In particular, EFSA's risk assessments provide risk managers (EU institutions with political accountability, i.e. the European Commission, the European Parliament and the Council) with a sound scientific basis for defining policy-driven legislative or regulatory measures required to ensure a high level of consumer protection with regard to food and feed safety. EFSA communicates to the public in an open and transparent way on all matters within its remit. Collection and analysis of scientific data, identification of emerging risks and scientific support to the Commission, particularly in the case of a food crisis, are also part of EFSA's mandate, as laid down in the founding Regulation (EC) No 178/2002[4] of 28 January 2002.

About ECDC

The European Centre for Disease Prevention and Control (ECDC), an EU agency based in Stockholm, Sweden, was established in 2005. The objective of ECDC is to strengthen Europe's defences against infectious diseases. According to Article 3 of the founding Regulation (EC) No 851/2004[5] of 21 April 2004, ECDC's mission is to identify, assess and communicate current and emerging threats to human health posed by infectious diseases. In order to achieve this mission, ECDC works in partnership with national public health bodies across Europe to strengthen and develop EU-wide disease surveillance and early warning systems. By working with experts throughout Europe, ECDC pools Europe's knowledge on health so as to develop authoritative scientific opinions about the risks posed by current and emerging infectious diseases.

About the report

EFSA is responsible for examining the data on zoonoses, antimicrobial resistance and food-borne outbreaks submitted by Member States in accordance with Directive 2003/99/EC[6] and for preparing the EU Summary Report from the results. Data from 2011 in this EU Summary Report were produced in collaboration with ECDC which provided the information on and analyses of zoonoses cases in humans.

Acknowledgement

EFSA and ECDC wish to thank the members of the Task Force on Zoonoses Data Collection and the Food and Waterborne Diseases and Zoonoses network members who provided the data and reviewed the report. The contributions of the following for the support provided to this scientific output are also gratefully acknowledged: EFSA staff members Pia Mäkelä, Frank Boelaert, Valentina Rizzi, Marios Georgiadis, Elena Mazzolini, Giusi Amore, Francesca Riolo, Kenneth Mulligan; ECDC staff members Therese Westrell, Taina Niskanen, Angela Lahuerta Marin, Joana Gomes Dias and Johanna Takkinen; and reviewer Hein Imberechts.

4 Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety. OJ L 31, 01.02.2002, pp. 1–24.

5 Regulation (EC) No 851/2004 of the European Parliament and of the Council of 21 April 2004 establishing a European Centre for Disease Prevention and Control. OJ L 142, 30.04.2004, pp. 1–11.

6 Directive 2003/99/EC of the European Parliament and of the Council of 17 November 2003 on the monitoring of zoonoses and zoonotic agents, amending Council Decision 90/424/EEC and repealing Council Directive 92/117/EEC. OJ L 325, 12.12.2003, pp. 31-40.

Summary

Zoonoses are infections and diseases that are naturally transmissible directly or indirectly, for example via contaminated foodstuffs, between animals and humans. The severity of these diseases in humans varies from mild symptoms to life-threatening conditions. In order to prevent zoonoses from occurring, it is important to identify which animals and foodstuffs are the main sources of infections. For this purpose information aimed at protecting human health is collected and analysed from all European Union Member States.

In 2011, 27 Member States submitted information on the occurrence of zoonoses, zoonotic agents and food-borne outbreaks to the European Commission and the European Food Safety Authority. Furthermore, information on cases of zoonoses reported in humans was provided by the European Centre for Disease Prevention and Control. In addition, three European countries that were not European Union Member States provided information. The European Food Safety Authority and the European Centre for Disease Prevention and Control jointly analysed the data, the results of which are published in this annual European Union Summary Report, which covers 10 zoonoses and food-borne outbreaks.

In 2011, the notification rate and confirmed number of cases of human campylobacteriosis in the European Union increased compared with 2010. Human campylobacteriosis continued to be the most commonly reported zoonosis with 220,209 confirmed cases. The number of confirmed cases of campylobacteriosis in the European Union has followed a significant increasing trend in the last four years, along with a clear seasonal trend. The proportion of *Campylobacter*-positive food and animal samples remained at levels similar to previous years, with the occurrence of *Campylobacter* continuing to be high in broiler meat.

The number of salmonellosis cases in humans decreased by 5.4 % compared with 2010 and by as much as 37.9 % compared with 2007. A statistically significant decreasing trend in the European Union was observed over the period 2008-2011. In total, 95,548 confirmed human cases were reported in 2011. It is assumed that the observed reduction in salmonellosis cases is mainly a result of the successful *Salmonella* control programmes in poultry populations. Most Member States met their *Salmonella* reduction targets for poultry, and *Salmonella* is declining in these animal populations. In foodstuffs, *Salmonella* was most often detected in fresh broiler meat. The food categories with highest proportion of products not complying with the European Union *Salmonella* criteria were minced meat and meat preparations as well as live bivalve molluscs.

The number of listeriosis cases in humans decreased slightly compared with 2010, and 1,476 confirmed human cases were reported in 2011. As in previous years, a high fatality rate (12.7 %) was reported among the cases. *Listeria monocytogenes* was seldom detected above the legal safety limit from ready-to-eat foods at point of retail. Samples exceeding this limit were most often found in fishery products, cheeses and fermented sausages.

A total of 9,485 confirmed verotoxigenic *Escherichia coli* infections were reported in 2011, which was a 2.6-fold increase compared with 2010. Of those cases in which the serogroup was known, most were caused by serogroup O157. As many as 1,064 cases were, however, reported of serogroup O104 (20.1 % of cases with known serogroup) due to a large outbreak primarily in Germany. A large number of the cases, 1,006 cases, were also affected by the severe condition, Haemolytic Uraemic Syndrome, in 2011. This was a 4.5-fold increase compared with 2010, primarily observed in adult cases and attributed to the German outbreak. The number of reported cases of verotoxigenic *Escherichia coli* human cases has been increasing in the EU since 2008. In animals and food most verotoxigenic *Escherichia coli*-positive findings were made in cattle and bovine meat, but the bacteria were also detected in some other animal species and foodstuffs.

A total of 7,017 confirmed cases of yersiniosis were reported in the European Union in 2011, corresponding to an increase by 3.5 % compared with 2010. There was, however, a statistically significant decreasing five-year trend in the European Union in 2007-2011. Among food and animals, *Yersinia enterocolitica* was mainly isolated from pig meat and pigs.

The number of confirmed human cases due to *Mycobacterium bovis* in the European Union in 2011 was 132. This was a decrease compared with 2010, with a few Member States accounting for the majority of the reported cases. The reported prevalence of bovine tuberculosis in cattle increased slightly at European

Union level, although remained at very low level. This slight increase was, however, due to one Member State that reported an increase in prevalence of bovine tuberculosis for the third consecutive year.

The number of confirmed brucellosis cases in humans continued to decline, and 330 confirmed cases were reported in 2011 at European Union level. The number of brucellosis-positive sheep and goat herds continued to decrease. Bovine brucellosis decreased only marginally compared with 2010.

In 2011, two parasitic zoonoses, trichinellosis and echinococcosis, caused 268 and 781 confirmed human cases in the European Union, respectively. Although the number of cases was slightly higher in 2011 compared with 2010, human trichinellosis cases remained at a low level in the European Union compared with 2009 and previous years. In 2011, *Trichinella* was found slightly more often in pigs than it was in 2010. The parasite was more prevalent in wildlife than in farmed animals. The number of confirmed human echinococcosis cases in 2011 increased by 3.3 % compared with 2010, primarily as a result of the increasing number of cases of *Echinococcus multilocularis*, causing alveolar echinococcosis, being reported in 2011, but also on account of an increase over the last five years. *Echinococcus multilocularis* was reported mainly in foxes by several central European reporting countries.

One imported human case of rabies was reported in the European Union in 2011. The general decreasing trend in the numbers of reported rabies cases in animals continued in 2011. Rabies was reported mainly in wildlife animal species and sometimes in farm and pet animals in some Baltic and Eastern and Southern European Member States.

A total of 5,648 food-borne outbreaks were reported in the European Union, resulting in 69,553 human cases, 7,125 hospitalisations and 93 deaths. Most of the reported outbreaks were caused by *Salmonella*, bacterial toxins, *Campylobacter* and viruses; however, the outbreak with most human cases was caused by Shiga toxin-producing *Escherichia coli*/verotoxigenic *Escherichia coli* and associated with sprouted seeds. The most important food sources of the outbreaks were eggs and egg products, followed by mixed food and fish and fish products. Overall, 11 waterborne outbreaks were reported in 2011, caused by *Campylobacter,* calicivirus, *Cryptosporidium hominis* and verotoxigenic *Escherichia coli*.

TABLE OF CONTENTS

1. INTRODUCTION

The European Union (EU) system for the monitoring and collection of information on zoonoses is based on the Zoonoses Directive 2003/99/EC, which obliges EU Member States (MSs) to collect relevant and, where applicable, comparable data on zoonoses, zoonotic agents, antimicrobial resistance and food-borne outbreaks. In addition, MSs shall assess trends and sources of these agents as well as outbreaks in their territory, transmitting an annual report to the European Commission (EC), covering the data collected. The European Food Safety Authority (EFSA) is assigned the tasks of examining these data and publishing the EU Summary Report.

Decision 2119/98/EC[7] on setting up a network for the epidemiological surveillance and control of communicable diseases in the EU, as complemented by Decision 2000/96/EC[8] with amendment 2003/542/EC[9] on the diseases to be progressively covered by the network, established the basis for data collection on human diseases from MSs. The Decisions anticipate that data from the networks shall be used in the EU Summary Report.

Since 2005, the European Centre for Disease Prevention and Control (ECDC) has provided data on zoonotic infections in humans, as well as their analyses, for the EU Summary Report. Starting in 2007, data on human cases have been reported from The European Surveillance System (TESSy), maintained by ECDC.

This EU Summary Report 2011 on zoonoses, zoonotic agents and food-borne outbreaks was prepared in collaboration with ECDC. MSs, other reporting countries, the EC, members of EFSA's scientific panels on Biological Hazards (BIOHAZ) and Animal Health and Welfare (AHAW) and the relevant EU Reference Laboratories were consulted while preparing the report.

The efforts made by MSs, the reporting non-MSs and the EC in the reporting of zoonoses data and in the preparation of this report are gratefully acknowledged.

The data on antimicrobial resistance in zoonotic agents in 2011 is published in a separate EU Summary Report.

In 2011, data were collected on a mandatory basis for the following eight zoonotic agents in animals, food and feed: *Salmonella*, thermophilic *Campylobacter, Listeria monocytogenes,* verotoxigenic *Escherichia coli*, *Mycobacterium bovis*, *Brucella, Trichinella* and *Echinococcus*. Data on human cases were reported via TESSy by the 27 MSs and two European Economic Area (EEA)/European Free Trade Association (EFTA) countries (Iceland and Norway) for all diseases. Switzerland reported human cases directly to EFSA. Moreover, mandatory reported data included antimicrobial resistance in *Salmonella* and *Campylobacter* isolates, food-borne outbreaks and susceptible animal populations. In addition, based on the epidemiological situations in MSs, data were reported on the following agents and zoonoses: *Yersinia*, rabies, Q fever, *Toxoplasma, Cysticerci,* and *Francisella*. Data on *Staphylococcus* and antimicrobial resistance in indicator *E. coli* and enterococci isolates were also submitted. Furthermore, MSs provided data on certain other microbiological contaminants in foodstuffs: histamine, staphylococcal enterotoxins and *Enterobacter sakazakii* (*Cronobacter* spp.), for which food safety criteria are set down in EU legislation.

All 27 MSs submitted national zoonoses reports concerning the year 2011. In addition, zoonoses reports were submitted by three non-MSs (Iceland, Norway and Switzerland). Data on zoonoses cases in humans were also received from all 27 MSs and additionally from three non-MSs: Iceland, Norway and Switzerland.

The 2011 EU Summary Report on zoonoses and food-borne outbreak is a restricted one focusing on the most relevant annual information on zoonoses and food-borne outbreaks. If substantial changes compared with the previous year were observed, these changes have also been covered. In addition, all the reported data are summarized in the Level 3 Tables.

---

7 Decision 2119/98/EC of the European Parliament and of the Council of 24 September 1998 setting up a network for the epidemiological surveillance and control of communicable diseases in the Community. OJ L 268, 3.10.1998, pp.1-7.

8 Commission Decision 2000/96/EC of 22 December 1999 on the on the communicable diseases to be progressively covered by the Community network under Decision No 2119/98/EC of the European Parliament and of the Council. OJ L 28, 3.2.2000, pp. 50–53.

9 Commission Decision 2003/542/EC of 17 July 2003 amending Decision 2000/96/EC as regards the operation of dedicated surveillance networks. OJ L 185, 24.7.2003, pp. 55–58.

The current report includes a general summary and main findings (Level 1), and EU assessments of the specific zoonoses and items (Level 2). Level 3 of the report consists of an overview of all data submitted by MSs in table format and is available only online.

Monitoring and surveillance schemes for most zoonotic agents covered in this report are not harmonised among MSs, and findings presented in this report must, therefore, be interpreted with care. The data presented may not have necessarily been derived from sampling plans that were statistically designed, and, thus, findings may not accurately represent the national situation regarding zoonoses. Regarding data on human infections, please note that the numbers presented in this report may differ from national zoonoses reports due to differences in case definitions used at EU and national level or because of different dates of data submission and extraction. Results are generally not directly comparable among MSs and sometimes not even between different years in one country.

The national zoonoses reports submitted in accordance with Directive 2003/99/EC are published on the EFSA website together with the EU Summary Report.

2. MAIN FINDINGS

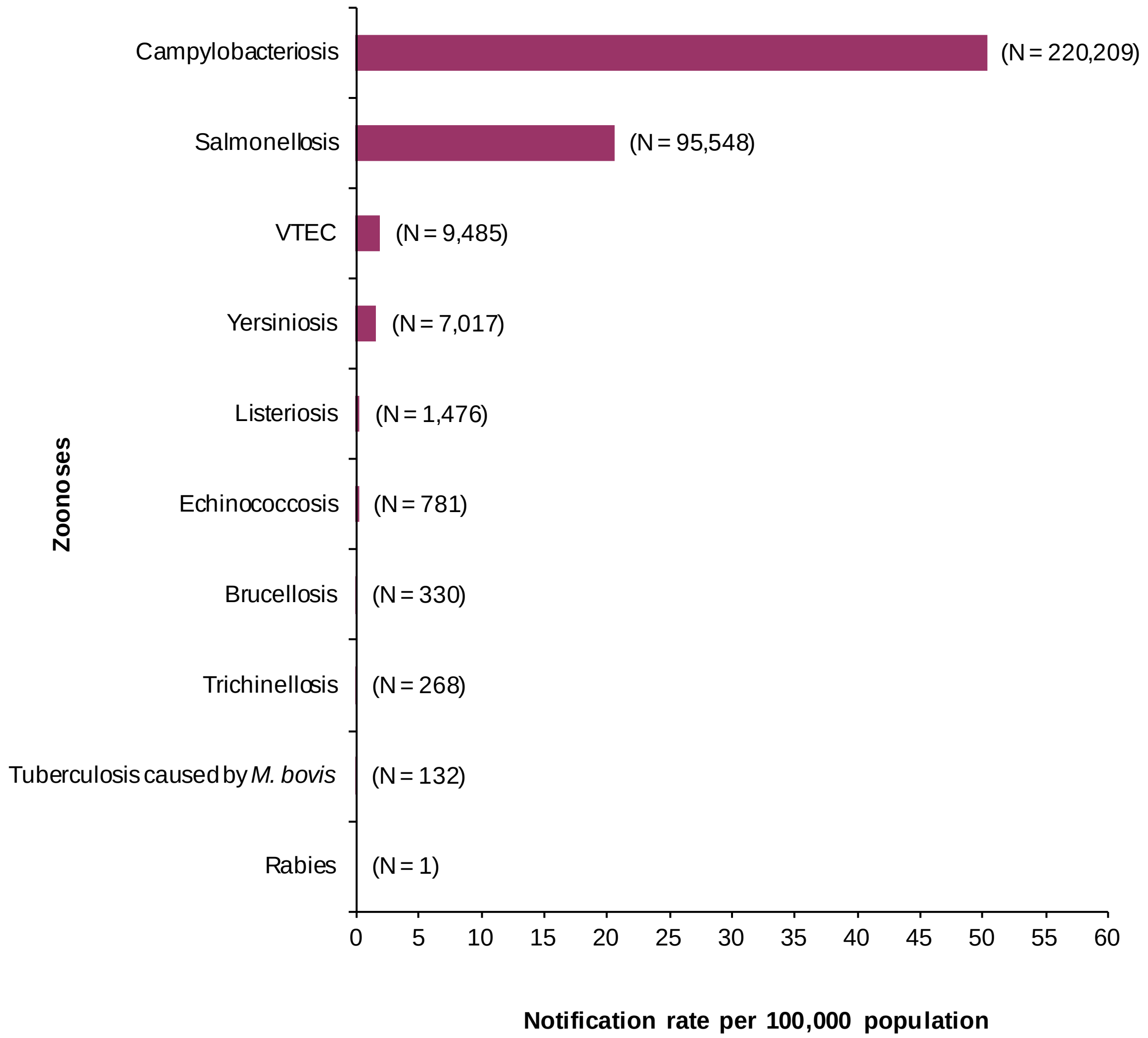
2.1. Main conclusions of the EU Summary Report on zoonoses, zoonotic agents and food-borne outbreaks 2011

- The number of confirmed campylobacteriosis cases in humans has increased in the past five years in the EU, and campylobacteriosis remains the most frequently reported zoonotic disease in humans. The occurrence of *Campylobacter* continued to be high in broiler meat at the EU level.
- The number of human salmonellosis cases reported in the EU decreased and this decline is a continuation of the significant declining trend observed since 2007. It is assumed that the observed reduction in salmonellosis cases is mainly as a result of the successful *Salmonella* control programmes in poultry populations. Most MSs met their *Salmonella* reduction targets for poultry in 2011 and *Salmonella* is declining in these animal populations. *Salmonella* in foodstuffs was mainly detected in meat and products thereof.
- Although a decrease in case numbers of listeriosis was reported in 2011, there was no statistically significant increasing or decreasing trend in the EU between 2008 and 2011. The highest proportions of food samples exceeding the legal safety limit set for *Listeria monocytogenes* (*L. monocytogenes*) in 2011 were observed in ready-to-eat (RTE) fishery products, cheeses and fermented sausages.
- The number of cases of verotoxigenic *Escherichia coli* (VTEC) in humans has been increasing in the EU since 2008. In 2011, there was an increase of 2.6 times in reported case numbers and 4.5 times the number of severe renal complications (haemolytic uremic syndrome) reported, compared with 2010. This was due to a single extensive food-borne outbreak primarily affecting Germany but with linked cases in 14 other MSs and the United States. The outbreak strain STEC/VTEC O104:H4 was particularly virulent with higher proportion of severe cases and fatalities than normally reported. Of cases in which the serogroup was known, serogroup O157 was still the most commonly reported. In animals and food, findings of VTEC and serogroup O157 were most often reported from cattle and bovine meat, but the bacteria were also detected in some other animal species and foodstuffs.
- There was a statistically significant decreasing five-year trend of human yersiniosis cases in the EU over the period 2007-2011.The number cases, however, slightly increased in 2011 for the first time since 2006. *Yersinia enterocolitica* (*Y. enterocolitica*) was mainly isolated from pig meat and pigs.
- The number of human cases due to *Mycobacterium bovis* (*M. bovis*) decreased in 2011 compared with 2010, with three MSs accounting for the majority of the reported cases. The reported prevalence of bovine tuberculosis in cattle increased slightly at the EU level. However, this was due to one MS that reported an increase in the prevalence of bovine tuberculosis for the third consecutive year.
- Concomitantly with the significant decreasing EU trend in human brucellosis cases, the prevalence of both bovine and small ruminant brucellosis has continued to decrease within the EU, with the decline in small ruminant cases being more substantial.
- The number of trichinellosis cases in humans increased in 2011 compared with 2010 but remained at a lower level than in 2007-2009. *Trichinella* was also found slightly more often in pigs in 2011 than in 2010. The parasite was more prevalent in wildlife than in farmed animals.
- Cases of echinococcosis in humans increased slightly in 2011. This was primarily a result of an increasing number of cases of the more severe form of echinococcosis, alveolar echinococcosis caused by *Echinococcus multilocularis* (*E. multilocularis*), being reported in 2011 and over the last five-year period. *E. multilocularis* was reported mainly in foxes by several reporting MSs, while among the MSs that reported data on *Echinococcus* in farm animals, the majority reported no findings or very low levels of *Echinococcus*.
- One human rabies case associated to travel outside of the EU was reported in 2011. The general decreasing trend in the total number of rabies cases in domestic animals and wildlife observed in previous years continued in 2011.
- *Salmonella* was the most frequently reported cause of reported food-borne outbreaks in 2011, although the numbers of *Salmonella* outbreaks continued to decrease. The second most important causative agent group was bacterial toxins, followed by *Campylobacter* and viruses. The main food vehicles in the reported food-borne outbreaks were eggs and egg products, mixed foods and fish and fish products. In terms of most people affected however, the largest outbreak in 2011 was due to STEC/VTEC O104:H4 in sprouted seeds.

2.2. Zoonoses and item-specific summaries

The public health importance of a zoonosis is not dependent on its incidence in the human population alone. The severity of the disease, case fatality, post-infection (chronic) complications and possibilities for prevention are also key factors determining the importance of the disease. For instance, despite the relatively low number of cases caused by *Listeria* and *Lyssavirus* (rabies), compared with the number of human campylobacteriosis and salmonellosis cases (Figure SU1), these infections are considered important because of the severity of the associated illness and the higher case-fatality rate (Table SU1). The case-fatality rates should, however, be interpreted with caution as the final fate of surviving cases is often unknown beyond the initial sampling and, regarding fatal cases, it can be difficult to ascertain that the disease was the primary cause of death.

Figure SU1. Reported notification rates of zoonoses in confirmed human cases in the EU, 2011



Note: Total number of confirmed cases is indicated in parenthesis at the end of each bar.

Table SU1. Reported hospitalisation and case-fatality rates due to zoonoses in confirmed human cases in the EU, 2011

Disease	Number of confirmed human cases	Hospitalisation				Deaths			
		Confirmed cases covered[1] (%)	Number of reporting MSs[2]	Reported hospitalised cases	Hospitalisation rate (%)	Confirmed cases covered[1] (%)	Number of reporting MSs[2]	Reported deaths	Case-fatality rate (%)
Salmonellosis	95,548	10.4	9	4,557	45.7	49.0	14	56	0.12
Campylobacteriosis	220,209	7.7	9	8,137	47.9	52.1	13	43	0.04
Listeriosis	1,476	43.7	16	604	93.6	71.4	19	134	12.7
VTEC infections	9,485	22.5	14	721	33.8	79.0	16	56	0.75
Yersiniosis	7,017	11.0	9	427	55.2	70.1	12	1	0.02
Brucellosis	330	53.9	8	118	66.3	41.2	8	1	0.74
Trichinellosis	268	76.9	9	153	74.3	76.5	12	1	0.49
Echinococcosis	781	18.2	10	96	67.6	28.4	12	2	0.90
Rabies	1	100	27	1	100	100	27	1	100

1. The proportion (%) of confirmed cases for which the information on hospitalisation or death was available.
2. Not all countries observed cases for all diseases.

Campylobacter

Humans

Campylobacteriosis has been the most frequently reported zoonotic disease in humans in the EU since 2005. In 2011, 220,209 confirmed cases of campylobacteriosis were reported by 25 MSs, which represents an increase of 2.2 % compared with 2010. The overall notification rate of human campylobacteriosis was 50.3 per 100,000 population. The number of confirmed cases of campylobacteriosis increased significantly over the last four years (2008-2011), with clear seasonal peaks occurring each summer. Considering the high number of human campylobacteriosis cases, the severity in terms of reported fatalities was low (0.04 %) (Table SU1).

Foodstuffs

For 2011, most of the information on *Campylobacter* in foodstuffs was reported with regard to broiler meat and products thereof. Overall, 31.3 % of fresh broiler meat units were found positive for *Campylobacter* in the reporting MSs. As in previous years, the proportions of positive broiler meat samples varied widely among MSs, with the prevalence ranging from 3.2 % to 84.6 %.

Animals

In 2011, the overall proportion of *Campylobacter*-positive broiler flocks was 17.8 %, ranging from 12.8 % to 80.6 % among the four MSs reporting flock-based data. In the case of broiler slaughter batch-based data, the overall proportion of *Campylobacter*-positive samples was 21.3 %, varying from 0 % to 92.0 % among the six reporting MSs.

Salmonella

Humans

In 2011, a total of 95,548 confirmed cases of human salmonellosis were reported in the EU. This represents a decrease of 5.4 % compared to 2010 and a reduction by 37.9 % compared to 2007, representing 58,304 fewer cases reported in 2011 than in 2007. The EU notification rate for confirmed cases was 20.7 cases per 100,000 population. The case fatality rate of human salmonellosis was 0.12 % in 2011 (Table SU1). As in previous years, *S.* Enteritidis and *S*. Typhimurium were the most frequently reported serovars (44.4 % and 24.9 %, respectively, of all known reported serovars in human cases). As a result of the harmonised reporting and also several large outbreaks, monophasic *S.* Typhimurium 1,4,[5],12:i:- was the third most commonly reported serovar in the EU (4.7 %). The fourth most common serovar in humans was *Salmonella* Infantis (*S*. Infantis), which has been increasing over the last four years. A seasonal peak in the number of cases during the late summer and early autumn was again observed in the EU in 2011.

It is assumed that the observed reduction in salmonellosis cases in humans is mainly the result of successful *Salmonella* control programmes in fowl (*Gallus gallus*) populations that are in place in EU MSs and that have particularly resulted in a lower occurrence of *Salmonella* in eggs, though other control measures might also have contributed to the reduction.

Foodstuffs

Information on *Salmonella* was reported from a wide range of foodstuff categories in 2011, but the majority of data were from various types of meat and products thereof. The highest proportions of *Salmonella*-positive units were reported for fresh broiler meat at an average level of 5.9 %. In fresh pig meat, 0.7 % of tested samples were found positive for *Salmonella* in the group of reporting MSs.

Salmonella was found in a very low proportion of table eggs, at levels of 0.1 % (single samples or batch samples). *Salmonella* was also detected in other foods, including turkey meat, bovine meat, milk and dairy products, fruit and vegetables and fish and fishery products.

Non-compliance with the EU *Salmonella* criteria was, once again, most often observed in food categories of meat origin. Minced meat and meat preparations from poultry intended to be eaten cooked had the highest level of non-compliance (6.8 % of single samples and 2.4 % of batches). A high proportion of non-compliance was also reported for minced meat and meat preparations from animal species other than poultry intended to be eaten cooked (1.1 % of single samples and 1.4 % of batch samples) and meat products from poultry meat intended to be eaten cooked (1.1 % of single samples). Non-compliance was also observed in live bivalve molluscs and live echinoderms, tunicates and gastropods, where 1.6 % and 0.8 % of single samples and batches were non-compliant, respectively. Of relevance are the *Salmonella* findings in ready-to-eat (RTE) foods, such as minced meat and meat preparations intended to be eaten raw (1.4 % of non-compliant single samples). All samples of egg products and RTE sprouted seeds were compliant with the criteria in 2011.

Animals

In 2011, 20 MSs (as in 2010) met the *Salmonella* reduction target of ≤1 % set for breeding flocks of *Gallus gallus* (fowl), which covers five target serovars (*S.* Enteritidis, *S.* Typhimurium, *S.* Hadar, *S.* Infantis, *S.* Virchow). Overall, 0.6 % of breeding flocks of *Gallus gallus* in the EU were positive for the target serovars during the production period, which was less than in 2010 (0.7 %). Together 1.9 % of the breeding flocks of *Gallus gallus* in the EU were positive for *Salmonella* spp., which was similar to the proportion reported in 2010 (2.0 %).

In the case of flocks of laying hens, 22 MSs (compared with 25 MSs in 2010) met their relative *Salmonella* reduction targets, which cover *S.* Enteritidis and *S.* Typhimurium. The EU prevalence was reduced for the two target serovars from 1.9 % in 2010 to 1.5 % in 2011. Overall, during the production period, 4.2 % (5.9 % in 2010) of laying hen flocks in the EU were positive for *Salmonella* spp.

2011 was the third year of implementing the EU reduction target of ≤1 % prevalence for *S.* Enteritidis and *S*. Typhimurium in broiler flocks. Altogether 24 MSs (22 in 2010) met this target and a further slight decrease in the EU prevalence for the target serovars was observed, from 0.4 % in 2010 to 0.3 % in 2011. The prevalence of *Salmonella* spp. was also further reduced from 4.1 % in 2010 to 3.2 % in 2011.

2011 was the second year of MSs implementing the *Salmonella* reduction targets for turkey flocks (≤1 % for *S.* Enteritidis and *S*. Typhimurium). All the 14 MSs that reported data on turkey breeding flocks met the target, with an EU prevalence of 0.2 % of the two target serovars (0.3 % in 2010). A further 22 MSs met the target for fattening turkey flocks before slaughter, with only one MS not meeting the target. At the EU level 0.5 % of the fattening turkey flocks were infected with the two target serovars, which is similar to 2010 (0.5 %). In total, 3.5 % and 10.1 % of turkey breeding and fattening flocks, respectively, were positive for *Salmonella* spp. in 2011 (6.9 % and 12.1 % in 2010).

Salmonella findings were also reported in other animal species, including ducks, geese, pigs, cattle, sheep and goats.

Serovars in animals and food

S. Infantis and *S*. Enteritidis were the most commonly reported serovars from *Gallus gallus,* eggs and broiler meat at EU level over the period 2004-2011. The number of reported isolations of *S*. Enteritidis have declined over the years, while isolations of *S*. Infantis have increased in the last three years. In pigs and meat thereof *S*. Typhimurium was by far the most commonly reported serovar over the period 2004-2011. Monophasic *S.* Typhimurium has was the third most frequently reported serovar in 2011 in pigs and meat from pigs. In bovines and meat thereof *S*. Typhimurium and *S.* Dublin were the two most frequently reported serovars over the period 2004-2011.

Feedingstuffs

Salmonella was detected most often in feed materials from land animal origin, up to levels of 4.0 %. Some findings were also made in feed materials derived from fish meal, cereals and oil seeds. *Salmonella* was reported in compound feedingstuffs for cattle, pigs and poultry with the proportion of positive samples 0.3 %-0.8 % at the EU level.

Listeria

Humans

In 2011, 26 MSs reported 1,476 confirmed human cases of listeriosis, which represented a 7.8 % decrease compared with 2010. The overall EU notification rate was 0.32 cases per 100,000 population. There was no statistically significant increasing or decreasing trend in confirmed human cases of listeriosis observed at the EU level in 2008-2011. Listeriosis represents the most severe human disease in terms of hospitalisation and fatal cases (12.7 %) (Table SU1), reflecting the focus of the EU listeriosis surveillance on severe, systemic infections.

Foodstuffs

MSs provided information on numerous investigations of *L. monocytogenes* in different categories of RTE food in 2011. In the case of RTE products at point of retail, very low proportions of samples were generally found to be non-compliant with the EU criterion of ≤100 cfu/g. The highest proportion of non-compliant samples was reported for RTE fishery products (0.6 % in single samples and 0.2 % in batches), for fermented sausages (0.6 % in single samples), for hard cheeses (0.1 % in single samples and 1.6 % in batches), and for soft and semi-soft cheeses (0.6 % in batches). The highest level of non-compliance in single samples at processing was observed in RTE fishery products (6.7 %), while the percentage of non-compliance for this category at batch-level was 2.3 %.

Verotoxigenic *E. coli*

Humans

In 2011, a total of 9,485 confirmed human VTEC cases were reported by 26 MSs. This represents an increase of 159.4 % compared with 2010 (3,656) as a result of a large STEC/VTEC O104:H4 outbreak that occurred in 2011 in the EU, primarily in Germany. The very high number of haemolytic uraemic syndrome (HUS) cases reported (1,006 in 2011 compared with 222 in 2010) could also be attributed to the outbreak. The overall EU notification rate of VTEC was 1.9 cases per 100,000 population in 2011. There was a statistically significant increasing EU trend in confirmed VTEC cases in 2008-2011. As in previous years, the most commonly identified VTEC serogroup was O157 (41.2 %) followed by O104 (20.1 %); however, serogroup information was missing for 44 % of confirmed cases. The case fatality rate for human VTEC infections in 2011 was 0.75 % compared with 0.39 % in 2010, with 56 deaths reported (Table SU1). Germany accounted for 89 % of the total number of reported deaths.

Foodstuffs

In food, most information was reported on VTEC and the VTEC O157 serogroup, and these bacteria were most often detected in fresh bovine meat, where overall 1.4 % and 0.3 % of the units tested were positive for VTEC and VTEC O157, respectively. In addition, VTEC was occasionally reported in poultry meat, raw cow's milk, cheeses, butter, sprouted seeds and vegetables. The human pathogenic serogroups were detected from bovine meat, poultry meat, milk and dairy products and vegetables.

Animals

VTEC and VTEC O157 were most frequently reported in cattle, at levels of 8.6 % and 1.4 %, respectively. In addition, VTEC was found in sheep, pigs and some other animal species. The human pathogenic serogroups were detected in cattle and sheep.

Yersinia

Humans

In 2011, 7,017 confirmed human yersiniosis cases were reported in the EU, which represents an increase of 3.5 % compared with 2010. The number of yersiniosis cases in the EU has been declining, with a statistically significant five-year trend since 2007. In 2011, yersiniosis was the fourth most frequently reported zoonosis in the EU, with an overall notification rate of 1.63 cases per 100,000 population. The case fatality rate of human yersiniosis was 0.02 % in 2011 (Table SU1). *Y. enterocolitica* was the most common species reported in human cases and was isolated from 98.4 % of the confirmed cases.

Foodstuffs

In food *Y. enterocolitica* and its human pathogenic biotypes and serovars were most often detected in pig meat and products thereof. Some *Yersinia* findings were also reported in meat from other animal species, and in milk, vegetables and fish. There were no reported findings of *Yersinia pseudotuberculosis* (*Y. pseudotuberculosis*) in any food items tested in 2011.

Animals

Y. enterocolitica was most often detected in pigs, but was also sometimes found in cattle, sheep, goats, cats, dogs, domestic solipeds and some other animal species.

Tuberculosis due to *Mycobacterium bovis*

Humans

Human infections due to *M. bovis* are rare in the EU. In 2011, the total number of confirmed human tuberculosis cases due to *M. bovis* was 132, representing a decrease compared with 2010 (165). As in previous years, a few MSs accounted for most of the confirmed cases.

Animals

In 2011, one MS and two provinces in one MS became officially bovine tuberculosis free (Officially Tuberculosis Free, OTF), increasing the number of OTF MSs to 15 plus two non-MSs, as well as Scotland (the United Kingdom) and six regions and 13 provinces in Italy. Five OTF MSs reported infected cattle herds in 2011. Nine non-OTF MSs reported positive or infected herds. In most of these non-OTF MSs the prevalence of bovine tuberculosis remained at a level comparable to 2010 or decreased, except in the United Kingdom which reported an increase in the prevalence of bovine tuberculosis. *M. bovis* was also detected in over 10 animal species other than cattle, including wildlife.

Brucella

Humans

In 2011, a total of 330 confirmed cases of human brucellosis were reported in the EU, representing a decrease of 7.3 % compared with the 356 confirmed cases in 2010. A significant decreasing five-year trend in human brucellosis was noted in the EU. As in previous years, the highest numbers were reported by non-Officially Brucellosis-Free (non-OBF)/non-Officially *Brucella melitensis* (*B. melitensis)*-Free (non-ObmF) MSs. Significant decreasing trends by country were also observed in the two MSs Italy and Spain, which is in accordance with the findings in the animal population in these countries. Two thirds of the human brucellosis cases were hospitalised but only one fatal case was reported in 2011 (Table SU1).

Foodstuffs

In 2011 *Brucella* was not reported in any food samples tested.

Animals

In 2011, 15 MSs were OBF and 19 MSs were ObmF in sheep and goats. In addition, some regions and provinces in Italy, Spain and Portugal as well as Great Britain in the United Kingdom were OBF. Furthermore, a number of departments in France and some regions and provinces in Italy, Portugal and Spain were ObmF.

At the EU level, the prevalence of bovine brucellosis in cattle herds has been steadily decreasing, and in 2011, only 0.05 % of the existing cattle herds remaining test-positive. In the EU non-OBF MSs, the percentage of existing infected/positive herds decreased between 2005 and 2007 but since then has remained stable. The prevalence of brucellosis in sheep and goat herds decreased more substantially both at the EU level and in the non-ObmF MSs, with a statistically significant decreasing trend in EU co-financed non-ObmF MSs since 2005. In 2011, the proportion of existing infected/positive sheep and goat herds infected with *B. melitensis* in the EU was 0.17 %.

Trichinella

Humans

In 2011, confirmed cases of trichinellosis increased by 20.2 %, with 268 cases reported compared with 223 cases in 2010. The EU notification rate was 0.05 cases per 100,000 population and the highest notification rates in 2011 were reported in Latvia followed by Lithuania, Romania, Bulgaria and Slovakia. These five countries accounted for 84.3 % of all confirmed cases reported in 2011. There were major fluctuations in the number of cases reported by country over the years. In general, human cases were most likely to be associated with food-borne outbreaks due to consumption of meat from domestic pigs raised in backyards. One death due to *Trichinella* infection was reported in 2011 (Table SU1).

Animals

All MSs provided data on *Trichinella* in animals. The parasite was very rarely detected in pigs in 2011, with an overall EU prevalence of *Trichinella*-positive pigs of 0.00017 %, which is however a higher prevalence than in 2010. The positive findings reported by eight MSs in 2011 were mainly from pigs from non controlled housing conditions. The parasite was isolated more frequently from farmed and hunted wild boars. *Trichinella* is often reported in wildlife species by some Eastern and Northern European MSs, where the parasite is circulating in wildlife populations.

Echinococcus

Humans

In humans, the number of confirmed echinococcosis cases increased by 3.3 % in 2011 compared with 2010. Among the cases for which species had been determined, *Echinococcus granulosus* (*E. granulosus*) accounted for 85.1% of the cases and *E. multilocularis* for 14.9 %. An increasing number of cases of alveolar echinococcosis was reported (based on reported cases of *E. multilocularis)* over the last five years and a decreasing number of cystic echinococcosis (based on reported cases of *E. granulosus*). In 2011, six MSs reported only cases of *E. granulosus*, two MSs reported only cases of *E. multilocularis* and five MSs reported both parasites in humans. The highest population-based risk was noted in Bulgaria, where the notification rate was 23 times higher than the rate at the EU level. Two deaths due to echinococcosis were reported in 2011, resulting in an EU case-fatality rate of 0.9 % (Table SU1).

Animals

E. multilocularis was reported in foxes by many central European countries, while the Nordic countries, Ireland and the United Kingdom, did not detect the parasite in their investigations of foxes.

Rabies

Humans

In 2011, a fatal case of rabies occurred in a person travelling in a country endemic for rabies. The person did not receive the vaccine directly after exposure and also delayed seeking medical attention on returning to Europe. This again highlights the importance of public information and education about the risk of rabies while travelling to rabies endemic countries or to MSs that are not free of the disease in their animal population.

Animals

In 2011, 512 domestic or wildlife animals, other than bats, were found infected with classical rabies or unspecified *Lyssavirus* in seven MSs and one non-MS situated in the eastern part of the EU. Reported cases decreased compared with 2010 continuing the overall decreasing trend. The majority of the rabies cases were reported from wildlife. A further six MSs reported rabies cases in bats.

Food-borne outbreaks

A total of 5,648 food-borne outbreaks, including waterborne outbreaks, were reported in the EU. Overall, 69,553 human cases, 7,125 hospitalisations and 93 deaths were recorded. The evidence supporting the link between human cases and food vehicles was strong in 701 outbreaks.

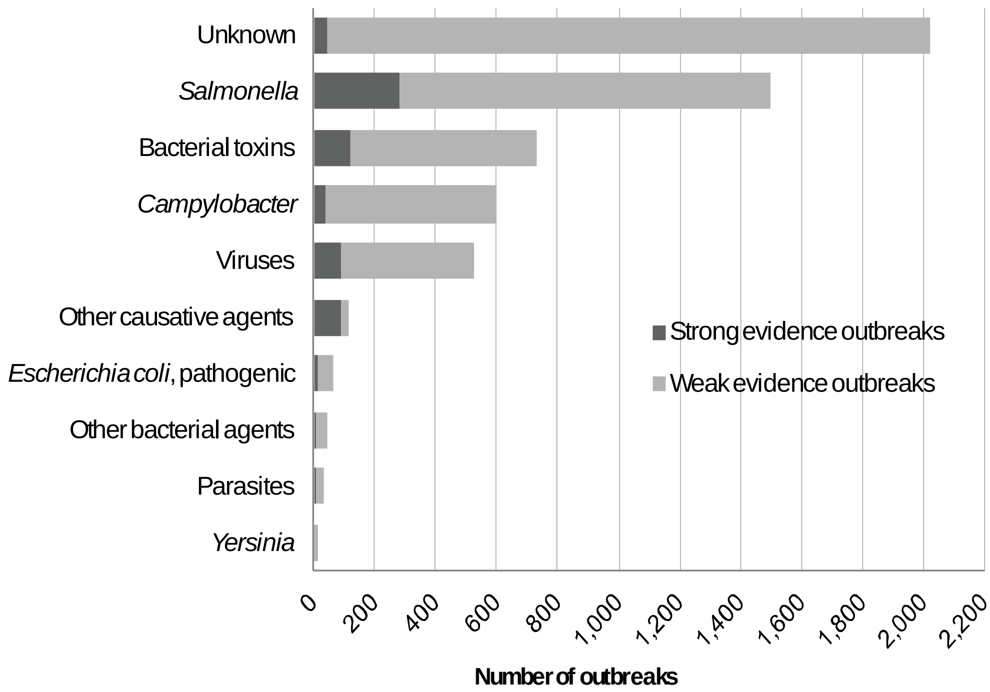
The largest number of reported food-borne outbreaks was caused by *Salmonella* (26.6 % of all outbreaks), followed by bacterial toxins (12.9 %), *Campylobacter* (10.6 %) and viruses (9.3 %). The numbers of reported *Salmonella* and virus outbreaks declined compared to previous years. The most important food vehicles in the strong evidence outbreaks were eggs and egg products (in 21.4 % of outbreaks), mixed foods (13.7 %) fish and fish products (10.1 %), crustaceans, shellfish, molluscs and products thereof (6.0 %), and vegetables, juices and products thereof (5.3 %).

In 2011, 11 waterborne outbreaks were reported in the EU, and the main causative agents were *Campylobacter,* calicivirus*, Cryptosporidium hominis* (*C. hominis*) and VTEC.

The largest food-borne outbreaks in terms of human cases in 2011 were a STEC/VTEC O104 outbreak in Germany, France and some other MSs, and a waterborne *Cryptosporidium* outbreak in Sweden.

The revised food-borne outbreak reporting specifications were implemented for the second time in 2011. The two new evidence categories to support the reporting of a detailed dataset (descriptive epidemiological evidence and detection of the causative agent in the food chain) were used in approximately one third of the strong evidence outbreaks in 2011.

Figure SU2. Distribution of food-borne outbreaks per causative agent in the EU, 2011



Note: Food-borne viruses include calicivirus, hepatitis A virus and other unspecified food-borne viruses. Bacterial toxins include toxins produced by *Bacillus*, *Clostridium* and *Staphylococcus*. Other causative agents include mushroom toxins, marine biotoxins, histamine, mycotoxins, escolar fish (wax esters) and other unspecified agents. Parasites include primarily *Trichinella*, but also *Giardia*, *Cryptosporidium* and *Anisakis*. Other bacterial agents include *Listeria*, *Shigella* and *Brucella*.

3. INFORMATION ON SPECIFIC ZOONOSES AND ZOONOTIC AGENTS

3.1. *Salmonella*

The genus *Salmonella* is divided into two species*: Salmonella enterica* (*S. enterica*) and *S. bongori*. *S. enterica* is further divided into six subspecies, and most zoonotic *Salmonella* belong to the subspecies *enterica*. This subspecies can be further divided into serovars which are often named according to the place of first isolation. In the following text, a genus name followed by serovar is used, for example *S.* Typhimurium. More than 2,600 serovars of zoonotic *Salmonella* exist and the prevalence of different serovars may change over time.

Human salmonellosis is usually characterised by acute onset of fever, abdominal pain, nausea, and sometimes vomiting, after an incubation period of 12-36 hours. Symptoms are often mild and most infections are self-limiting, lasting a few days. However, in some patients, the infection may be more serious and the associated dehydration can be life threatening. When *Salmonella* causes systemic infections, such as septicaemia, effective antimicrobials are essential for treatment. Salmonellosis has also been associated with long-term and sometimes chronic sequelae, e.g. reactive arthritis. Mortality is usually low, and less than 1 % of reported *Salmonella* cases have been fatal.

The common reservoir of *Salmonella* is the intestinal tract of a wide range of domestic and wild animals, which may result in a variety of foodstuffs of both animal and plant origin becoming contaminated with faecal organisms either directly or indirectly. Transmission often occurs when organisms are introduced in food preparation areas and are allowed to multiply in food, e.g. due to inadequate storage temperatures, inadequate cooking or cross contamination of RTE food. The organism may also be transmitted through direct contact with infected animals or humans or faecally contaminated environments. Infected food handlers may also act as a source of contamination for foodstuffs.

In the EU, *S.* Enteritidis and *S.* Typhimurium are the serovars most frequently associated with human illness. Human *S.* Enteritidis cases are most commonly associated with the consumption of contaminated eggs and poultry meat, while *S.* Typhimurium cases are mostly associated with the consumption of contaminated pig, bovine and poultry meat.

In animals, sub-clinical infections are common. The organism may easily spread between animals in a herd or flock without detection and animals may become intermittent or persistent carriers. Infected cattle, sheep and horses may succumb to fever, diarrhoea and abortion. Also within calf herds, *Salmonella* may cause outbreaks of diarrhoea and septicaemia with high mortality. Clinical signs are less common in pigs and goats and poultry usually show no obvious signs of infection.

Table SA1 presents the countries reporting data for 2011.

Table SA1. Overview of countries reporting data for* Salmonella*, 2011

Data	Total number of reporting MSs	Countries
Human	27	**All MSs** **Non-MSs:** CH, IS, NO
Food	26	**All MSs** except MT **Non-MSs:** CH, IS, NO
Animal	27	**All MSs** **Non-MSs:** CH, IS, NO
Feed	24	**All MSs** except BG, CY, LT **Non-MSs:** CH, NO
Serovars (food and animals)	26	**All MSs** except MT **Non-MSs:** IS, NO

Note: The overview table includes all data reported by MSs.

3.1.1. Salmonellosis in humans

Salmonellosis continued to decrease in 2011. A total of 97,897 salmonellosis cases were reported by the 27 EU MSs, with 95,548 confirmed cases (EU notification rate 20.7 cases per 100,000 population) (Table SA2). This was a 5.4 % decrease in confirmed cases compared to 2010. The highest notification rates in 2011 were reported in the Czech Republic, Slovakia and Lithuania (≥70 per 100,000), while the lowest were reported in Portugal, Greece and Romania (≤5 per 100,000). It should be noted that the proportion of travel-related cases was as usual very high, >70 %, in the Nordic countries Finland, Sweden and Norway. The proportion of travel-related cases and domestic cases by country can be found in the earlier report.[10]

There was a statistically significant (p <0.001) decreasing EU trend in confirmed salmonellosis cases in 2008-2011 (Figure SA1). There was also a clear seasonal trend (Figure SA1). Significant decreasing trends by country were observed in 10 MSs: Austria, Denmark, Finland, Germany, Greece, Italy, Portugal, Slovakia, Slovenia and Sweden. Only one country, France, had a significant increasing trend in salmonellosis cases, which could be explained by an increased proportion of *Salmonella* isolates sent to the national reference centre for *Salmonella* from 2008 and onwards and two very large outbreaks of the monophasic variant of *S*. Typhimurium (see further details in the *Salmonella* serovar section).

Data on hospitalisation for salmonellosis have been collected in the case-based reporting in TESSy for the last two years. Nine MSs provided this information for some or all of their cases (Figure SA2). On average, 45.7 % of the confirmed salmonellosis cases were hospitalised; hospitalisation status was, however, only provided for 10.4 % of all confirmed cases. The highest hospitalisation rates were reported in Greece, Romania and Portugal (>85 % of cases hospitalised), which were also the countries reporting the lowest notification rates of salmonellosis. This indicates that the surveillance systems in these countries primarily capture the more severe cases.

Fourteen MSs provided data on the outcome of their cases and among them 11 MSs reported a total of 56 fatal cases. This gives an EU case-fatality rate of 0.12 % among the 46,757 confirmed cases for which this information was reported (49.0 % of all confirmed cases).

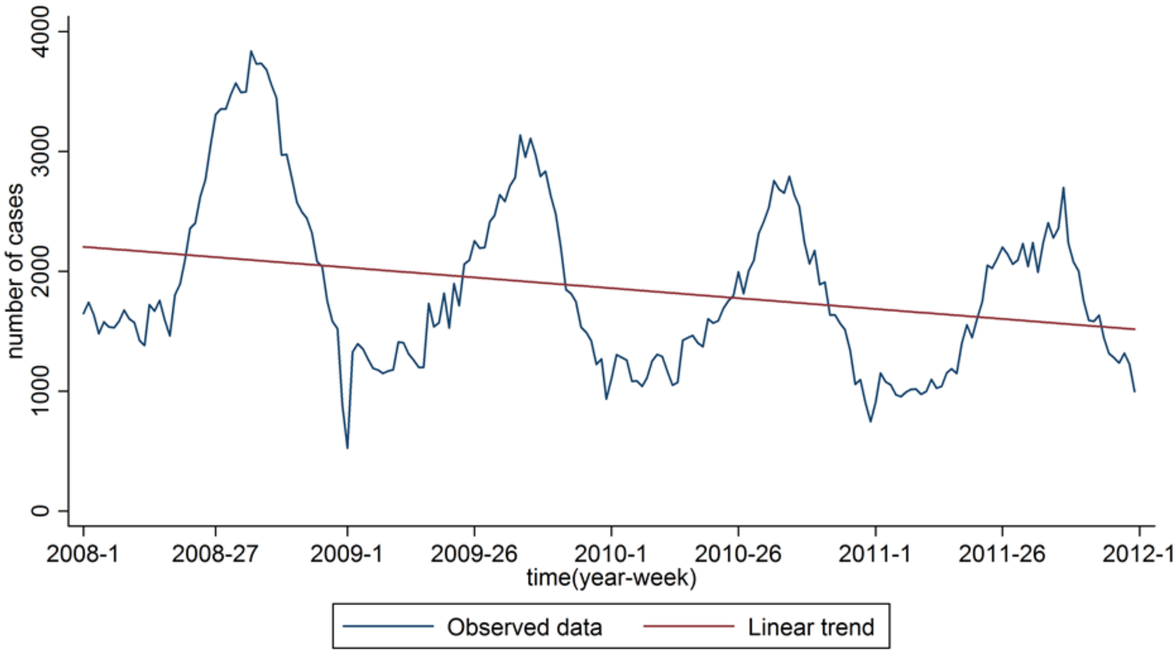
10 EFSA (European Food Safety Authority), ECDC (European Centre for Disease Prevention and Control), 2012. The European Union Summary Report on Trends and Sources of Zoonoses, Zoonotic Agents and Food-borne Outbreaks in 2010; EFSA Journal 2012; 10(3):2597. [442pp.]. Available online: www.efsa.europa.eu/efsajournal

Table SA2. Reported cases of human salmonellosis in 2007–2011 and notification rate for confirmed cases in the EU, 2011

Country	2011				2010	2009	2008	2007
	Report Type[1]	Cases	Confirmed cases	Confirmed cases/ 100,000	Confirmed cases			
Austria	C	2,010	1,433	17.1	2,179	2,775	2,312	3,386
Belgium	C	3,177	3,177	29.0	3,169	3,113	3,831	3,930
Bulgaria	A	932	924	12.3	1,154	1,247	1,516	1,136
Cyprus	C	110	110	13.7	136	134	169	158
Czech Republic	C	8,641	8,499	80.7	8,209	10,480	10,707	17,655
Denmark	C	1,170	1,170	21.0	1,608	2,130	3,669	1,648
Estonia	C	385	375	28.0	381	261	647	428
Finland	C	2,082	2,082	38.7	2,422	2,329	3,126	2,738
France	C	8,685	8,685	13.4	7,184	7,153	7,186	5,313
Germany	C	24,511	23,982	29.3	24,833	31,395	42,885	55,399
Greece	C	472	469	4.1	297	403	792	706
Hungary	C	6,446	6,169	61.8	5,953	5,873	6,637	6,578
Ireland	C	311	311	6.9	349	335	447	440
Italy	C	3,344	3,344	5.5	4,752	5,715	6,662	6,731
Latvia	C	1,088	998	44.8	877	795	1,229	619
Lithuania	C	2,294	2,294	70.7	1,962	2,063	3,308	2,270
Luxembourg	C	125	125	24.4	211	162	153	163
Malta	C	129	129	30.9	160	125	161	85
Netherlands[2]	C	1,284	1,284	12.0	1,447	1,204	1,627	1,224
Poland	A	8,813	8,400	22.0	9,257	8,529	9,149	11,155
Portugal	C	174	174	1.6	205	220	332	438
Romania	C	1,055	989	4.6	1,285	1,105	624	620
Slovakia	C	4,131	3,897	71.7	4,942	4,182	6,849	8,367
Slovenia	C	400	400	19.5	363	616	1,033	1,336
Spain[3]	C	3,786	3,786	32.8	4,420	4,304	3,833	3,842
Sweden	C	2,887	2,887	30.7	3,612	3,054	4,185	3,930
United Kingdom	C	9,455	9,455	15.1	9,670	10,479	11,511	13,557
EU Total		**97,897**	**95,548**	**20.7**	**101,037**	**110,181**	**134,580**	**153,852**
Iceland	C	45	45	14.1	34	35	134	93
Norway	C	1,290	1,290	26.2	1,370	1,235	1,941	1,649
Switzerland[4]	C	1,300	1,300	16.4	1,179	1,298	2,031	1,778

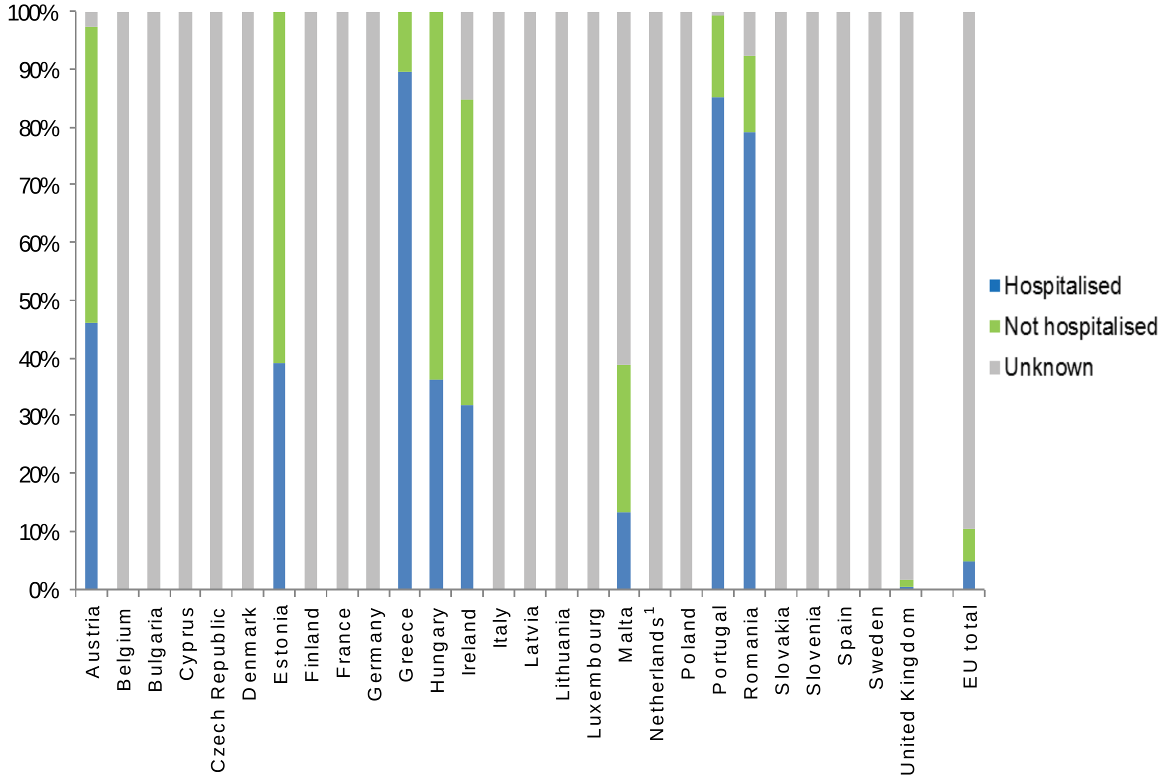
1. A: aggregated data report; C: case-based report.
2. Sentinel system; notification rates calculated with an estimated population coverage of 64 %.
3. Notification rates calculated with an estimated population coverage of 25 %.
4. Switzerland provided data directly to EFSA.

Figure SA1. Trend in reported confirmed cases of human salmonellosis in the EU, 2008–2011



Source: TESSy data from 25 MSs: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and United Kingdom. Bulgaria and Poland are excluded as they reported only monthly data.

Figure SA2. Proportion of reported confirmed cases of human salmonellosis hospitalised in the EU, 2011



1. In the Netherlands, hospitalisation data are collected in a special register which cannot be linked to the case-based data. In 2011, 23 % of laboratory-confirmed cases were hospitalised.

3.1.2. *Salmonella* in food

Twenty six MSs and three non-MSs provided data on *Salmonella* in various foodstuffs. Most MSs reported data on *Salmonella* in food of animal origin, primarily broiler meat, pig meat and bovine meat (Table SA3).

In the following sections, only results based on 25 or more units tested are presented, with the exception of the section on compliance with microbiological criteria, in which investigations with fewer than 25 units tested are also included. Results from industry own-check programmes and Hazard Analysis and Critical Control Point (HACCP) sampling, as well as specified suspect sampling, selective sampling and outbreak investigations, have also been excluded owing to difficulties with the interpretation of data. These data are, however, presented in the Level 3 Tables.

Table SA3. Overview of countries reporting data for* Salmonella *in food, 2011

Data	Total number of reporting MSs	Countries
Broiler meat	25	**All MSs** except MT, SI **Non-MSs:** CH, IS
Turkey meat	20	**All MSs** except DK, ES, FR, LT, MT, SI, UK **Non-MSs:** CH, IS
Eggs and egg products	20	**All MSs** except DK, FI, FR, MT, NL, SI, UK
Pig meat	25	**All MSs** except MT,UK **Non-MSs:** IS, NO
Bovine meat	25	**All MSs** except MT, UK **Non-MSs:** CH, NO
Milk and dairy products	20	**All MSs** except DK, FI, FR, LT, LU, MT, UK
Fruit and vegetables	20	**All MSs** except CY, GR, LT, LU, MT, PL, UK
Fish and other fishery products[1]	20	**All MSs** except DK, FI, FR, LT, LU, MT, UK **Non-MSs:** CH, NO

Note: The overview table includes all data reported by MSs. In the following sections, data reported as HACCP or own control are not included in the detailed tables, and, unless stated, data from suspect sampling, selective sampling and outbreak investigations are also excluded. Also, only countries reporting 25 samples or more have been included for analysis, with the exception of the section on compliance with microbiological criteria, in which investigations with fewer than 25 units tested are also included.

1. This category includes fish, fishery products, crustaceans, live bivalve molluscs, molluscan shellfish and surimi.

Compliance with microbiological criteria

The *Salmonella* criteria laid down by Regulation (EC) No 2073/2005[11] have been in force since 1 January 2006. The criteria were modified by Regulation (EC) No 1441/2007[12], which came into force in December 2007. The Regulations prescribe rules for sampling and testing, and set limits for the presence of *Salmonella* in specific food categories and in samples from food processing. The food safety criteria for *Salmonella* apply to products placed on the market within their shelf-life. According to these criteria, *Salmonella* must be absent in the food categories listed in Table SA4. Absence is defined by testing five or 30 samples of 25 g per batch depending on the food category. In official controls, often only single samples are taken to verify compliance with the criteria.

In 2011, as in previous years, the highest levels of non-compliance with *Salmonella* criteria generally occurred in foods of meat origin (Figure SA3). Minced meat and meat preparations from poultry intended to be eaten cooked had the highest level of non-compliance (category 1.5; 6.8 % of single samples and 2.4 % of batches).

11 Commission Regulation (EC) No 2073/2005 of 15 November 2005 on microbiological criteria for foodstuffs. OJ L 338, 22.12.2005, pp. 1–26.

12 Commission Regulation (EC) No 1441/2007 of 5 December 2007 amending Regulation (EC) No 2073/2005 on microbiological criteria for foodstuffs. OJ L 322, 7.12.2007, pp. 12–29.

A high proportion of non-compliance was also reported for minced meat and meat preparations from animal species other than poultry intended to be eaten cooked (category 1.6, 1.1 % of single samples and 1.4 % of batches positive for *Salmonella*), as well as for meat products from poultry meat intended to be eaten cooked (category 1.9, 1.1 % of single samples and 0.7 % of batches being positive).

The occurrence of *Salmonella* in RTE foods such as minced meat and meat preparations intended to be eaten raw (food category 1.4), for which 1.4 % of non-compliant single samples were reported, is of particular relevance because of the risk such foods pose to human health.

Non compliance was also observed in live bivalve molluscs and live echinoderms, tunicates and gastropods (category 1.17), where 1.6 % and 0.8 % of single samples and batches were not compliant.

In addition, a very low proportion of samples not complying with *Salmonella* criteria was observed in batches of cheeses, butter and cream made from raw or low heat-treated milk (category 1.11, 0.1 %).

All samples of egg products (food category 1.14) and RTE sprouted seeds (food category 1.18) were compliant with the criteria in 2011.

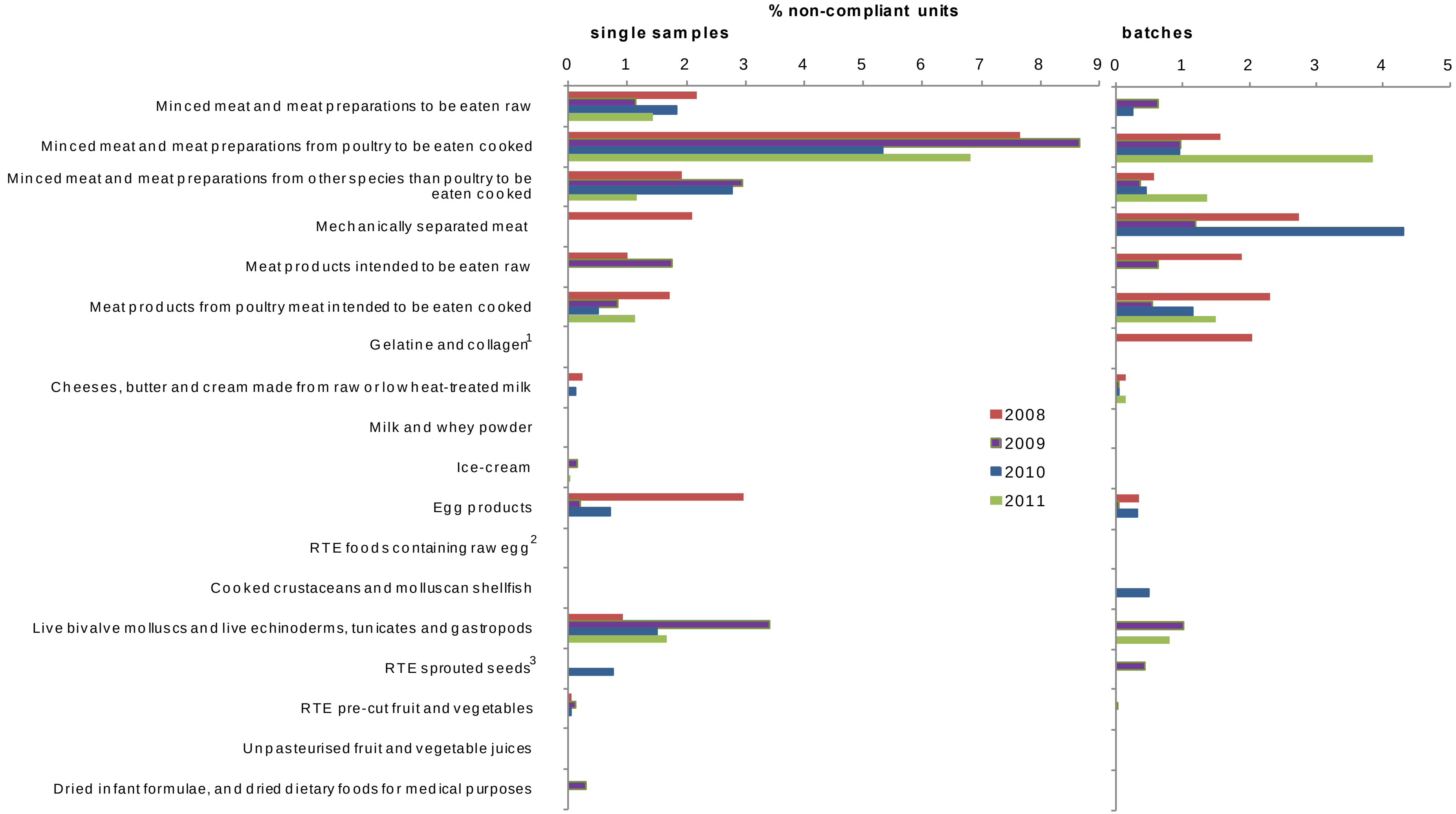
Table SA4. Compliance with the food safety* Salmonella *criteria laid down by EU Regulations (EC) 2073/2005 and (EC) 1441/2007, 2011

Food categories[1]		Total single samples			Total batches		
		Sample weight	N	% non-compliant	Sample weight	N	% non-compliant
1.4	Minced meat and meat preparations intended to be eaten raw	25 g	280	1.4	25 g or 100 g or 150 g	614	0
1.5	Minced meat and meat preparations from poultry intended to be eaten cooked	10 g or 25 g	1,466	6.8	10 g or 25 g or 150 g	553	2.4
1.6	Minced meat and meat preparations from other species than poultry intended to be eaten cooked	10 g or 25 g	5,406	1.1	10 g or 25 g or 100 g	1,552	1.4
1.7	Mechanically separated meat	-	-	-	10 g	1	0
1.8	Meat products intended to be eaten raw	25 or 50 g	9	0	25 g	1	0
1.9	Meat products from poultry meat intended to be eaten cooked	25 g	887	1.1	25 g or 100 g or 150 g	410	0.7
1.10	Gelatine and collagen	25 g	51	0	not stated	87	0
1.11	Cheeses, butter and cream made from raw or low heat-treated milk	25 g or 50 g or not stated	305	0	25 g or 200 g	2,198	0.1
1.12	Milk and whey powder	25 g or not stated	153	0	25 g or 25 ml	32	0
1.13	Ice cream	25 g	6,556	<0.1	25 g	541	0
1.14	Egg products	25 g or 25 ml	552	0	100 g	20	0
1.15	RTE foods containing raw eggs	25 g	48	0	-	-	-
1.16	Cooked crustaceans and molluscan shellfish	25 g or 150 g	32	0	25 g or 100 g	131	0
1.17	Live bivalve molluscs and live echinoderms, tunicates and gastropods	25 g	185	1.6	25 g or not stated	252	0.8
1.18	Sprouted seeds (RTE)	25 g	70	0	25 g or 500 g	49	0
1.19	Pre-cut fruit and vegetables (RTE)	25 g	1,606	0	25 g	548	0
1.20	Unpasteurised fruit and vegetable juices (RTE)	25 g or 25 ml	123	0	25 g, 25 ml or not stated	255	0
1.22-23	Dried infant formulae, dried dietary foods for medical purposes[2] and dried follow-on formulae	25 g	864	0	25 g, 200 g or not stated	275	0

Note: RTE: ready-to-eat products.
Data presented include only investigations at retail and at catering.

1. Numbers before food categories refer to Annex 1, chapter 1 of Regulation (EC) No 1441/2007. See this Regulation for full description of food categories.
2. Intended for infants below six months of age.

Figure SA3. Proportion of units not complying with EU* Salmonella *criteria, 2008–2011



Note: For 2011 investigations covering fewer than 25 samples are also included. For previous years, data are presented only for samples sizes ≥25.

1. No investigations with 25 or more batches of gelatine and collagen in 2009.
2. No investigations with 25 or more samples of RTE foods containing raw egg in 2009 and 2010, and batches in 2009 and 2010.
3. No investigations with 25 or more batches of RTE sprouted seeds in 2010.

Broiler meat and products thereof

In 2011, 21 MSs and one non-MS reported data on *Salmonella* in fresh broiler meat from investigations with 25 or more samples. The occurrence of *Salmonella* in these food samples at different levels of the production chain is presented in Table SA5.

Salmonella was detected in most of the reported investigations, with only four MSs (Estonia, Denmark, Finland and Sweden) reporting no positive findings. Overall, 25,611 fresh broiler meat units (single or batch) were tested within the EU and 5.9 % of them were positive. The majority of the samples (69.5 %) were single samples (17,799 units tested) with a proportion of positive findings of 6.7 %. Out of the 7,812 batch samples investigated, 4.0 % were positive for *Salmonella*.

At single sample level, Poland and Sweden reported the largest investigations on neck skin samples at slaughterhouse; Poland found 7.6 % of samples positive, whereas Sweden did not detect *Salmonella*. A substantial number of samples was also tested by the other countries, with the highest proportion of positive results reported by Hungary (36.3 %). In most investigations the sample was carcase neck skin and mainly 25 g of sample were tested. Spain reported testing of carcase surface samples (swabs) and found 17.3 % of samples positives out of 347 samples tested. At the processing plant, Poland reported the largest investigation on fresh broiler meat with 6.9 % of samples positive. Finland and Hungary also carried out investigations with a high number of samples taken at processing plants; and only Hungary detected *Salmonella* at a level of 42.5 %, the highest proportion observed at this stage. At retail the Netherlands, Latvia and Ireland tested a substantial number of broiler meat samples and reported 3.0 %, 2.6 % and 0.7 % of positive findings, respectively. Germany also carried out large investigations and found 4.2 % and 6.3 % of samples positive in the context of their surveillance and monitoring programmes, respectively. However, the largest proportion of positive samples came from a smaller number of units (156) reported by Hungary (40.4 %).

Bulgaria reported the largest investigation on batches of carcases at the slaughterhouse with 0.6 % of positive findings. Germany found a moderate proportion (17.8 %) of positive batches by using neck skin samples. The highest proportion of positive batches at the slaughterhouse was reported by Romania in an investigation on meat samples (22.6 %), but with a small number of units tested (31). At the processing and cutting plant, Bulgaria reported the largest investigation on fresh meat samples with 0.1 % of positive results. Sweden and Belgium also reported testing on a substantial number of fresh meat scrapings and fresh meat samples, respectively; and only Belgium detected *Salmonella* at a level of 5.6 %. The Czech Republic reported the highest proportion of positive batches at processing (13.3 %), but only 30 samples were tested. At the retail level, Belgium tested 337 batches of fresh meat and reported that 11.3 % of samples were positive.

Iceland tested a large number of batches of carcases at slaughterhouse and detected *Salmonella* at a low level (1.2 %).

For further information see Level 3 Tables.

Table SA5. Salmonella in fresh broiler meat at slaughter, processing/cutting level and retail, 2011

Country	Description	Sample unit	Sample weight	2011		
				N	N pos	% pos
At slaughterhouse						
Belgium	Carcase - neck skin	Batch	1 g	458	18	3.9
Bulgaria	Carcase - neck skin	Batch	25 g	1,782	10	0.6
Cyprus	Carcase - neck skin	Batch	25 g	245	30	12.2
Czech Republic	Carcase - neck skin	Batch	25 g	750	69	9.2
Denmark	Carcase - neck skin	Batch	300 g	306	0	0
Estonia	Carcase - neck skin	Batch	25 g	51	0	0
Germany	Carcase - neck skin, domestic production	Batch	25 g	337	60	17.8
Hungary	Carcase - neck skin	Single	25 g	397	144	36.3
Ireland[1]	Carcase	Single	25 g	239	6	2.5
Latvia	Carcase - neck skin	Single	25 g	100	1	1.0
Poland	Carcase - neck skin	Single	200 g	290	0	0
	Carcase - neck skin	Single	25 g	6,515	494	7.6
Romania	Carcase - neck skin	Batch	25 g	358	38	10.6
	Carcase - meat	Batch	25 g	31	7	22.6
Spain	Carcase - carcase swab	Single	25 g	347	60	17.3
Sweden	Carcase - neck skin	Single	-	3,089	0	0
Iceland	Carcase - neck skin	Batch	25 g	695	8	1.2
At processing or cutting plant						
Belgium	Fresh meat, at processing plant	Batch	25 g	430	24	5.6
Bulgaria	Fresh meat, at processing plant	Batch	25 g	1,636	1	0.1
Cyprus	Fresh meat, at processing plant	Batch	25 g	130	10	7.7
Czech Republic	Fresh meat, at processing plant	Batch	25 g	30	4	13.3
Estonia	Fresh neck skin, at cutting plant, domestic production	Batch	25 g	47	0	0
Finland	Fresh meat, at cutting plant	Single	25 g	791	0	0
Greece	Fresh meat, at processing plant	Single	25 g	45	7	15.6
Hungary	Fresh meat, at processing plant	Single	25 g	334	142	42.5
Luxembourg	Fresh meat, at processing plant	Single	25 g	28	1	3.6
Poland	Fresh meat, at processing plant	Single	25 g	2,523	174	6.9
Portugal	Fresh meat, at processing plant	Single	25 g	81	1	1.2
Spain	Fresh meat, at processing plant	Single	25 g	66	2	3.0
Sweden	Fresh meat scrapings, at cutting plant	Batch	-	819	0	0
At retail						
Austria	Fresh meat, domestic production	Single	25 g	55	3	5.5
Belgium	Fresh meat	Batch	200 g	337	38	11.3
Czech Republic	Fresh meat	Batch	25 g	30	3	10.0
Germany	Fresh meat, surveillance	Single	25 g	693	29	4.2
	Fresh meat, monitoring	Single	25 g	398	25	6.3
Greece	Fresh meat	Single	25 g	30	0	0
Hungary	Fresh meat	Single	25 g	156	63	40.4
Ireland[1]	Fresh meat	Single	25 g	299	2	0.7
Latvia	Fresh meat	Single	25 g	350	9	2.6
Lithuania	Fresh meat, chilled	Batch	25 g	35	2	5.7
Luxembourg	Fresh meat	Single	25 g	36	0	0
Netherlands	Fresh meat	Single	25 g	539	16	3.0
Spain	Fresh meat	Single	25 g	118	2	1.7
Sampling level not stated						
Austria	Fresh meat, domestic production	Single	25 g	280	20	7.1
EU Total	**Total**			**25,611**	**1,515**	**5.9**
	Single			**17,799**	**1,201**	**6.7**
	Batch			**7,812**	**314**	**4.0**

Note: Data presented include only investigations with sample size ≥25.

1. Sample weight is most usually 25 g but occasionally there are other sample weights reported (range from 10 g - 25.99 g)

Pig meat and products thereof

Many of the national monitoring programmes for *Salmonella* in pig meat and products thereof are based on sampling at the slaughterhouse and meat-cutting plants. At the slaughterhouse, sampling is carried out by means of carcase swabbing or sampling of meat.

In 2011, 19 MSs and two non-MSs reported data on *Salmonella* in fresh pig meat from investigations with 25 or more samples. The occurrence of *Salmonella* in these food samples at different levels in the production line is presented in Table SA6. *Salmonella* was detected in 26 of these 39 investigations. Overall, a total of 52,868 fresh pig meat units (single or batch) were tested within the EU and 0.7 % of them were positive. The majority were single carcase samples (43,010 units tested or 81.4 % of total units tested) with 0.6 % of *Salmonella* positive carcases. Out of the 9,858 batches investigated, 0.9 % were positive for *Salmonella*.

As regards single samples, Denmark reported the largest investigation at slaughterhouse, and Finland and Sweden also tested high numbers of single pig meat samples (about 6,000). Out of these three countries only Denmark detected *Salmonella*-positive samples at a level of 0.7 %. Most of the single samples tested at slaughterhouse were carcase swabs and the area swabbed varied from 400 cm^2 to 1,400 cm^2. Although it would be expected that MSs swabbing larger areas would be more likely to detect *Salmonella,* the highest proportion of positive carcase swabs was observed in an investigation in Germany where 400 cm^2 were sampled (4.0 % of positive results). Spain reported testing of meat samples at the slaughterhouse with 7.5 % of positive samples.

At processing plants, Finland reported the largest investigation with no positive findings, whereas the highest proportion of positive samples at this stage was reported by Portugal in a smaller investigation (5.0 % out of 60 tested samples). At retail, the Netherlands and Germany tested a substantial number of single samples and reported a low proportion of positive findings (1.4 % and 1.9 %, respectively). The highest proportion of positive samples at this stage was reported by Spain (5.2 %). In addition Poland reported a large investigation in which *Salmonella* was found at a very low level (0.1 %); in this investigation the sampling level was not defined.

Fewer pig meat batches were tested for *Salmonella*. At the slaughterhouse, Bulgaria and the Czech Republic reported very large investigations on meat samples and carcase swabs, respectively; and only the Czech Republic detected *Salmonella* at a very low level (0.4 %). Belgium reported the highest proportion of positive batches at the slaughterhouse (6.8 %). At processing plants, Belgium and Bulgaria reported investigations on a substantial number of batch samples with a low to very low proportion of positive findings (2.1 % and 0.3 %, respectively). At retail, Bulgaria reported 3.4 % of positive batches out of 203 samples tested.

The two non-MSs Iceland and Norway conducted large investigations on single samples at the slaughterhouse, and Iceland also tested a large number of batches of carcase swabs at the slaughterhouse; only Iceland detected *Salmonella* at a low to very low level (0.6 % of single samples and 2.3 % of batches).

For further information see Level 3 Tables.

Table SA6. **Salmonella** *in fresh pig meat, at slaughter, cutting/processing level and retail, 2011*

Country	Description	Sample unit	Sample weight	2011		
				N	N pos	% pos
At slaughterhouse						
Belgium	Carcase swabs	Batch	-	649	44	6.8
Bulgaria	Meat	Batch	25 g	1,521	0	0
Czech Republic	Carcase swabs	Batch	100 cm^2	5,577	23	0.4
Denmark[1]	Carcase swabs	Single	400 cm^2	22,025	155	0.7
Estonia	Carcase swabs	Single	1400 cm^2	635	13	2.0
Finland	Carcase swabs	Single	1400 cm^2	6,282	0	0
Germany	Carcase swabs, domestic production	Single	400 cm^2	249	10	4.0
Hungary	Carcase swabs	Single	400 cm^2	272	1	0.4
Romania	Carcase swabs	Batch	-	381	3	0.8
	Meat	Batch	25 g	125	0	0
Slovakia	Meat	Batch	25 g	91	3	3.3
Spain	Meat	Single	25 g	268	20	7.5
Sweden[2]	Carcase swabs	Single	-	5,765	0	0
Iceland	Carcase swabs	Batch	-	998	23	2.3
	Carcase swabs	Single	-	1,524	9	0.6
Norway	Carcase swabs	Single	-	2,212	0	0
At processing or cutting plant						
Belgium	At processing plant	Batch	25 g	292	6	2.1
Bulgaria	At processing plant	Batch	25 g	705	2	0.3
Cyprus	At processing plant	Batch	10 g	95	0	0
Estonia	At cutting plant, domestic production	Single	25 g	242	1	0.4
	At processing plant	Single	25 g	109	1	0.9
Finland	At cutting plant	Single	25 g	1,395	0	0
Hungary	At processing plant	Single	25 g	169	5	3.0
Italy	At processing plant, domestic production	Single	25 g	152	1	0.7
Portugal	At processing plant	Single	25 g	60	3	5.0
Romania	At processing plant	Batch	25 g	78	0	0
At retail						
Bulgaria		Batch	25 g	203	7	3.4
Germany	Fresh meat, surveillance	Single	25 g	1,931	37	1.9
Greece		Single	25 g	135	0	0
Hungary		Single	25 g	47	0	0
Italy	Domestic production	Single	25 g	57	1	1.8
Netherlands		Single	25 g	886	12	1.4
Romania		Batch	25 g	40	0	0
Spain		Single	25 g	116	6	5.2
Sampling level not stated						
Austria	Domestic production	Single	10 g	178	1	0.6
Cyprus	Meat	Batch	25 g	101	0	0
Italy	Domestic production	Single	25 g	49	1	2.0
Poland	Carcase swabs	Single	-	1,960	1	0.1
Sweden	Meat	Single	-	28	0	0
Total (19 MSs)	**Total**			**52,868**	**357**	**0.7**
	Single			**43,010**	**269**	**0.6**
	Batch			**9,858**	**88**	**0.9**

Note: Data presented include only investigations with sample size ≥25.
1. 4x100 cm^2 from four different areas of the pig are analysed. The samples are analysed in pools of five carcase swabs. Prevalence of *Salmonella* in single swab samples is calculated using a conversion factor estimated in a Danish research project.
2. 2,336 carcase swabs from breeding pigs and 3,429 carcase swabs from fattening pigs.

Eggs and egg products

According to the EU legislation, starting from 1 January 2009, eggs shall not be used for direct human consumption as table eggs unless they originate from a commercial flock of laying hens subject to a national *Salmonella* control programme. Eggs originating from flocks with unknown health status that are suspected of being infected or known to be infected with *S.* Enteritidis or *S.* Typhimurium may be placed on the market only if treated in a manner that guarantees the elimination of all *Salmonella* serovars with public health significance and marked in a way that easily distinguishes them from table eggs before being placed on the market (Regulation (EC) No 1237/2007).[13] These provisions, together with the mandatory *Salmonella* control programmes in flocks of laying hens, are believed to have contributed to the reduction in *Salmonella* contaminated laying hens in the EU.

In 2011, 13 MSs reported data from investigations in table eggs with 25 or more samples and the findings are presented in Table SA7. *Salmonella* was detected in eight of these 26 investigations. Overall, a total of 25,619 sample units (single samples or batch samples) were tested and 0.1 % were positive for *Salmonella.* Most of the investigations (about 80 %) were carried out on single samples, with 20,567 units tested and 0.1 % of findings positive. The same proportion of positive results (0.1 %) was reported for the 5,052 batches tested.

At single sample and packing centre level, Germany reported the largest investigation on table eggs with rare detection of *Salmonella* (<0.1 %). In the other countries' investigations a smaller number of samples were analysed and *Salmonella* was either detected at a very low level (Spain, 0.2 % of single samples) or not detected at all (Poland and Portugal). Also, at the retail level, Germany carried out the largest investigations and reported very low to rare proportions of positive samples (between <0.1 % and 0.2 %). A substantial number of samples at retail was also tested by Spain and this revealed the highest proportion of positive samples (1.8 %). The other reporting countries did not detect *Salmonella*-positive samples, although these MSs mainly tested a small number of samples.

Fewer data were reported by MSs on batches. At the packing centre, the only investigation with a substantial number of samples was carried out by Bulgaria, which reported detecting *Salmonella* rarely (<0.1 %). The largest proportion of positive findings came from a small number of sample units reported by Romania (1.7 % out of 120 batch samples). At retail only three investigations were carried out on batches and *Salmonella* was not detected in any sample.

Germany reported data separately for the different egg components (shell, white and yolk) and showed that the highest contamination is at shell level (0.7 % and 0.2 % of positive samples at the processing plant and at retail, respectively), while *Salmonella* was not detected either in the egg white or in the yolk. Ireland also tested the egg shell in retail samples and, conversely, no positive results were reported, although in this investigation only 32 single samples were tested.

Austria tested at retail a bigger sample weight (300g) and did not find any positive results; however, only a limited number of samples (29) was tested.

It should be noted that what constituted a batch or single sample varied in terms of weight and content among the MSs, and this may impact comparison between investigations.

For further information see Level 3 Tables.

13 Commission Regulation (EC) No 1237/2007 of 23 October 2007 amending Regulation (EC) No 2160/2003 of the European Parliament and of the Council and Decision 2006/696/EC as regards the placing on the market of eggs from *Salmonella* infected flocks of laying hens. OJ L 280, 24.10.2007, pp 5-9.

Table SA7.* Salmonella *in table egg samples, 2011

Country	Description	Sample unit	Sample weight	2011		
				N	N pos	% pos
At packing center/ processing plant						
Bulgaria	At packing center	Batch	25 g	3,646	1	<0.1
Czech Republic	At packing center	Batch	25 g	31	0	0
Germany	Shell, at processing plant, domestic production	Single	25 g	148	1	0.7
	White, at processing plant, domestic production	Single	25 g	34	0	0
	Yolk, at processing plant, domestic production	Single	25 g	132	0	0
	At processing plant, domestic production	Single	25 g	2,612	1	<0.1
Poland	At packing center	Batch	25 g	146	0	0
	At packing center	Single	-	50	0	0
	At packing center	Single	25 g	209	0	0
Portugal	At packing center	Single	25 g	49	0	0
Romania	At packing center	Batch	25 g	120	2	1.7
Spain	At packing center	Single	25 g	560	1	0.2
At retail						
Austria	Domestic production	Single	300 g	29	0	0
Belgium		Batch	25 g	118	0	0
Bulgaria		Batch	25 g	720	0	0
Czech Republic		Single	25 g	120	0	0
Germany	Shell, domestic production	Single	25 g	1,191	2	0.2
	White, domestic production	Single	25 g	100	0	0
	Yolk, domestic production	Single	25 g	1,196	0	0
	Domestic production	Single	25 g	13,110	2	<0.1
Hungary		Batch	-	233	0	0
Ireland[1]	Shell	Single	25 g	32	0	0
		Single	25 g	58	0	0
Italy	At catering, domestic production	Single	25 g	26	0	0
Lithuania		Batch	25 g	38	0	0
Spain		Single	25 g	911	16	1.8
Total (13 MSs)	**Total**			**25,619**	**26**	**0.1**
	Single			**20,567**	**23**	**0.1**
	Batch			**5,052**	**3**	**0.1**

Note: Data presented include only investigations with sample size ≥25.

1. Sample weight is most usually 25 g but occasionally there are other sample weights reported (range from 10 g – 25.99 g).

Other food

In 2011 *Salmonella* was also detected in turkey meat (by eight MSs and one non-MS), bovine meat (by 15 MSs), milk and dairy products (by six MSs), fruits and vegetables (by three MSs), and fish and other fishery products (by seven MSs).

For detailed information see the Level 3 Tables.

3.1.3. *Salmonella* in animals

EU MSs have compulsory or voluntary *Salmonella* control or monitoring programmes in place for a number of farm animal species. An overview of the countries that reported data on *Salmonella* in animals for 2011 is presented in Table SA8. All MSs reported data on flocks of laying hens or broilers and 25 MSs reported data on *Gallus gallus* breeding flocks and on turkeys. In the following chapter, data on breeders of *Gallus gallus*, laying hens, broilers, breeding turkeys and fattening turkeys also include results based on sample sizes below 25; for other animal species, only results based on 25 or more units tested are presented. Results from industry own-check programmes and HACCP sampling as well as specified suspect sampling and clinical investigations have been excluded owing to difficulties in interpreting the data. These data are, however, presented in the Level 3 Tables.

Table SA8. Overview of countries reporting data for* Salmonella *in animals, 2011

Data	Total number of reporting MSs	Countries
Gallus gallus (no further sampling level)	3	**MSs:** IT, PT, RO **Non-MS:** NO
Breeders of *Gallus gallus*	25	**All MSs** except LU, MT **Non-MSs:** CH, IS, NO
Laying hens	27	**All MSs** **Non-MSs:** CH, IS, NO
Broilers	27	**All MSs** **Non-MSs:** CH, IS, NO
Turkeys	25	**All MSs** except LU, MT **Non-MSs:** CH, IS, NO
Ducks	11	**MSs:** BE, CY, DE, DK, IT, LV, PL, PT, SE, SK, UK **Non-MSs:** IS, NO
Geese	6	**MSs:** DE, IT, LV, PL, SE, SK **Non-MS:** NO
Other poultry[1]	14	**MSs:** BE, BG, CY, DK, EE, ES, IE, IT, LV, PL, PT, RO, SK, UK
Pigs	18	**All MSs** except AT, BE, CY, CZ, FR, LT, LU, MT, SI **Non-MSs:** CH, IS, NO
Cattle	18	**All MSs** except AT, BE, CZ, DK, FR, LT, MT, RO, SI **Non-MSs:** CH, NO
Sheep and goats	13	**MSs:** BG, DE, EE, GR, IE, IT, LV, NL, PT, RO, SE, SK, UK **Non-MSs:** CH, NO
Other animal species	18	**MSs:** except AT, BE, CZ, FI, FR, HU, LU, MT, SI **Non-MSs:** CH, NO

Note: The overview table includes all data reported by MSs and non-MSs. In the following chapter, data reported as HACCP or own control are not included in the detailed tables, and, unless stated otherwise, data from suspect sampling and outbreak or clinical investigations are also excluded. Also, only countries reporting investigations with 25 samples or more have been included for analysis, except for the data on *Salmonella* control programmes, where also investigations with less than 25 units tested are included.

1. This category includes guinea fowl, partridges, pheasants, pigeons, quails, other poultry and poultry unspecified.

To protect human health against *Salmonella* infections transmissible between animals and humans, EU Regulation (EC) No 2160/2003[14] obliges MSs to set up national control programmes for *Salmonella* serovars in poultry and pigs deemed to be of particular importance for public health. The animal populations that are currently targeted include breeding flocks, laying hens, broilers of *Gallus gallus* and breeding and fattening turkeys. The national control programmes are established to achieve EU reduction targets to reduce *Salmonella* prevalence in those animal populations at the primary production level.

Poultry production lines involve a breeding pyramid so that genetic improvement, which mainly takes place through selection at the top of the production pyramid, can be rapidly distributed among commercial poultry populations. The top of the pyramid comprises elite flocks, great grandparent flocks and grandparent flocks, with parent flocks in the middle, and production flocks at the bottom of the pyramid. Hereafter in this report, elite flocks, great grandparent flocks, grandparent flocks, and parent flocks are generically referred to as breeding flocks.

In poultry, *Salmonella* may be transmitted both horizontally and vertically. The relevance of *Salmonella* infection in breeding flocks is mainly related to the potential for vertical transmission to production flocks, and the impact of the vertical route of transmission is amplified by the pyramidal structure of the egg and broiler meat production sectors, contamination of hatcheries and trade in grandparent, parent, and commercial stock and hatching eggs.

The national control programmes may vary to some extent between MSs owing to their different circumstances, while aiming to achieve the same goal. National control programmes have to be approved by the EC. The results of the programmes have to be reported to the EC and EFSA as part of the annual zoonoses report.

Breeding flocks of *Gallus gallus*

The year 2011 was the fifth year in which MSs were obliged to implement *Salmonella* control programmes in breeding flocks of *Gallus gallus* in accordance with Regulation (EC) No 2160/2003 and Regulation (EC) No 200/2010.[15] The control programmes for breeding flocks aim at meeting a reduction target of 1 % or less of positive flocks for the following serovars: *S.* Enteritidis, *S.* Typhimurium, *S.* Infantis, *S.* Virchow and *S.* Hadar, including monophasic *S*. Typhimurium, according to Regulation (EC) No 200/2010. The target was set for all commercial-scale adult breeding flocks, during the production period, comprising at least 250 birds. However, MSs with fewer than 100 breeding flocks would attain the target if only one adult breeding flock remained positive.

The basic minimum requirements for *Salmonella* detection in breeding flocks, laid down in Regulation (EC) No 2160/2003, include sampling three times during the rearing period and every two weeks during the production period. Test results have to be reported, as well as any relevant additional information, on a yearly basis to the EC and EFSA as part of the annual report on trends and sources of zoonoses and zoonotic agents. A flock is reported positive if one or more of the samples have been found positive.

In 2011, control programmes approved by the Commission were implemented in all MSs. In total, 25 MSs and three non-MSs reported 2011 data within the framework of the programme. This is because two MSs, Luxembourg and Malta, do not have breeding flocks of *Gallus gallus*.

The total *Salmonella* prevalence data for *Gallus gallus* breeding flocks during the production period in 2011 is presented in Table SA9. The prevalence of the five serovars (*S.* Enteritidis, *S.* Typhimurium, *S.* Infantis, *S.* Virchow and *S.* Hadar) targeted in the control programmes is presented in Table SA9 and Figures SA4, SA5, and SA6. The geographical distribution of the target serovars is shown in Figure SA7. Monophasic *S*. Typhimurium, which is counted as a target serovar, was not reported in breeding flocks of *Gallus gallus* in 2011.

14 Regulation (EC) No 2160/2003 of the European Parliament and of the Council and Regulation of 17 November 2003 on the control of *Salmonella* and other specified food-borne zoonotic agents. OJ L 325, 12.12.2003, pp. 1–15.

15 Commission Regulation (EC) No 200/2010 of 10 March 2010 implementing Regulation (EC) No 2160/2003 of the European Parliament and of the Council as regards a Union target for the reduction of the prevalence of *Salmonella* serotypes in adult breeding flocks of *Gallus gallus*. OJ L 61, 11.3.2010, pp. 1-9.

Overall during 2011, *Salmonella* was found in 1.9 % of breeding flocks in the EU at some stage during the production period. The prevalence of the five targeted *Salmonella* serovars in adult breeding flocks tested under the mandatory *Salmonella* control programmes was 0.6 % in 2011. This was a decrease compared to 2010 (0.7 %) and 2009 (1.2 %) at the EU level (Table SA9 and Figure SA4).

In total, 20 MSs and three non-MSs met the target of 1 % set for 2011. The MSs that failed to meet the target were Cyprus, Hungary, Italy, Poland and Slovenia, with the highest flock prevalence of 10.0 % reported by Cyprus (Figure SA6). A total of 10 MSs and three non-MSs reported no positive flocks for the target serovars.

Figure SA5 presents the trends in prevalence of the five target serovars for the 23 MSs and two non-MSs that reported data for all five years. The results show that 14 MSs and the two non-MSs maintained a prevalence below the 1 % threshold in the last three, four or five years. Out of these, four MSs (Estonia, Finland, Latvia, and Lithuania), plus Norway and Switzerland, did not report any positive results in all five years. Besides the fluctuations between prevalence increases and decreases in past reporting years, Greece, Slovakia and Spain maintained their prevalence below the 1 % threshold in the last two years. In addition, three MSs that did not meet the EU target in 2010 (the Czech Republic, Denmark and Ireland), reported a decrease in their prevalence below the 1 % threshold in 2011.

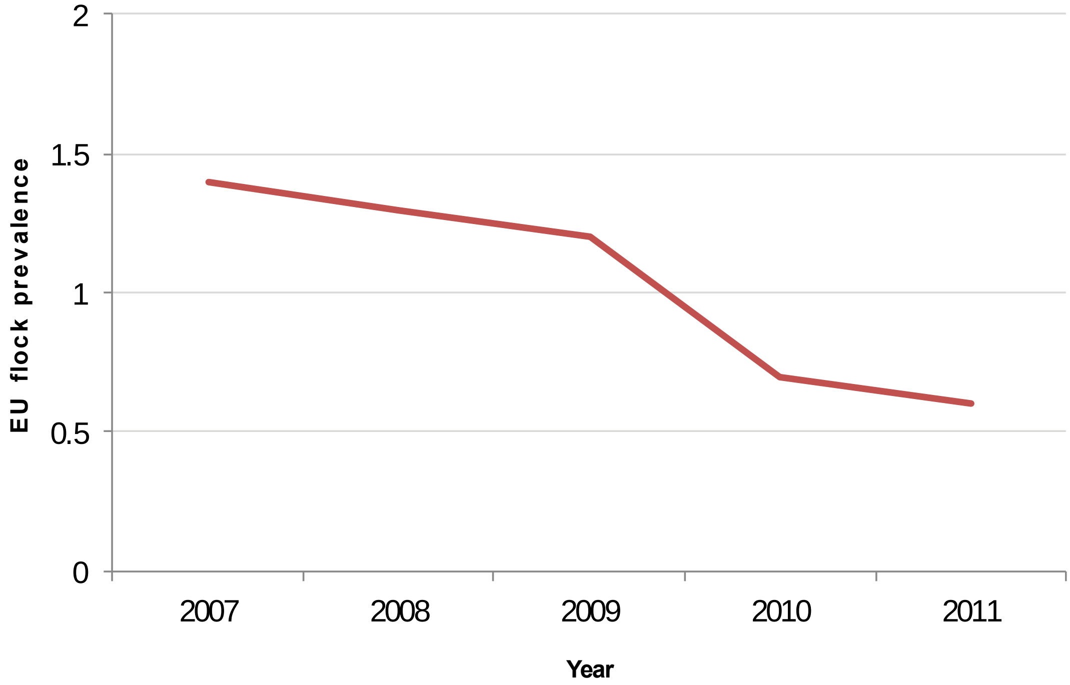
The most commonly reported target serovar in breeding flocks of *Gallus gallus* in 2011 was *S.* Enteritidis (0.4 %), which was the most common serovar in most MSs. *S.* Typhimurium was the most frequently reported target serovar in Belgium, Bulgaria, France, Slovenia and the United Kingdom. *S*. Infantis was the predominant serovar in Greece and *S*. Hadar in Spain. Monophasic *S*. Typhimurium was not detected in any breeding flock in Europe. A total of 15 MSs reported findings of *Salmonella* serovars other than the five target ones, generally at low levels. Cyprus and Romania reported the highest prevalence (10.0 % and 6.8 %, respectively) of flocks testing positive for serovars other than the targeted ones, and in nine MSs the prevalence of non-targeted serovars was higher than that of the target serovars (Table SA9).

Table SA9.* Salmonella *in breeding flocks of* Gallus gallus *during the production period (all types of breeding flocks, flock-based data) in countries running control programmes in accordance with Regulation (EC) No 2160/2003, 2011

Country	N	% positive							
		pos (all)	5 target serovars[1]	*S.* Enteritidis	*S.* Typhimurium	*S.* Infantis	*S.* Virchow	*S.* Hadar	Other serovars, non-typeable, and unspecified
Austria	127	1.6	0.8	0.8	0	0	0	0	0.8
Belgium	581	2.9	0.2	0	0.2	0	0	0	2.8
Bulgaria	127	1.6	0.8	0	0.8	0	0	0	0.8
Cyprus	50	20.0	10.0	10.0	0	0	0	0	10.0
Czech Republic	650	1.8	0.6	0.6	0	0	0	0	1.2
Denmark	228	0	0	0	0	0	0	0	0
Estonia	16	0	0	0	0	0	0	0	0
Finland	177	0	0	0	0	0	0	0	0
France	1,661	0.3	0.3	0	0.3	0	0	0	0
Germany	762	0.7	0.3	0.3	0	0	0	0	0.4
Greece	240	3.8	0.8	0	0	0.8	0	0	2.9
Hungary	914	2.5	1.4	1.4	0	0	0	0	1.1
Ireland	139	0.7	0	0	0	0	0	0	0.7
Italy	1,062	3.0	1.1	0.5	0.5	0	0	0.2	1.9
Latvia	20	0	0	0	0	0	0	0	0
Lithuania	65	0	0	0	0	0	0	0	0
Netherlands	819	0	0	0	0	0	0	0	0
Poland	1,498	2.0	1.7	1.7	0	0	<0.1	0	0.3
Portugal	245	1.6	0.8	0.4	0.4	0	0	0	0.8
Romania	396	6.8	0	0	0	0	0	0	6.8
Slovakia	86	0	0	0	0	0	0	0	0
Slovenia	160	1.3	1.3	0	1.3	0	0	0	0
Spain[2]	2,123	2.7	0.3	0.1	<0.1	<0.1	0	0.2	2.4
Sweden	153	0	0	0	0	0	0	0	0
United Kingdom	1,382	1.2	<0.1	0	<0.1	0	0	0	1.1
EU Total	**13,681**	**1.9**	**0.6**	**0.4**	**0.1**	**<0.1**	**<0.1**	**<0.1**	**1.2**
Iceland	42	0	0	0	0	0	0	0	0
Norway	163	0	0	0	0	0	0	0	0
Switzerland	82	0	0	0	0	0	0	0	0

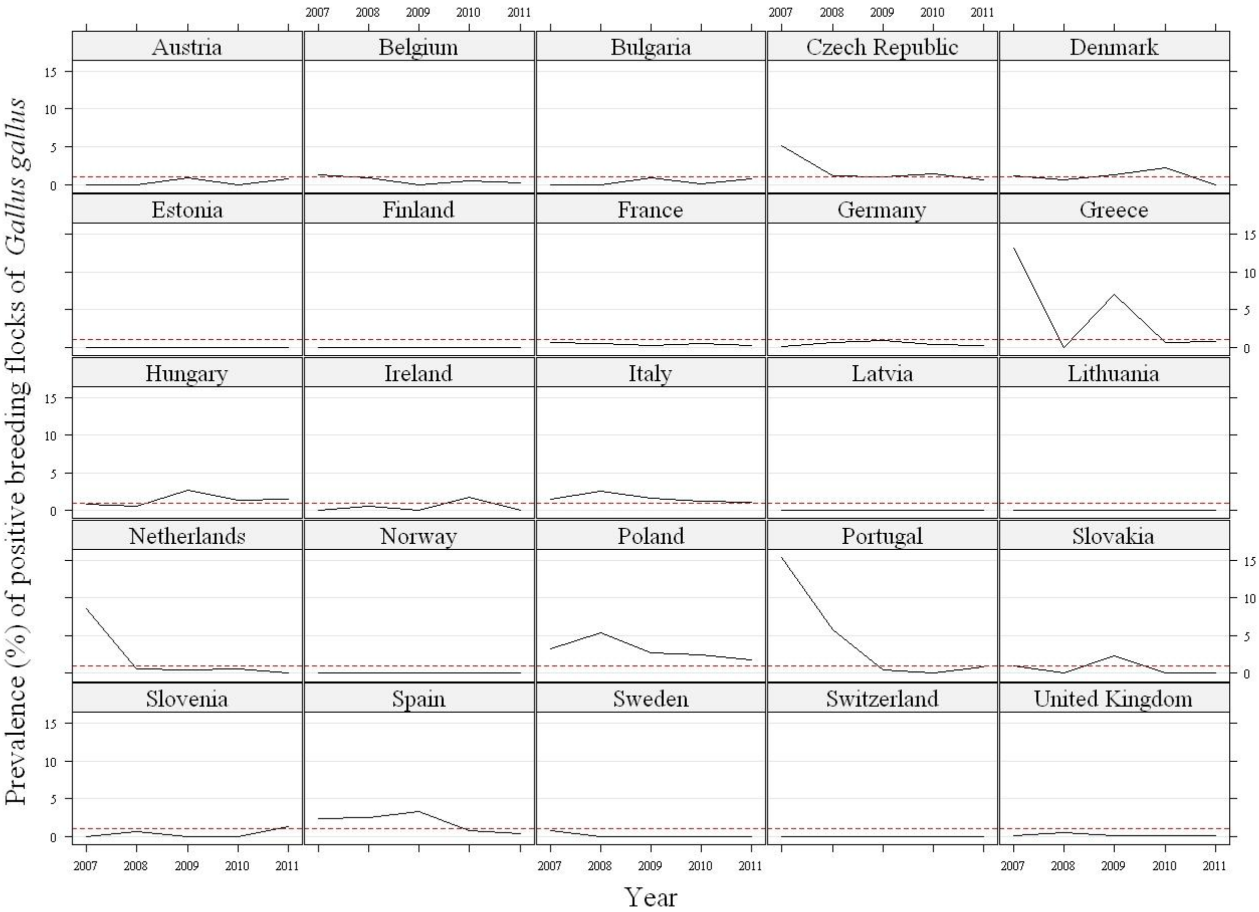
Note: Luxembourg and Malta do not have breeding flocks of *Gallus gallus*.
1. *S.* Enteritidis, *S.* Typhimurium including monophasic *S.* Typhimurium, *S.* Infantis, *S.* Virchow, *S.* Hadar.
2. Spain: more than one target serovar isolated in some flocks.

Figure SA4. Prevalence of* S. *Enteritidis,* S. *Typhimurium,* S. *Infantis,* S. *Virchow and* S. *Hadar-positive breeding flocks of* Gallus gallus *during production in the EU,[1] 2007–2011



1. No data from Luxembourg and Malta as they have no breeding flocks of *Gallus gallus*.

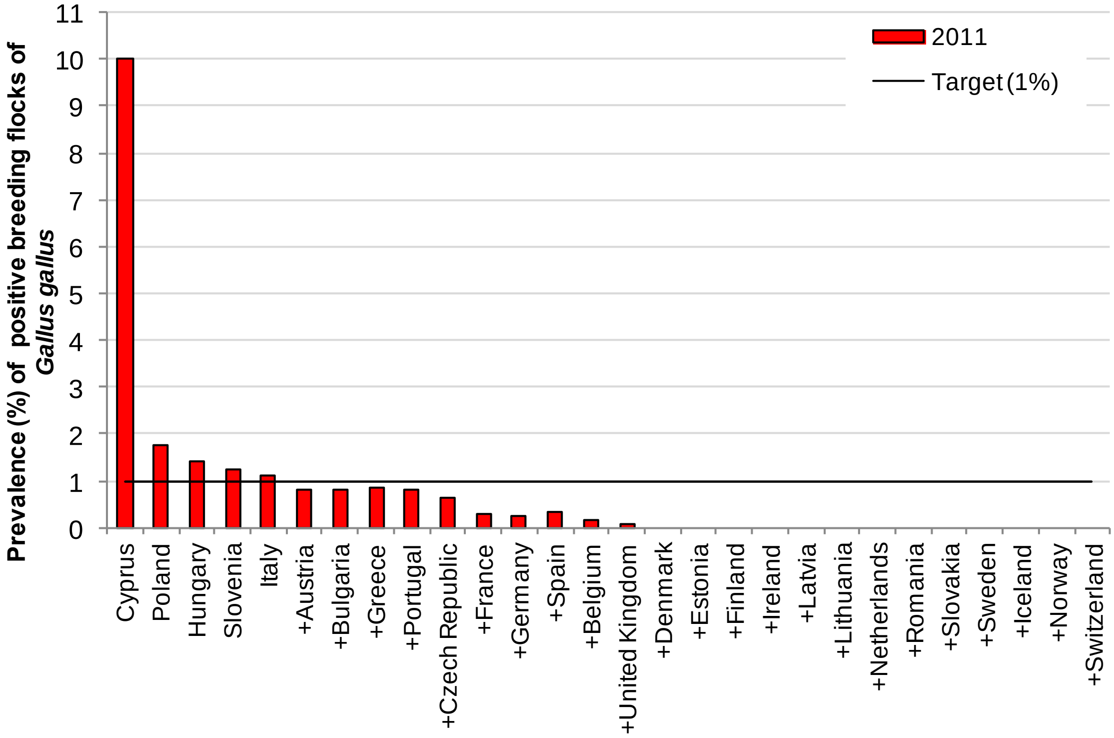
Figure SA5. Prevalence of* S. *Enteritidis,* S. *Typhimurium,* S. *Infantis,* S. *Virchow and* S. *Hadar-positive breeding flocks of* Gallus gallus *during the production period in 23 Member States,*[1] *Norway and Switzerland, 2007–2011



Note: The dashed line indicates the EU *Salmonella* targets of 1 %.

1. No data from Luxembourg and Malta are presented as they have no breeding flocks of *Gallus gallus*. Cyprus and Romania were not included because for some years they tested less than 100 adult flocks and reported only one positive flock leading to a proportion of positives higher than 1 %. Based on the Regulation (EC) No 1003/2005 17 (Art. 1, point 1), these MSs met the EU target in all five years (except in 2011 for Cyprus). Specifically, Cyprus tested less than 100 breeding flocks and reported one or 0 positive flocks in all the years, except in 2011, where five flocks were positive out of 50 flocks tested. In 2007 and 2008, Romania tested less than 100 adult flocks and reported only one positive flock. In 2009 and 2010 Romania reported, respectively, 325 and 304 adult breeding flocks, and, of these, only two (0.62 %) and one (0.33 %) were positive, respectively. In 2011, Romania reported no positive flocks out of the 396 flocks tested. Iceland was not included because it reported data for the first time in 2011.

Figure SA6. Prevalence of* S. *Enteritidis,* S. *Typhimurium,* S. *Infantis,* S. *Virchow and* S. *Hadar-positive breeding flocks of* Gallus gallus *during the production period for MSs,*[1] *Iceland, Norway and Switzerland, 2011



1. No data from Luxembourg and Malta as they have no breeding flocks of *Gallus gallus*. Twenty MSs and three non-MSs met the target in 2011, indicated with a '+' symbol.

Figure SA7. Prevalence of the five target serovars (S. Enteritidis, S. Typhimurium, S. Infantis, S. Virchow and S. Hadar)-positive breeding flocks of* Gallus gallus *during the production period,*[1] *2011

1. No breeding flocks of *Gallus gallus* in Luxembourg, Malta, French Guiana, Guadaloupe, Martinique and Reunion. These MSs are indicated by 'No data (MS)'.

Laying hen flocks

From 2008 MSs have implemented *Salmonella* control programmes for *S*. Enteritidis and *S*. Typhimurium in laying hen flocks of *Gallus gallus* providing eggs intended for human consumption in accordance with Regulation (EC) No 2160/2003. The control programmes consist of effective measures of prevention, detection and control of *Salmonella* at all relevant stages of the egg production line, particularly at the level of primary production, in order to reduce the prevalence of *Salmonella* and the risk to public health.

In 2011 a final annual *Salmonella* reduction target for laying hen flocks of *Gallus gallus* came into force. This target was the extension of the transitional target implemented in the period 2008-2010. The EU definitive target for laying hens is defined in Regulation (EC) No 517/2011[16] as an annual minimum percentage of reduction in the number of adult laying hen flocks (i.e. in the production period) remaining positive for *S*. Enteritidis and/or *S*. Typhimurium by the end of the previous year. The annual targets are proportionate, depending on the prevalence in the preceding year, and the final EU target is defined as a maximum percentage of flocks remaining positive of 2 %. However, MSs with fewer than 50 flocks of adult laying hens would attain the target if only one adult flock remained positive.

Minimum sampling requirements laid down in Regulation (EC) No 2160/2003 include sampling flocks twice during the rearing period (day-old chicks and at the end of the rearing period before moving to the laying unit), as well as sampling every fifteenth week during the production period, starting at a flock-age between 22 and 26 weeks. Test results have to be reported, as well as any relevant additional information, on a yearly basis to the EC and EFSA as part of the annual report on trends in and sources of zoonoses and zoonotic agents. A flock was reported as positive if one or more samples were positive during the production period. However, only flocks testing positive for *S.* Typhimurium and/or *S.* Enteritidis during the production period are taken into consideration when assessing whether MS meet the target. Any reporting of monophasic *S*. Typhimurium was included within the *S*. Typhimurium total and as such was counted as a target serovar.

Regulation (EC) No 517/2011 setting the definitive target for laying hens has simplified the reporting of results of 2011 *Salmonella* testing programmes in adult laying hens; the reporting should include the results from all samples taken under the testing programme by both food business operators and competent authorities. As flocks may test positive at different stages and ages of their lifespan, positive flocks must be counted and reported once only during the production period (flock level prevalence), irrespective of the number of sampling and testing operations.

In 2011 all MSs had control programmes approved by the EC. In total, 27 MSs and three non-MSs reported data within the framework of the laying hen flock programme for 2011. The prevalence of *Salmonella* spp. and of the two serovars (*S.* Enteritidis and *S.* Typhimurium) targeted in the control programmes for laying hen flocks during the production period are presented in Table SA10. The prevalence of *S.* Enteritidis and *S.* Typhimurium and the target for production flocks of laying hens for MSs and non-MSs in 2011 are shown in Figures SA8 and SA10, and the trend in prevalence of the two target serovars at MS level is shown in Figure SA9. The geographical distribution of prevalence by MS is presented in Figure SA11, which shows that the Nordic countries reported no positive samples, apart from Denmark. Table SA10 shows that Austria, France, Germany, Poland, Spain and the United Kingdom had large (>2,000) numbers of flocks under their control programmes.

Overall, 22 MSs and three non-MSs met their 2011 reduction targets. Five MSs did not achieve the reduction in *Salmonella* prevalence, although it should be noted that two of them (Cyprus and Estonia) reported relatively few flocks tested (69 and 35, respectively) and all these countries reported low prevalences.

The prevalence of the two target serovars in laying hen flocks tested under the mandatory control programmes was 1.5 % (Table SA10). The most common of the target serovars in laying hen flocks was *S*. Enteritidis (1.3 % compared to 0.2 % of *S*. Typhimurium), which was the most common serovar in all MSs

16 Commission Regulation (EU) No 517/2011 of 25 May 2011 implementing Regulation (EC) No 2160/2003 of the European Parliament and of the Council as regards a Union target for the reduction of the prevalence of certain *Salmonella* serotypes in laying hens of *Gallus gallus* and amending Regulation (EC) No 2160/2003 and Commission Regulation (EU) No 200/2010. OJ L 138, 26.5.2011, p. 45–51.

reporting positive findings for the target serovars, except for Denmark, which reported one isolate each for the two serovars.

The MSs reported between 0 % and 8.8 % flocks positive with *S.* Enteritidis and/or *S.* Typhimurium (Table SA10). Ten MSs and three non-MSs reported no positive flocks or very low prevalence, whereas Malta and Estonia reported the highest prevalence (8.8 % and 8.6 %, respectively). Monophasic *S*. Typhimurium was detected only in France in a single flock.

The reported *S.* Enteritidis and *S.* Typhimurium prevalence at the EU level has continued to decline from 3.5 % in 2008 and was more than halved in 2011 (1.5 %) (Figure SA8) and prevalence declined in the majority of MSs (Figure SA9). In most MSs the prevalence of the two target serovars fell markedly over these four years. However, seven MSs (Bulgaria, Cyprus, the Czech Republic, Estonia, Hungary, the Netherlands, and Romania) reported an increase in their prevalence from 2010 to 2011 (Figure SA9). In particular, the prevalence of the two target serovars increased notably in Estonia from 0 % in 2010 to 8.6 % in 2011. Nevertheless, the EU decreasing trend in the prevalence of *S.* Enteritidis and *S.* Typhimurium has continued and indicates that progress is still been made in combating these *Salmonella* serovars.

In 2011, the prevalence of *Salmonella* spp. in laying hens was 4.2 %. Finland, Slovakia and Sweden were the only MSs reporting no positive flocks, and Ireland, Luxembourg and Slovenia detected only serovars other than the two targeted ones. The highest prevalence of *Salmonella*-positive flocks was reported by Romania (29.2 %) where mainly other serovars (27.3 %) were detected. Cyprus also reported high prevalences of *Salmonella*-positive productive laying hen flocks (23.2 %). Eighteen MSs reported flocks positive for serovars other than the two target ones at very low to high levels, and in 13 of them the prevalence of these serovars was higher than the prevalence of the target serovars. As for the non-MSs, Iceland reported no positive flocks, Norway reported only positive flocks for serovars other than the two targeted ones, and Switzerland reported few flocks positive for the target serovars and for serovars other than those targeted.

Table SA10.* Salmonella *in laying hen flocks of* Gallus gallus *during the production period (flock-based data) in countries running control programmes, 2011

Country	N	Target (production period)	% positive				
			pos (all)	S. Enteriditis and/or S. Typhimurium[1]	S. Enteritidis	S. Typhimurium[1]	Other serovars, non-typeable, and unspecified
Austria	2,843	2.0	2.3	1.2	1.1	0.1	1.1
Belgium	750	2.9	5.2	2.1	1.7	0.4	3.1
Bulgaria	228	2.0	6.6	1.8	1.8	0	4.8
Cyprus	69	4.3	23.2	5.8	5.8	0	17.4
Czech Republic	444	2.1	3.2	2.7	2.3	0.5	0.5
Denmark	410	2.0	0.5	0.5	0.2	0.2	0
Estonia	35	2.0	8.6	8.6	8.6	0	0
Finland	818	2.0	0	0	0	0	0
France	4,000	2.0	1.5	1.5	1.0	0.5	0
Germany	4,993	2.0	2.2	1.2	0.9	0.3	1.0
Greece	578	2.0	3.8	0.5	0.5	0	3.3
Hungary	867	2.0	15.7	3.0	2.7	0.3	12.7
Ireland	193	2.0	0.5	0	0	0	0.5
Italy	1,122	2.3	9.7	2.0	1.4	0.6	8.4
Latvia	370	2.6	2.4	1.6	1.1	0.5	0.8
Lithuania	127	5.7	0.8	0.8	0.8	0	0
Luxembourg	226	2.0	0.9	0	0	0	0.9
Malta	102	10.6	8.8	8.8	6.9	2.0	0
Netherlands	1,839	2.0	2.2	2.2	2.0	0.2	0
Poland	2,235	4.1	5.5	3.7	3.6	0.1	1.8
Portugal	332	2.1	9.3	1.8	1.8	0	7.5
Romania	411	2.0	29.2	1.9	1.9	0	27.3
Slovakia	290	2.0	0	0	0	0	0
Slovenia	185	2.0	0.5	0	0	0	0.5
Spain	2,500	5.3	13.6	2.8	2.5	0.3	10.8
Sweden	629	2.0	0	0	0	0	0
United Kingdom	4,195	2.0	0.7	0.2	0.1	<0.1	0.6
EU Total	**30,791**		**4.2**	**1.5**	**1.3**	**0.2**	**2.7**
Iceland	22	2.0	0	0	0	0	0
Norway	828	2.0	0.1	0	0	0	0.1
Switzerland	841	2.0	0.2	0.1	0.1	0	0.1

Note: Target (production period) is calculated from the prevalence rate reported in 2010.
1. *S.* Typhimurium includes monophasic *S.* Typhimurium.

Figure SA8. Prevalence of* S. *Enteritidis and* S. *Typhimurium-positive laying hen flocks of* Gallus gallus *during the production period in the EU, 2008–2011

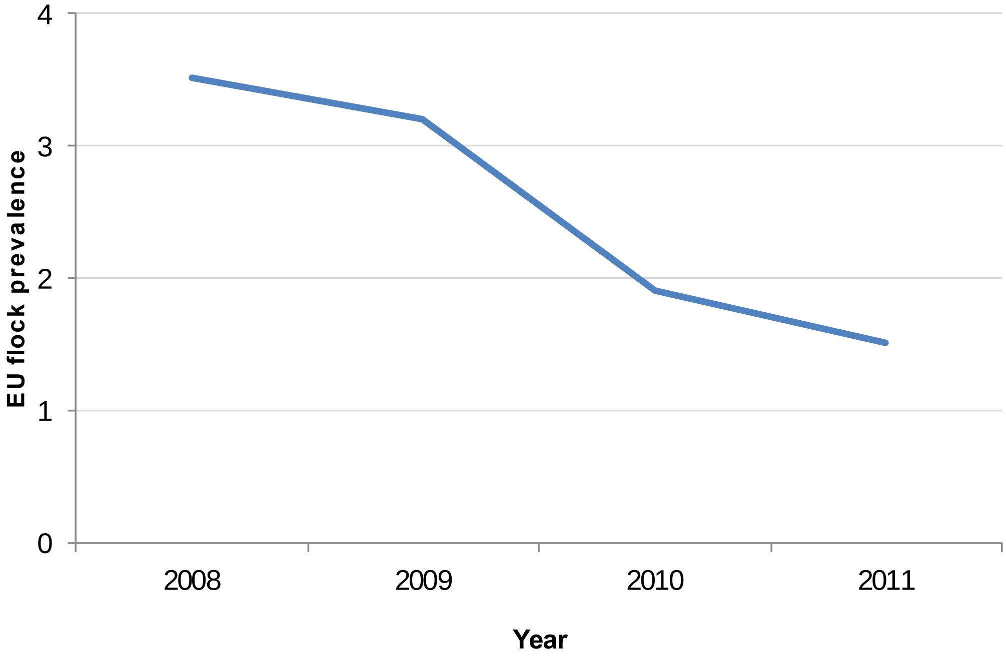
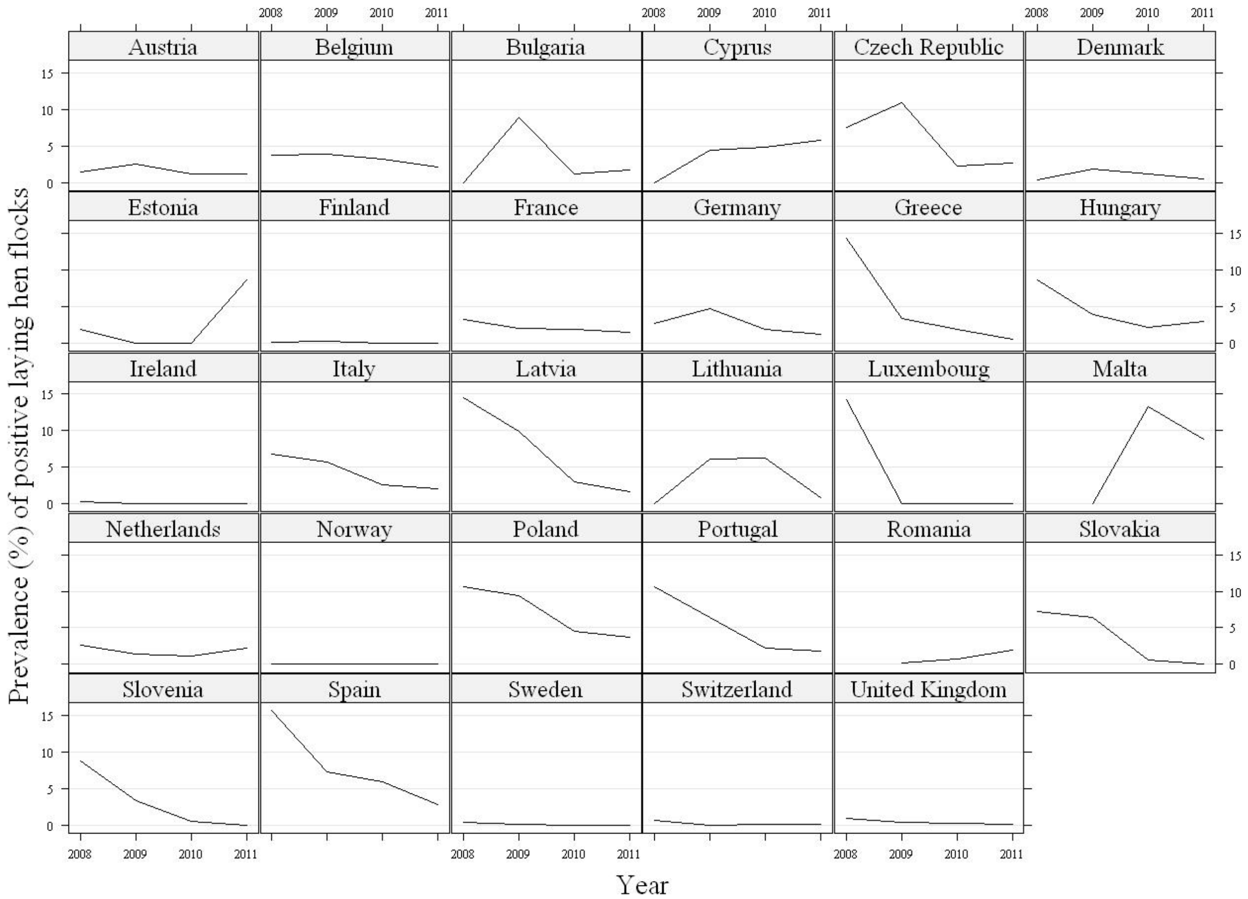


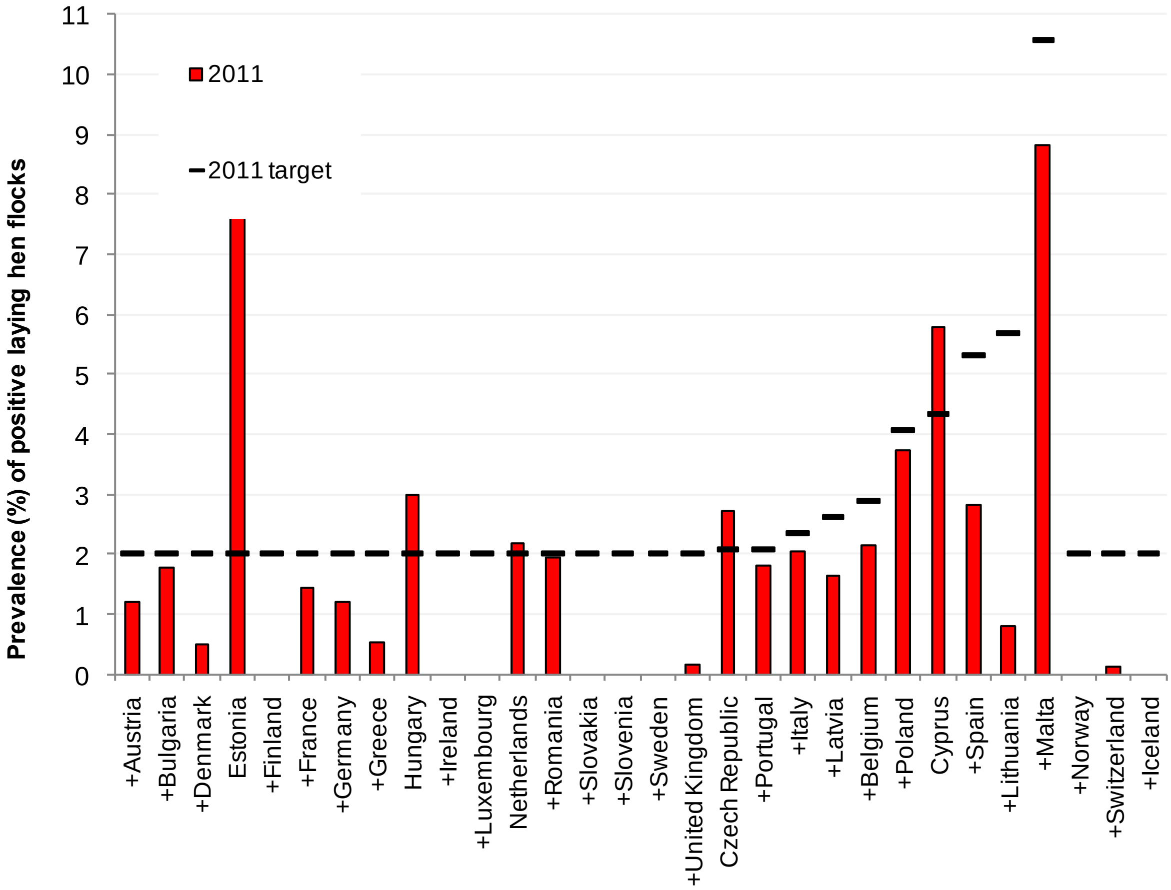
Figure SA9. Prevalence of* S. *Enteritidis and* S. *Typhimurium-positive laying hen flocks of* Gallus gallus *during the production period in Member States, Norway and Switzerland,[1] 2008–2011



Note: According to Regulation (EC) No 517/2011 (Art. 1, point 1), Lithuania and Luxembourg met the EU target in 2010 and 2008, respectively, as they tested less than 50 adult flocks and reported only one positive result.

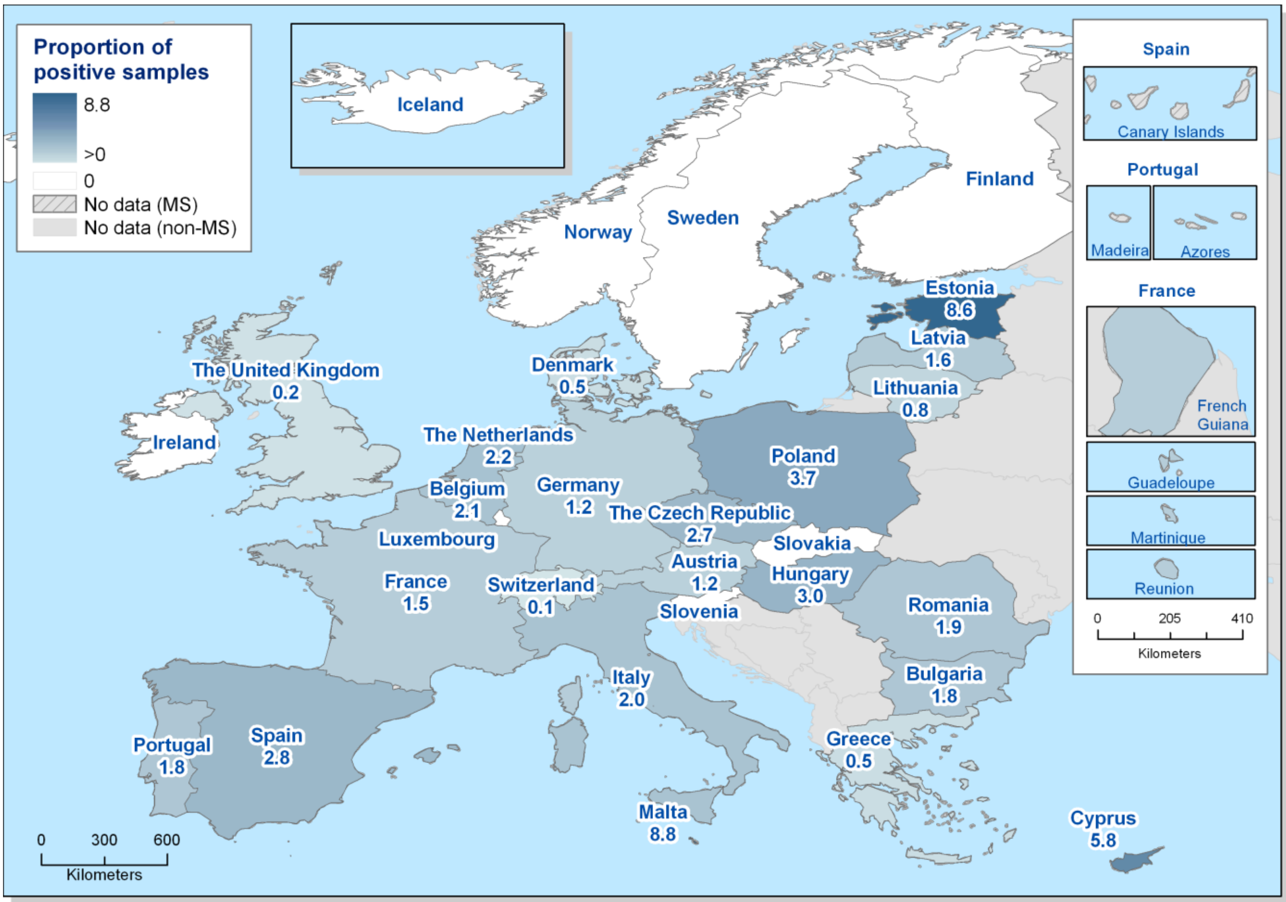
1. Iceland was not included because it reported data for the first time in 2011.

Figure SA10. Prevalence of* S. *Enteritidis and/or* S. *Typhimurium-positive laying hen flocks of* Gallus gallus *during the production period and targets for Member States, Iceland, Norway and Switzerland, 2011



Note: MSs are ordered by target level. Twenty two MSs and three non-MSs have met the 2011 targets, indicated with a '+'.

Figure SA11. Prevalence of the two target serovars,* S. *Enteritidis and* S. *Typhimurium-positive laying hen flocks of* Gallus gallus *during the production period, 2011



Broiler flocks

Since 2009 MSs have been obliged to implement national control programmes for *Salmonella* in broiler flocks in accordance with Regulation (EC) No 2160/2003. The Regulation requires that effective measures are taken to prevent, detect and control *Salmonella* at all relevant stages of production, processing and distribution, particularly in primary production, in order to reduce *Salmonella* prevalence and the risk to public health.

Minimum detection requirements in broiler flocks laid down in the Regulation include the sampling of flocks within the three weeks before the birds are moved to the slaughterhouse, taking at least two pairs of boot/sock swabs per flock. Test results have to be reported as Food Chain Information to slaughterhouses and to EFSA and EC, along with any relevant additional information, on a yearly basis as part of the annual report on trends in and sources of zoonoses and zoonotic agents. Positive flocks have to be counted and reported once only (flock level prevalence), irrespective of the number of sampling and testing operations.

The EU target for broiler flocks, referred to in Regulation (EC) No 160/2003, was set in Regulation (EC) No 646/2007 [17] as a maximum percentage of broiler flocks remaining positive for *S.* Enteritidis and/or *S*. Typhimurium of 1 % or less by 31 December 2011. A flock was reported as positive if one or more samples were positive. However, only flocks testing positive for *S*. Typhimurium and/or *S*. Enteritidis within the three weeks before slaughter are taken into consideration when assessing whether MSs meet the target. Any reporting of monophasic *S*. Typhimurium was included within the *S*. Typhimurium total and was counted as a target serovar.

In 2011 all MSs had control programmes approved by the EC. Twenty-seven MSs and three non-MSs reported data on broiler flocks before slaughter. The prevalences of *Salmonella* spp. and of the two serovars (*S.* Enteritidis and *S.* Typhimurium) targeted in the national control programmes for broilers are presented in Table SA11 and in Figures SA14 and SA15. The trends at EU and MS level are shown in Figures SA12 and SA13, respectively.

In 2011, 24 MSs and three non-MSs met the target of 1 % or less of the broiler flocks positive for *S.* Enteritidis and/or *S*. Typhimurium (Figure SA14), which was an improvement for two MSs compared to 2010. Three MSs did not achieve the 2011 *Salmonella* reduction target, although it should be noted that two of them (the Czech Republic and Latvia) reported low prevalences (≤2.3 %). Cyprus reported a higher prevalence (11.1 %), but tested only a small number of flocks (nine).

Overall in 2011, the MSs reported 0.3 % of positive flocks for the two target serovars (Table SA11). Six MSs and one non-MS reported no findings for the two target serovars, while 21 MSs and two non-MSs reported prevalence of the two serovars ranging from <0.1 % to 11.1 %. Monophasic *S*. Typhimurium was detected in France, Spain, the United Kingdom and Norway in 19, two, one and one flock, respectively.

The reported prevalence of *S.* Enteritidis and *S.* Typhimurium in the EU has continued to decline from 0.7 % in 2009 and 0.4 % in 2010 to 0.3 % in 2011 (Figure SA12). A decreasing trend in the reported prevalence has been observed in most MSs (Figure SA13). A number of MSs reported large reductions in the prevalence of the target serovars, in particular the Czech Republic, Malta, and Slovakia (Figure SA13). In particular, Slovakia reported a notable decrease in the prevalence of the two target serovars from 7.7 % in 2009 and 1.6 % in 2010 to 0.1 % in 2011. Compared to 2010, the prevalence has increased in Cyprus and Latvia. In particular, Cyprus reported a marked increase in the prevalence, from 0 % in 2009 and 2010 to 11.1 % in 2011, although only nine broiler flocks were tested in 2011 (against 239 and 643 flocks tested in 2009 and 2010, respectively), out of which one was positive. A fluctuating trend in the prevalence of the two target serovars has been observed for Latvia and Malta.

In 2011, the prevalence of *Salmonella* spp. in broiler flocks at the EU level was 3.2 %. Bulgaria, Estonia and Lithuania were the only MSs reporting no positive flocks, and Finland, Ireland, Luxembourg and Iceland reported only serovars other than the two targeted ones at rare to low level. The highest prevalence for all serovars was detected in Romania (36.5 %), although most of the positive findings were for serovars other

17 Commission Regulation (EC) No 646/2007 of 12 June 2007 implementing Regulation (EC) No 2160/2003 of the European Parliament and of the Council as regards a Community target for the reduction of the prevalence of *Salmonella* Enteritidis and *Salmonella* Typhimurium in broilers and repealing Regulation (EC) No 1091/2005. OJ L 151, 13.6.2007, p. 21–25.

than the targeted ones (35.8 %). Twenty-two MSs reported positive findings for serovars other than *S*. Enteritidis and *S*. Typhimurium with a prevalence that was in most of cases higher than the prevalence for the target serovars.

Table SA11. Salmonella in broiler flocks of* Gallus gallus *before slaughter (flock-based data) in countries running control programmes, 2011

Country	N	% positive				
		pos (all)	*S.* Enteritidis and/or *S.* Typhimurium[1]	*S.* Enteritidis	*S.* Typhimurium[1]	Other serovars, non-typeable, and unspecified
Austria	3,500	2.4	0.4	0.3	<0.1	2.0
Belgium	8,682	3.3	0.2	0	0.2	3.1
Bulgaria	513	0	0	0	0	0
Cyprus	9	22.2	11.1	11.1	0	11.1
Czech Republic	5,087	5.5	2.3	2.2	<0.1	3.3
Denmark	3,795	1.2	0.2	<0.1	0.1	1.1
Estonia	452	0	0	0	0	0
Finland	3,223	<0.1	0	0	0	<0.1
France	57,182	3.4	0.5	0.1	0.3	2.9
Germany	14,696	2.7	0.2	0.1	0.1	2.5
Greece	7,810	0.4	0.2	0.1	<0.1	0.3
Hungary	6,146	22.9	0.4	0.2	0.1	22.6
Ireland	33	3.0	0	0	0	3.0
Italy	14,620	9.2	<0.1	<0.1	0	9.1
Latvia	185	2.7	2.2	1.6	0.5	0.5
Lithuania	165	0	0	0	0	0
Luxembourg	99	4.0	0	0	0	4.0
Malta	561	0.7	0.7	0.5	0.2	0
Netherlands	19,578	2.8	0.1	<0.1	0.1	2.7
Poland	29,343	0.7	0.5	0.5	<0.1	0.2
Portugal	8,785	1.1	0.4	0.3	<0.1	0.7
Romania	1,535	36.5	0.7	0.7	0	35.8
Slovakia	1,443	0.1	0.1	0.1	0	0
Slovenia	2,226	1.2	0.1	0	0.1	1.1
Spain	23,464	2.2	0.1	<0.1	<0.1	2.0
Sweden	3,413	0.1	<0.1	0	<0.1	<0.1
United Kingdom	39,648	1.3	<0.1	0	<0.1	1.3
EU Total	**256,193**	**3.2**	**0.3**	**0.2**	**0.1**	**2.9**
Iceland	637	2.2	0	0	0	2.2
Norway	4,675	<0.1	<0.1	0	<0.1	0
Switzerland	415	1.2	0.2	0.2	0	1.0

1. *S.* Typhimurium includes monophasic *S.* Typhimurium.

Figure SA12. Prevalence of* S. *Enteritidis and* S. *Typhimurium-positive broiler flocks of* Gallus gallus *during the production period in the EU, 2009–2011

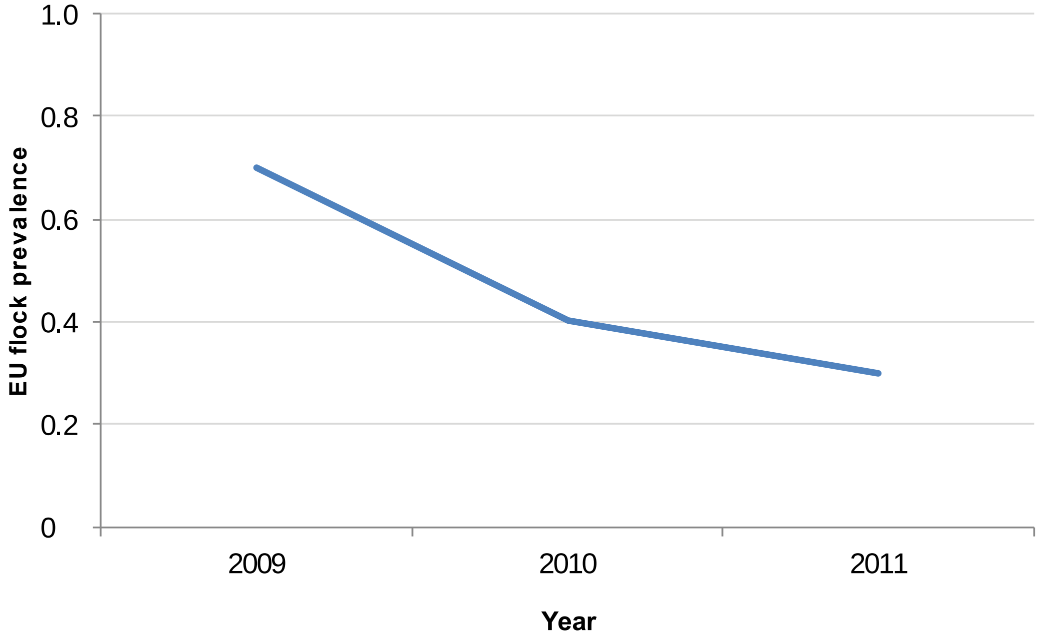
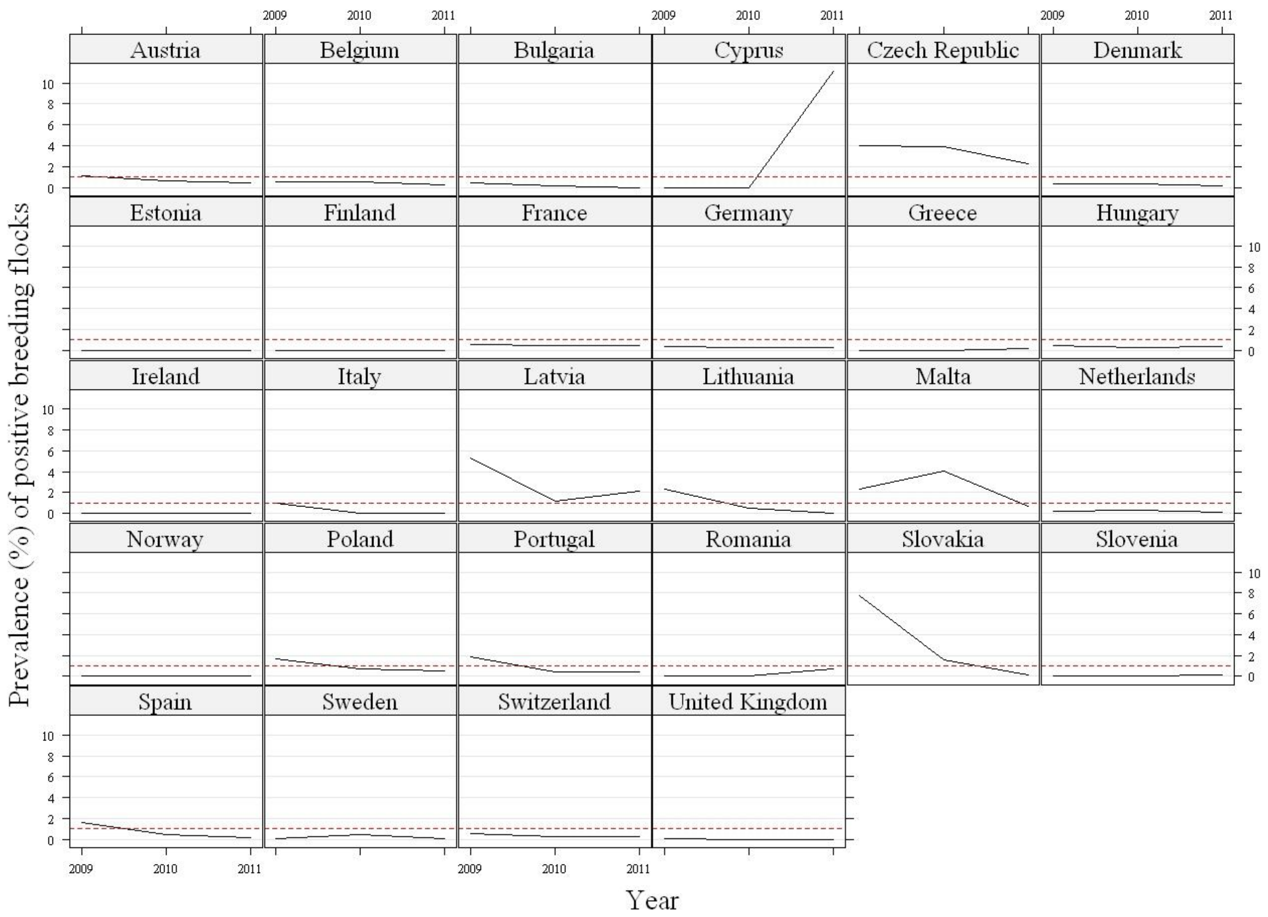


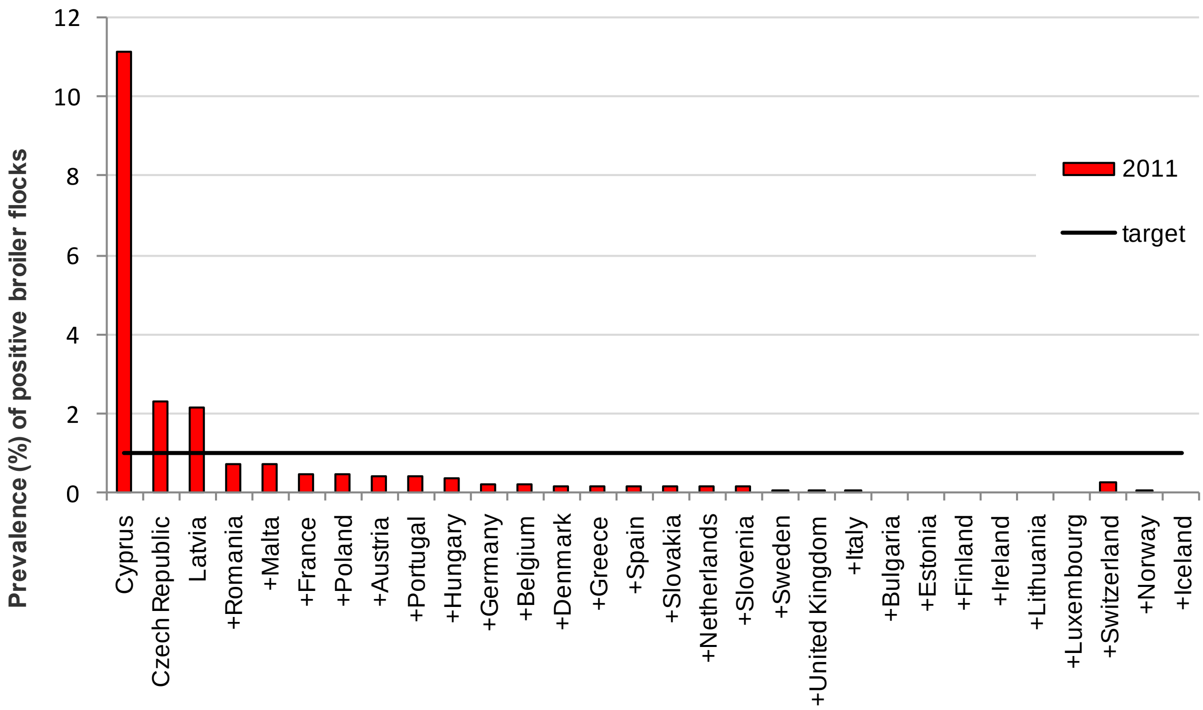
Figure SA13. Prevalence of* S. *Enteritidis and/or* S. *Typhimurium-positive broiler flocks of* Gallus gallus *before slaughter in 24 Member States,[1] Norway and Switzerland, 2009–2011



Note: The dashed line indicates the EU *Salmonella* targets of 1 %.

1. Luxembourg was not included because data were only reported in 2009 (4 tested flocks, 0 positive) and 2011 (99 tested flocks, 0 positive). Iceland was not included because it reported data for the first time in 2011.

Figure SA14. Prevalence of S. Enteritidis and/or S. Typhimurium-positive broiler flocks of* Gallus gallus *before slaughter for Member States, Iceland, Norway and Switzerland, 2011



Note: In 2011, 24 MSs and three non-MSs met the target, indicated with a '+'.

Figure SA15. Prevalence of S. Enteritidis and/or S. Typhimurium-positive broiler flocks of* Gallus gallus *before slaughter, 2011

Breeding and fattening turkeys

The mandatory national control programme for *Salmonella* in breeding and fattening turkeys came into effect on 1 January 2010 and has been implemented to comply with Regulation (EC) No 2160/2003 and Regulations (EC) No 584/2008[18] and 213/2009.[19] All flocks of 250 or more breeding turkeys and 500 or more fattening turkeys are to be included in the national control programme unless exempted in Regulation (EC) No 2160/2003 under Article 1.3, that is birds produced for private domestic consumption, or where there is a direct supply of small quantities of products to the final consumer or to local retail establishments directly supplying the primary products to the final consumer. A target for the reduction of *S.* Enteritidis and/or *S.* Typhimurium in turkey flocks is set by Regulation (EC) No 584/2008, according to which no more than 1 % of adult breeding turkey flocks and fattening turkey flocks are to remain positive for *S.* Enteritidis and/or *S.* Typhimurium by 31 December 2012. For MSs with fewer than 100 flocks of adult breeding or fattening turkeys, the EU target is that no more than one flock of adult breeding or fattening turkeys may remain positive by 31 December 2012.

For **breeding turkeys**, samples for the detection of *Salmonella* should be taken by the operator from rearing turkey breeding flocks at one day of age, at four weeks of age and two weeks before moving to the laying phase or laying unit. In adult breeding flocks, samples shall be taken at least every three weeks during the laying period at the holding or at the hatchery. The samples in adult breeding flocks, either at the holding or

18 Commission Regulation (EC) No 584/2008 of 20 June 2008 implementing Regulation (EC) No 2160/2003 of the European Parliament and of the Council as regards a Community target for the reduction of the prevalence of *Salmonella* Enteritidis and *Salmonella* Typhimurium in turkeys. OJ L 162, 21.6.2008, pp. 3-8.

19 Commission Regulation (EC) No 213/2009 of 18 March 2009 amending Regulation (EC) No 2160/2003 of the European Parliament and of the Council and Regulation (EC) No 1003/2005 as regards the control and testing of *Salmonella* in breeding flocks of *Gallus gallus* and turkeys. OJ L73, 19.3.2009, pp. 5-11.

at the hatchery, shall be taken in accordance with the provisions laid down in point 2.2.2 of the Annex to Regulation (EC) No 1003/2005.[20] Official control samples are required to be taken from all flocks on 10 % of holdings with at least 250 adult breeding turkeys between 30 and 45 weeks of age but including in any case all holdings in which *S.* Enteritidis or *S.* Typhimurium was detected during the previous 12 months and all holdings with elite, great grandparent and grandparent breeding turkeys; this sampling may also take place at the hatchery.

For **fattening turkeys,** samples must be taken by the operator within the three weeks before the birds are moved to the slaughterhouse. The results remain valid for up to six weeks after sampling. The samples in fattening turkey flocks shall be taken in accordance with the provisions laid down in point 2 of the Annex to Regulation (EC) No 584/2008. In addition, each year, official control samples are taken from all flocks on 10 % of holdings with at least 500 fattening turkeys.

Any reporting of monophasic *S*. Typhimurium was included within the *S*. Typhimurium total and was counted as a target serovar. The prevalence of *Salmonella* spp. and of the two serovars targeted in the control programmes are presented in Tables SA12 and SA13 for breeding and fattening flocks, respectively. The prevalence of target serovars (*S.* Enteritidis and *S.*Typhimurium), and the comparison between the prevalence of target serovars for MSs and non-MSs in 2010-2011 are presented in Figures SA16 and SA17 for breeding turkey flocks and in Figures SA18 and SA19 for fattening turkey flocks. All results are presented at flock level. A flock was reported as positive if one or more samples were positive for *S*. Typhimurium and/or *S*. Enteritidis.

Fourteen MSs and two non-MSs reported data from *Salmonella* testing in adult **turkey breeding flocks** in 2011 (Table SA12) compared to 13 MSs and one non-MS in 2010. Data show that only France and the United Kingdom had a relatively high number of flocks under their control programmes, whereas few flocks were reported by the other countries.

In total, 14 MSs and two non-MSs met the target prevalence of *S.* Enteritidis and/or *S.* Typhimurium set for adult turkey breeding flocks in 2011 (Figures SA16 and SA17), which is similar to 2010 when 13 MSs and one non-MS met their 2010 target. With the exception of France and Hungary, where a prevalence of 0.3 % and 0.8 % was reported, respectively, the other countries did not detect the two target serovars. Compared to 2010, an increase was observed for Hungary (0 % in 2010 to 0.8 % in 2011), while for Spain the prevalence decreased from 5.9 % in 2010 to 0 % in 2011 (Figure SA16). Overall, the prevalence for the target serovars was 0.2 %, which is slightly lower compared with 2010 (0.3 %). Monophasic *S*. Typhimurium was not detected in any flock.

Seven MSs reported *Salmonella* spp. in their turkey breeding flocks, the prevalence ranging from 0.3 % (France) to 50.0 % (the Czech Republic), and the overall EU prevalence of *Salmonella* was 3.5 %, which was at a lower level than in 2010 (6.9 %). The Czech Republic, Germany, Italy, Poland and the United Kingdom reported only serovars other than the two targeted ones. However, it should be noted that the number of flocks tested by each MS varied considerably and therefore the average figure was more influenced by MSs that reported larger numbers of flocks.

In addition, 23 MSs and three non-MSs provided data from **turkey fattening flocks** before slaughter (Table SA13) compared to 21 MSs and two non-MSs in 2010. The table shows that France, Germany, Hungary, Poland and the United Kingdom had large (>2,500) numbers of flocks under their programmes.

In 2011, 22 MSs and three non-MSs met their 2011 reduction targets set for fattening turkeys (Figures SA18 and SA19), compared to 20 MSs and two non-MSs in 2010. Denmark and Ireland met the target in 2011, although they reported a prevalence higher than 1 % because these countries tested fewer than 100 flocks (38 and 17 flocks, respectively) and detected only one flock positive for the target serovars.

Twelve MSs reported *S.* Enteritidis and/or *S.* Typhimurium infection; the overall prevalence at EU level was 0.5 %, which is the same prevalence as in 2010. Denmark, Ireland and Spain were the only countries reporting prevalence above 1 %, but at relatively low levels (2.6 %, 5.9 % and 1.1 %, respectively).

20 Commission Regulation (EC) No 1003/2005 of 30 June 2005 implementing Regulation (EC) No 2160/2003 as regards a Community target for the reduction of the prevalence of certain *Salmonella* serotypes in breeding flocks of *Gallus gallus* and amending Regulation (EC) No 2160/2003. OJ L 170, 1.7.2005, pp. 12–17.

Compared with 2010, a decrease in the prevalence of *S.* Enteritidis and/or *S.* Typhimurium-positive flocks was observed in the Czech Republic, Germany, Italy, Poland and Spain, whereas an increase was reported in Austria, Denmark, Finland, France, Hungary, Ireland, Portugal and the United Kingdom (Figure SA18). Monophasic *S.* Typhimurium was detected only in the United Kingdom in five flocks.

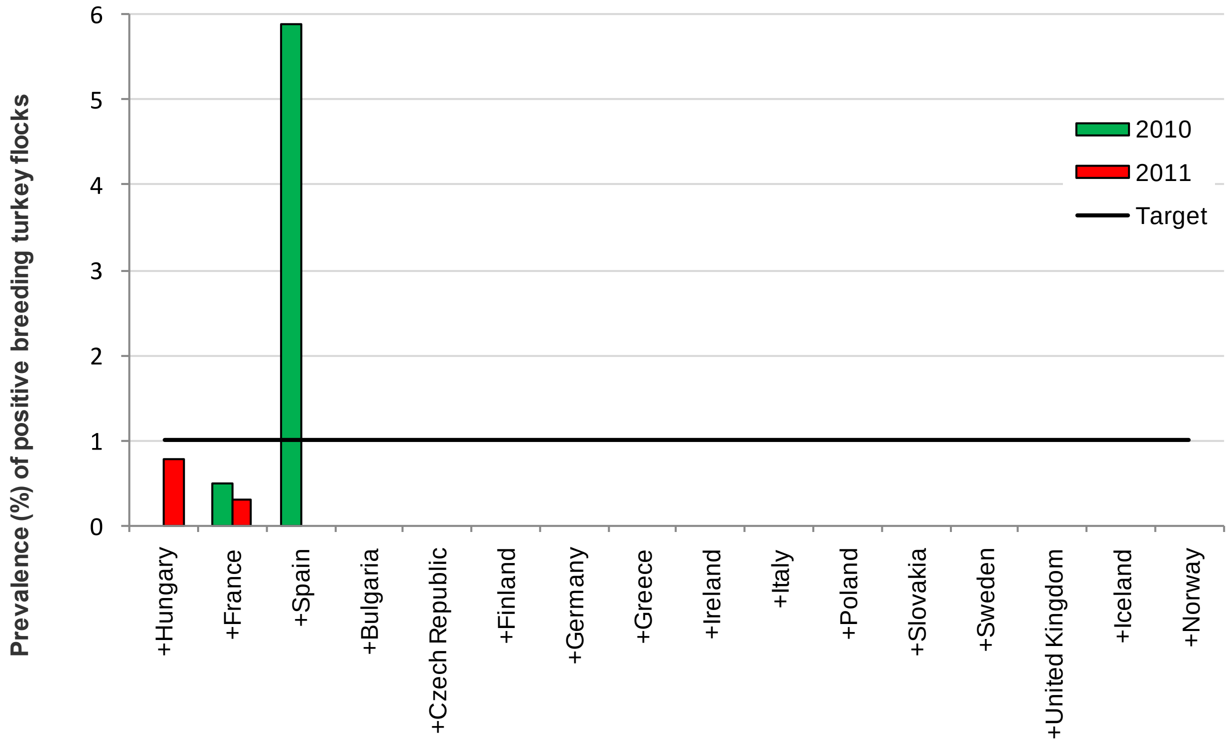
The prevalence of *Salmonella* spp. in turkey fattening flocks was 10.1 % at the EU level, which is a reduction compared to 2010, when it was 12.1 %. The highest prevalence was reported by Romania and Hungary (37.5 % and 37.3 %, respectively). In 2011, Belgium, Latvia, Lithuania, Slovakia and Sweden were the only MSs reporting no positive flocks. Cyprus, Greece, Italy, the Netherlands, Romania and Slovenia reported only serovars other than the targeted ones as well as Norway and Switzerland. In addition, 10 MSs reported serovars other than the targeted ones with a prevalence higher than the prevalence reported for the target serovars.

Table SA12.* Salmonella *in breeding flocks of turkeys (adults, flock-based data) in countries running control programmes, 2011

Country	N	% positive				
		pos (all)	*S.* Enteritidis and/or *S.* Typhimurium[1]	*S.* Enteritidis	*S.* Typhimurium[1]	Other serovars, non-typeable, and unspecified
Bulgaria	2	0	0	0	0	0
Czech Republic	12	50.0	0	0	0	50.0
Finland	10	0	0	0	0	0
France	687	0.3	0.3	0	0.3	0
Germany	166	0.6	0	0	0	0.6
Greece	1	0	0	0	0	0
Hungary	129	10.9	0.8	0.8	0	10.1
Ireland	5	0	0	0	0	0
Italy	55	5.5	0	0	0	5.5
Poland	79	1.3	0	0	0	1.3
Slovakia	32	0	0	0	0	0
Spain	44	0	0	0	0	0
Sweden	4	0	0	0	0	0
United Kingdom	356	8.1	0	0	0	8.1
Total (14 MSs)	**1,582**	**3.5**	**0.2**	**<0.1**	**0.1**	**3.4**
Norway	17	0	0	0	0	0
Iceland	3	0	0	0	0	0

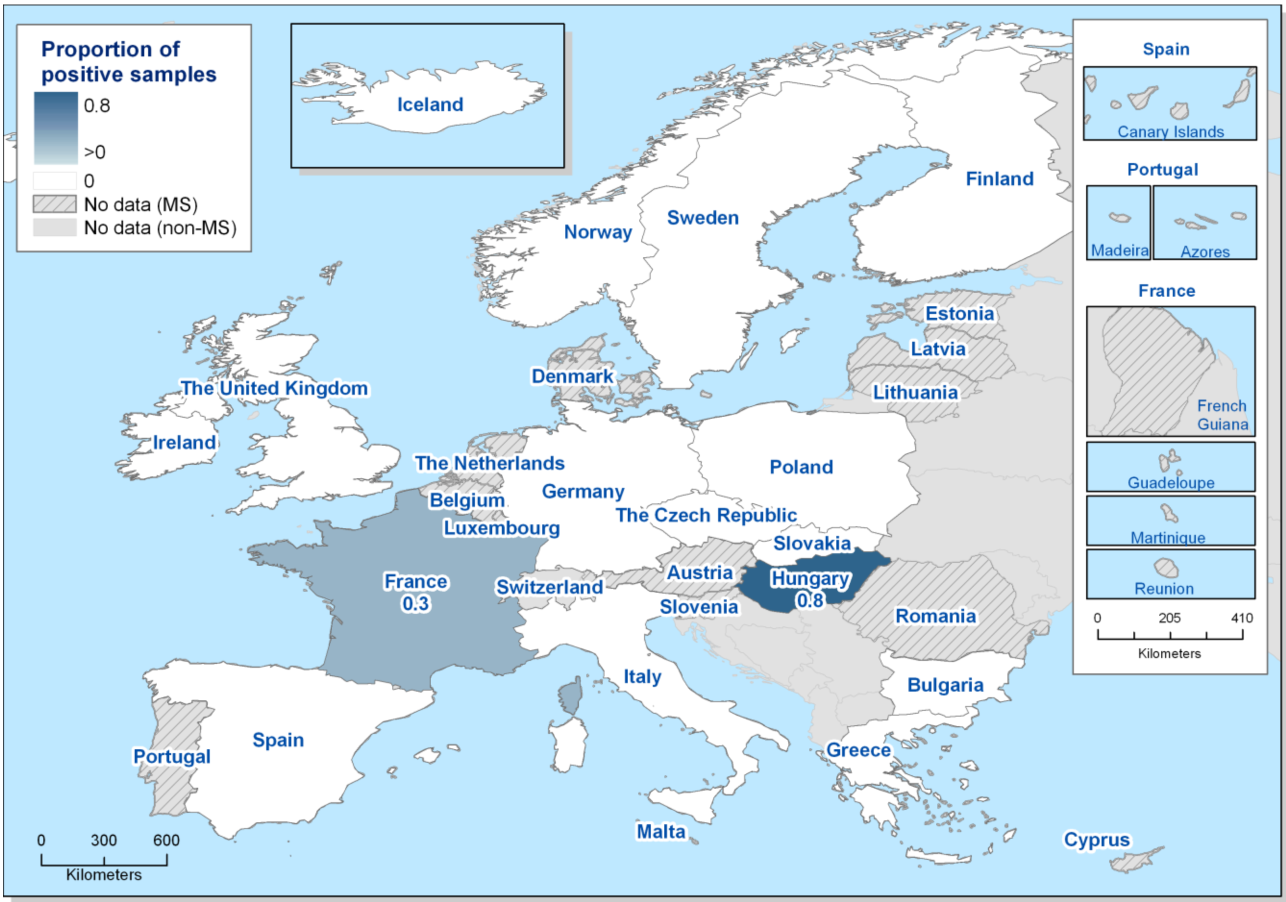
1. *S.* Typhimurium includes monophasic *S.* Typhimurium.

Figure SA16. Prevalence of S. Enteritidis and/or S. Typhimurium-positive breeding flocks of turkeys (all age groups) and targets for Member States, Iceland and Norway, 2011



Note: In 2011, 14 MSs and two non-MSs met the target, indicated with a '+'.
No data were supplied by Bulgaria in 2010. Iceland reported data for the first time in 2011.

Figure SA17. Prevalence of* S. *Enteritidis and/or* S. *Typhimurium-positive breeding flocks of turkeys during the production period,[1] 2011



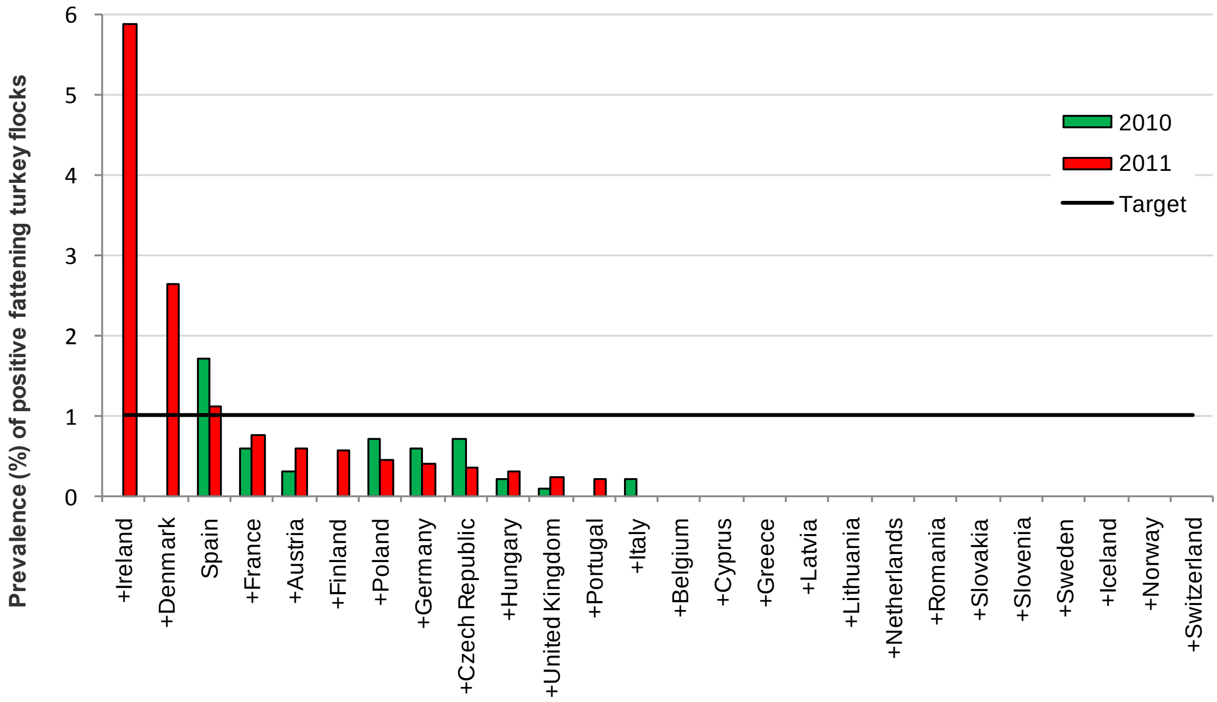
1. No breeding flocks of turkeys in Austria, Belgium, Cyprus, Denmark, Estonia, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Romania and Slovenia. These MSs are marked with 'No data (MS)'. No breeding flocks of turkeys in Switzerland. This country is marked with 'No data (non-MS)'.

Table SA13.* Salmonella *in fattening flocks of turkeys before slaughter (flock-based data) in countries running control programmes, 2011

Country	N	% positive				
		pos (all)	*S.* Enteriditis and/or *S.* Typhimurium[1]	*S.* Enteritidis	*S.* Typhimurium[1]	Other serovars, non-typeable, and unspecified
Austria	340	5.9	0.6	0.6	0	5.3
Belgium	167	0	0	0	0	0
Cyprus	11	9.1	0	0	0	9.1
Czech Republic	292	14.4	0.3	0.3	0	14.0
Denmark	38	2.6	2.6	0	2.6	0
Finland	352	0.6	0.6	0	0.6	0
France	8,046	7.1	0.8	0.2	0.6	6.3
Germany	2,723	1.0	0.4	0	0.4	0.6
Greece	53	17.0	0	0	0	17.0
Hungary	2,702	37.3	0.3	0.1	0.2	37.0
Ireland	17	17.6	5.9	0	5.9	11.8
Italy	1,816	7.7	0	0	0	7.7
Latvia	2	0	0	0	0	0
Lithuania	24	0	0	0	0	0
Netherlands	173	3.5	0	0	0	3.5
Poland	4,648	3.2	0.5	0.2	0.3	2.7
Portugal	504	2.0	0.2	0.2	0	1.8
Romania	40	37.5	0	0	0	37.5
Slovakia	52	0	0	0	0	0
Slovenia	122	3.3	0	0	0	3.3
Spain	1,604	15.1	1.1	0	1.1	14.0
Sweden	174	0	0	0	0	0
United Kingdom	3,078	15.7	0.2	0	0.2	15.5
EU Total	**26,978**	**10.1**	**0.5**	**0.1**	**0.4**	**9.6**
Iceland	22	0	0	0	0	0
Norway	208	0.5	0	0	0	0.5
Switzerland	42	2.4	0	0	0	2.4

1. *S.* Typhimurium includes monophasic *S.* Typhimurium.

Figure SA18. Prevalence of* S. *Enteritidis and/or* S. *Typhimurium-positive fattening flocks of turkeys and targets for Member States, Iceland, Norway and Switzerland, 2011



Note: In 2011, 22 MSs and three non-MSs met the target, indicated with a '+'. Ireland and Denmark met the target as they tested less than 100 flocks (17 and 38 flocks, respectively) and detected only one flock positive for the target serovars.

No data were supplied by Cyprus in 2010. Iceland reported data for the first time in 2011.

Figure SA19. ***Prevalence S. Enteritidis and/or S. Typhimurium-positive fattening flocks of turkeys during the production period, 2011***

Other animal species

Salmonella was also detected in ducks (three MSs), geese (one MS), other poultry species (four MSs), pigs (12 MSs and two non-MSs), cattle (seven MSs and one non-MS), sheep and goats (three MSs) and other animals (five MSs).

For further information on reported data, refer to the Level 3 Tables.

3.1.4. *Salmonella* in feedingstuffs

Data on *Salmonella* in feedingstuffs collected by MSs are generated from different targeted surveillance programmes as well as from unbiased reporting of random sampling of domestic and imported feedingstuffs. The presentation of single sample and batch-based data from the different monitoring systems has therefore been summarised and includes both domestic and imported feedingstuffs. Owing to differences in monitoring and reporting strategies, data are not necessarily comparable between MSs or reporting years. There are also very large differences in the number of samples tested among MSs, which can limit comparisons between investigations.

Table SA14 presents the EU proportion of *Salmonella*-positive samples in animal- and vegetable-derived feed material reported by MSs in 2011. In feed material derived from land animals results have been described according to origin. In feed material from fish meal, *Salmonella* was detected in 1.5 % batches tested, which is less than in 2010, when overall 9.1 % positive samples were reported. The highest level of *Salmonella* contamination (4.0 %) was reported for feed other than meat and bone meal, or dairy products, while the lowest contamination (0 % in single samples and 0.2 % in batches) was detected in feed material of dairy origin. In meat and bone meal *Salmonella* was found in 1.0 % in single samples and 3.4 % in batches. This feed contamination is to be considered only an indicator, and it does not pose any risk to animals because meat and bone meal is still prohibited for feeding food-producing animals. In cereals, 1.3 % of batch samples were positive for *Salmonella*. As for oil seeds and products thereof, 1.7 % of batches and 2.7 % of single units were reported to be contaminated with *Salmonella.*

In compound feedingstuffs, the finished feed for animals, the proportion of *Salmonella*-positive findings in 2011 ranged among the reporting MSs from no positive findings to 2.3 % in cattle feed when single samples were tested, and was 0.3 % in one MS sampling cattle feed at batch level. In compound pig feed *Salmonella* findings ranged from no positive findings to 1.2 % in single samples, and from no positive findings to 1.9 % at batch level. In poultry compound feed no *Samonella* contamination was detected in single samples, whereas the proportion varied from 0.2 % findings to 1.7 % in batch sampling in three MSs (Table SA15).

As in the previous years, the Netherlands reported large numbers of units tested at batch level for all three categories of compound feedingstuffs and very low proportions of contamination were reported for feed for pigs and poultry (0.2 %) and for cattle (0.3 %).

Among the reporting MSs, Hungary accounted for the highest proportion of *Salmonella*-contaminated compound feedingstuff for cattle (2.3 %) and pigs (1.2 %) at the single sample level. Belgium reported the highest contamination of pig feed and poultry feed batches, 1.9 % and 1.7 %, respectively.

It should be highlighted that the reported proportions of positive samples might not always be representative of feedingstuffs on the national markets, as reports might reflect intensive sampling of high-risk products.

There were few reports on the occurrence of *S*. Enteritidis and *S*. Typhimurium in feedingstuffs. *S*. Enteritidis was detected in compound feedingstuffs for poultry (six isolations from the final product for laying hens), feed material of cereal origin (one isolation from wheat), in feed material of oil seed (18 isolations from soya bean), in compound feedingstuffs for pigs (two isolations) and in pet food - dog snacks (two isolations from pig ears, chewing bones). *S*. Typhimurium was detected in feedingstuffs for cattle - final product (one isolation); in compound feedingstuffs for pigs - final product (15 isolations); in pet food - dog snacks (12 isolations from pig ears, chewing bones); in feed material of land animal origin (one isolation from blood meal) and in feed material of oil seed or fruit origin (one isolation from rape seed). Monophasic *S*. Typhimurium was reported in one sample of pet food - dog snacks (pig ears, chewing bones)

For more information on reported data, refer to the Level 3 Tables.

Table SA14. **Salmonella** *in animal and vegetable derived feed material, 2011*

EU Totals		2011		
		Sample unit	N	% pos
Fish meal		Batch	201	1.5
		Single	68	0
Feed material of land animal origin	Meat and bone meal	Batch	1,276	3.4
		Single	9,554	1.0
	Dairy product	Batch	600	0.2
		Single	36	0
	Other[1]	Batch	1,357	0.2
		Single	551	4.0
Cereals		Batch	1,746	1.3
		Single	2,876	0
Oil seeds and products		Batch	9,312	1.7
		Single	3,644	2.7

Note: Data presented include only investigations with sample size ≥25.
1. Includes: animal fat, blood meal, blood products, feather meal, greaves, offals.

Table SA15. **Salmonella** *in compound feedingstuffs, 2011*

Feedingstuff		2011		
		Sample unit	N	% pos
Cattle feed				
Finland		Single	156	0
Germany		Single	406	0.5
Hungary		Single	44	2.3
Ireland		Single	65	0
Netherlands		Batch	1,770	0.3
Portugal		Single	63	0
Total cattle feed (6 MSs)	**Single**		**734**	**0.4**
	Batch		**1,770**	**0.3**
Pig feed				
Belgium		Batch	105	1.9
Finland		Single	101	0
France		Single	86	0
Germany		Single	741	0.9
Hungary		Single	166	1.2
Latvia		Batch	50	0
Netherlands		Batch	2,531	0.2
Portugal		Single	61	0
Spain		Batch	26	0
Total pig feed (9 MSs)	**Single**		**1,155**	**0.8**
	Batch		**2,712**	**0.3**
Poultry feed				
Belgium		Batch	354	1.7
Hungary		Single	119	0
Latvia		Batch	140	0.7
Netherlands		Batch	3,829	0.2
Portugal		Single	35	0
Total poultry feed (5 MSs)	**Single**		**154**	**0**
	Batch		**4,323**	**0.3**

Note: Data presented include only investigations with sample size ≥25. They include results from final products, at process control and unspecified.

3.1.5. Evaluation of the impact of *Salmonella* control programmes in poultry

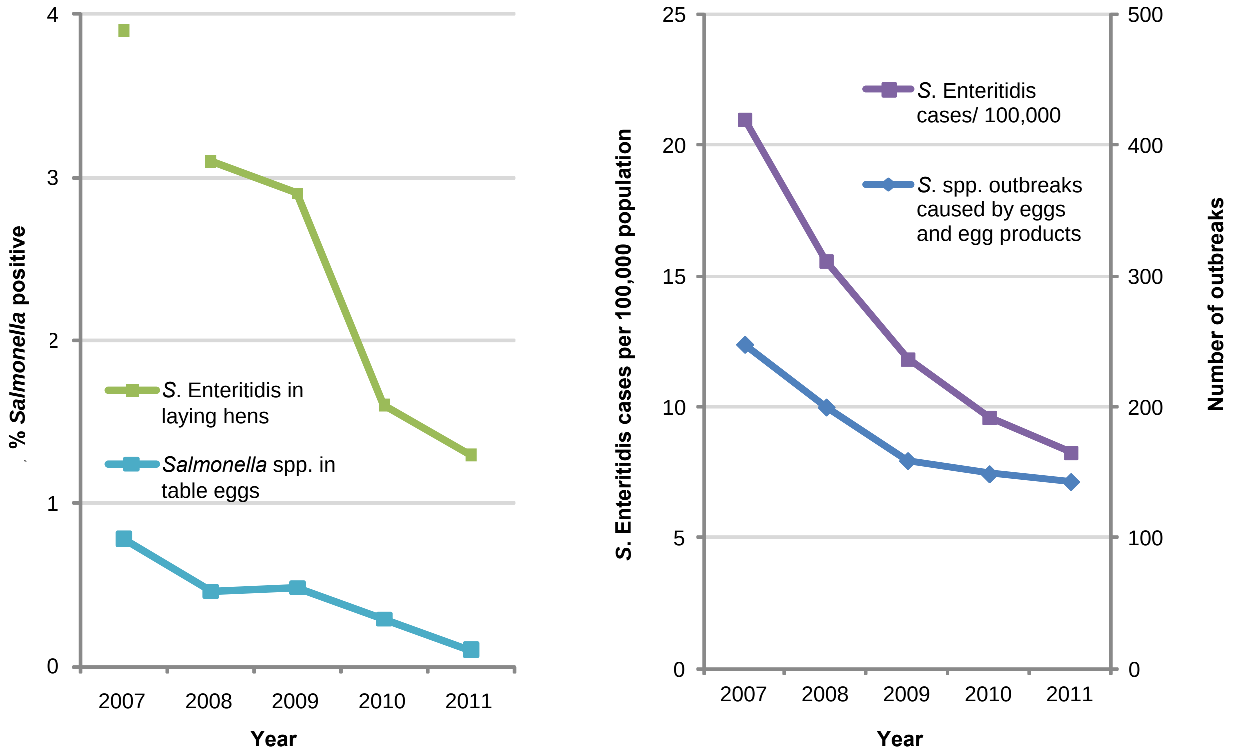
The legal obligations for the MSs to implement *Salmonella* control programmes and their results are presented earlier in this report in Chapter 3.1.3.

Eggs have been considered to be the most important source of human salmonellosis cases in the EU, particularly of those caused by *S*. Enteritidis, which is the most frequently occurring serovar in the EU and in most MSs. Therefore, in order to evaluate the impact of these control programmes on public health, the incidence of human salmonellosis cases caused by *S*. Enteritidis, the numbers of *Salmonella* food-borne outbreaks caused by eggs and egg products and the prevalence of *S*. Enteritidis in laying hen flocks were examined. It should be noted that the *Salmonella* control programmes now in place in MSs are intended to have an impact on the whole food chain from farm-to-fork and that a reduction in *Salmonella* at the farm level is expected to reduce the risk of salmonellosis in humans. Still, other control measures along the food chain, during slaughter, processing, distribution, retail and food preparation, are also important in reducing the risk.

At the EU level, the proportion of *S*. Enteritidis-infected laying hen flocks during the production period decreased steadily from 3.9 % in 2007 (19 reporting MSs) to 1.3 % in 2011 (27 reporting MSs). During the same period the proportion of *Salmonella* spp.-positive table eggs decreased from 0.8 % in 2007 (16 reporting MSs) to 0.1 % in 2011 (13 reporting MSs) (Figure SA20). In the same period, a 60.5 % drop in the notification rate of human *S*. Enteritidis cases per 100,000 population was observed (from 21.0 to 8.3). A corresponding 42.3 % reduction in the number of *Salmonella* spp. food-borne outbreaks caused by eggs and egg products was reported in the EU from 2007 to 2011 (a decrease from 248 to 143 outbreaks) (Figure SA20). The decline in the occurence of *S*. Enteritidis continued in 2011 both in laying hens and their eggs and in the human cases.

The results above indicate that the reduction of *S.* Enteritidis in laying hen flocks and of *Salmonella* spp. in table eggs is likely to have contributed to the decline of *S.* Enteritidis cases in humans.

Figure SA20. **Salmonella** ***in human cases, eggs and laying hens and the number of*** **Salmonella** ***outbreaks caused by eggs within the EU, 2007–2011***



Note: Data for table eggs are only presented for sample size ≥25. For laying hens only data from sampling during the production period were included. The mandatory *Salmonella* control programme for flocks of laying hens has been implemented since 2008. The discontinued trend line for *S.* Enteritidis in laying hens indicates that monitoring data from 2007 were underpinned by non-harmonized sampling schemes.

3.1.6. *Salmonella* serovars

As in previous years, in 2011 the information available on the distribution of *Salmonella* serovars along the food chain varied greatly between countries. In all MSs, the serotyping of *Salmonella* isolates from food, animals and feed is carried out according to the White–Kauffmann–Le Minor scheme, but in some MSs only a proportion of isolates are fully serotyped and are just reported to species or group level after initial screening to identify possible target serovars.

In the following paragraphs, data relating to the 10 most frequently reported serovars among isolates from humans, food and animal species are presented.

Serovars in humans

Information on *Salmonella* serovars in humans was available from 25 MSs (Bulgaria and Poland reported no case-based serovar data). The distribution of the 10 most common serovars in humans in the EU is shown in Table SA16 and in Figure SA21. The reporting of monophasic *S.* Typhimurium 1,4,[5],12:i:- was harmonised in 2010 when six countries started to report cases according to the new agreed serovar code. In 2011, 10 countries reported this type, placing the monophasic *S*. Typhimurium 1,4,[5],12:i:- as the top third serovar in the EU.

As in previous years, the two most commonly reported *Salmonella* serovars in 2011 were *S*. Enteritidis and *S*. Typhimurium, representing 44.4 % and 24.9 %, respectively, of all reported serovars in human-confirmed cases (N = 77,421) (Table SA16). The decrease in *S*. Enteritidis continued with 2,081 fewer cases (5.7 %) reported in the EU in 2011 than in 2010. Cases of *S*. Typhimurium remained constant between 2010 and 2011 or even increased by 1.2 % if the monophasic *S*. Typhimurium were added to the group.

Salmonella Infantis has been the third most common serovar in the EU since 2006, with the relative proportion steadily increasing from 1.0 % in 2006 to 2.2 % in 2010, surpassed, however, by monophasic *S*. Typhimurium in 2011. Cases of both *S*. Kentucky and *S*. Virchow decreased by around 30 % from 2010 to 2011. New on the top 10 serovar list was *S*. Poona with 548 cases reported in 2011 (Table SA16). A large proportion of these cases were from an outbreak of *S*. Poona in infants in Spain due to contaminated milk formula.[21]

21 Centre National de Epidemiologia. Brote supracomunitario de gastroenteritis por *Salmonella* Poona en 2010–2011. Boletín epidemiológico semanal, 19, jan. 2012. Disponible en: http://revista.isciii.es/index.php/bes/article/view/339/362.

Figure SA21. Distribution of the 10 most common *Salmonella* serovars in humans in the EU, 2011

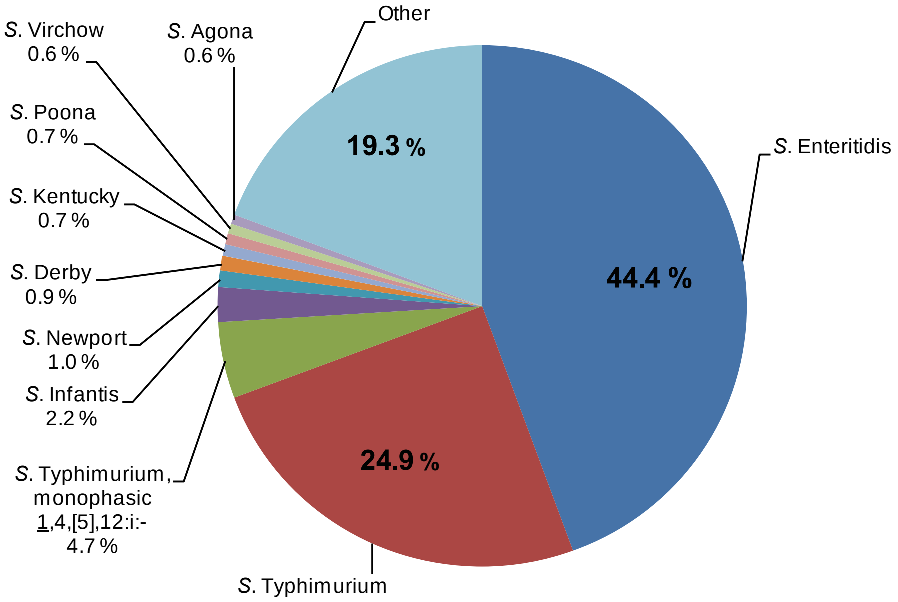


Table SA16. Distribution of reported confirmed cases of human salmonellosis by serovar (10 most frequent serovars) in the EU, 2010–2011

2011			2010		
Serovars	N	%	Serovars	N	%
S. Enteritidis	34,385	44.4	*S.* Enteritidis	36,466	44.2
S. Typhimurium	19,250	24.9	*S.* Typhimurium	21,223	25.7
S. Typhimurium, monophasic 1,4,[5],12:i:-	3,666	4.7	*S.* Infantis	1,793	2.2
S. Infantis	1,676	2.2	*S.* Typhimurium, monophasic 1,4,[5],12:i:-	1,426	1.7
S. Newport	771	1.0	*S.* Newport	839	1.0
S. Derby	704	0.9	*S.* Kentucky	783	0.9
S. Kentucky	559	0.7	*S.* Virchow	689	0.8
S. Poona	548	0.7	*S.* Derby	665	0.8
S. Virchow	467	0.6	*S.* Mbandaka	471	0.6
S. Agona	459	0.6	*S.* Agona	445	0.5
Other	14,936	19.3	Other	17,657	21.4
Total	**77,421**	**100**	**Total**	**82,457**	**100**

Source: 25 MSs: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and United Kingdom.

Trend analysis was performed on the top four serovars in humans in 2011, plus the two additional serovars included in the *Salmonella* reduction targets for breeding flocks of *Gallus gallus*. Significant decreasing trends were observed for *S*. Enteritidis, *S*. Typhimurium, *S*. Virchow and *S*. Hadar during 2008–2011 (Figure SA22); however, most of the decrease in *S.* Typhimurium in 2010 and 2011 could be explained by the introduction of a separate code in TESSy for reporting of monophasic *S*. Typhimurium 1,4,[5],12:i:- in 2010 (Figure SA23). A significant increasing trend was observed for *S*. Infantis. No trend was observed for *S*. Newport.

Six countries started to use the separate code for reporting cases of *S*. Typhimurium 1,4,[5],12:i:- in 2010 and 10 countries in 2011. In the four countries that reported over the whole two-year period, an increase in cases of 83.0 % was observed in 2011 compared to 2010. This was primarily due to two large outbreaks in France with 682 and 337 cases, respectively, which can be seen in the peaks in August–September and November–December in 2011 (Figure SA23). The first outbreak was of unknown source and the second linked to consumption of dried pork sausages.[22]

Figure SA22. Trend in reported confirmed cases of human salmonellosis in the EU by selected serovars, 2008–2011

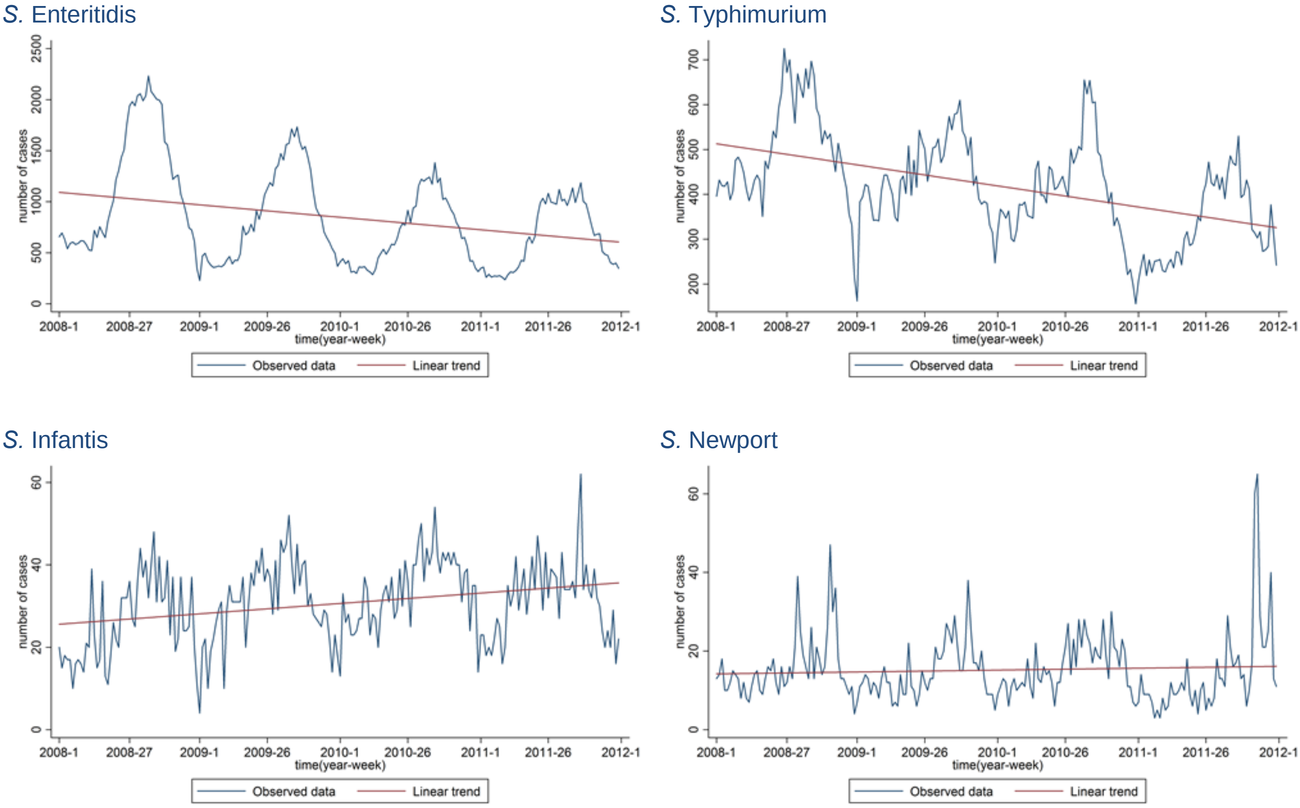
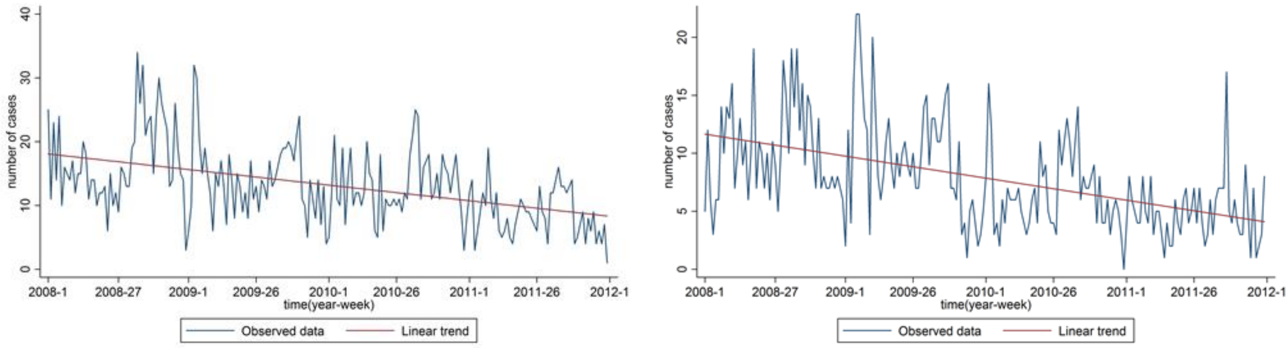


Figure continued overleaf.

22 Gossner C M, van Cauteren D, Le Hello S, Weill F X, Terrien E, Tessier S, Janin C, Brisabois A, Dusch V, Vaillant V and Jourdan-da Silva N. Nationwide outbreak of *Salmonella enterica* serotype 4,[5],12:i:- infection associated with consumption of dried pork sausage, France, November to December 2011. Euro Surveillance 2012;17(5):pii=20071. Available online: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=20071

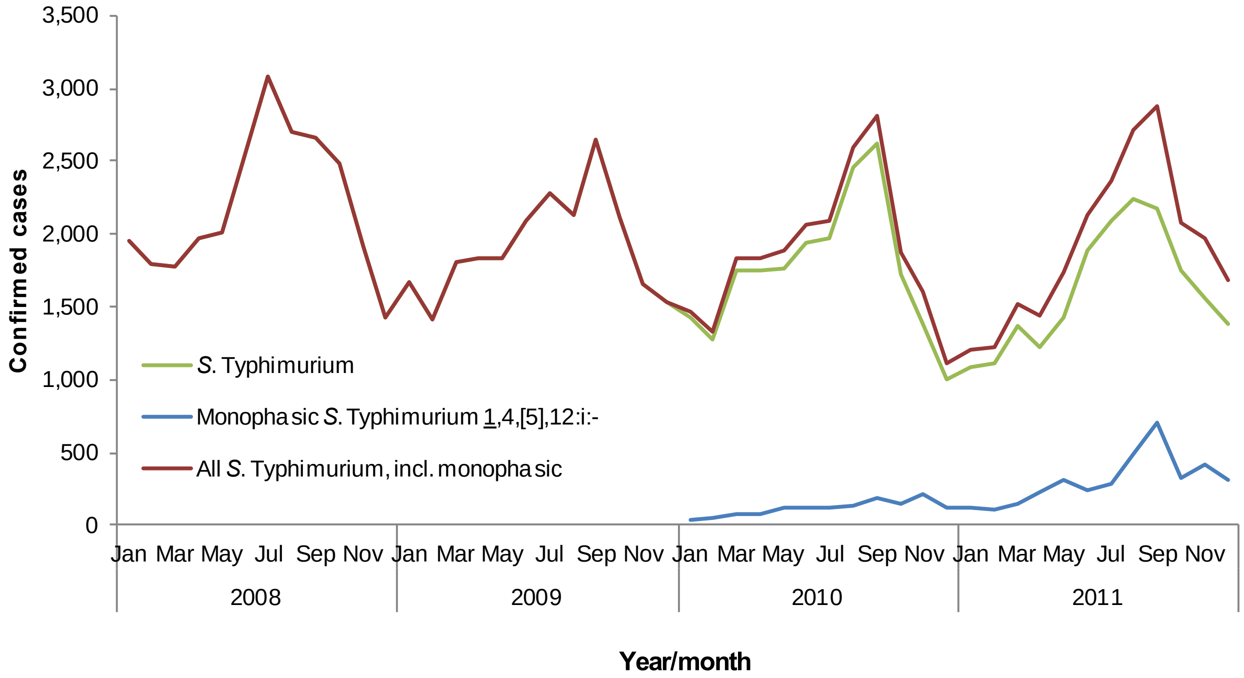
Figure SA22 (continued). Trend in reported confirmed cases of human salmonellosis in the EU by selected serovars, 2008–2011

S. Virchow *S.* Hadar



Source: TESSy data from 25 MSs: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and United Kingdom. Bulgaria and Poland excluded as they reported only monthly data.

Figure SA23. Number of reported confirmed cases of human salmonellosis by month for* S. *Typhimurium, monophasic* S. *Typhimurium and all* S. *Typhimurium including monophasic variant, 2008–2011



Source: TESSy data from 25 MSs (Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and United Kingdom). Bulgaria and Poland excluded as they reported in an aggregated format.

Serovars in animals and food

For food and animals, information on serovar distribution is presented for the main food-producing animal species (poultry (*Gallus gallus*), pigs and bovines) and food thereof over the period 2004–2011. As the reported serovars often originate from different sampling schemes, and as there are differences between the MSs in the way in which reports are made and the numbers of serovars reported, the tables and graphs presented are to be regarded only as indicative. However, as most MSs have not changed fundamentally their way of reporting over the years, the changes in the top 10 serovars reported at EU level may provide interesting information on the trends in the occurence of these serovars in food and animal populations.

S. Infantis and *S.* Enteritidis were by far the most frequently reported serovars from poultry *(Gallus gallus*), and eggs and meat from *Gallus gallus* in the EU over the period 2004–2011 (Table SA17 and Figure SA24). In the last three-year period *S*. Infantis was more commonly reported, and in 2011 it was the most frequently reported serovar. The numbers of *S.* Enteritidis isolations have been declining over the years. Both these results are in line with the trends observed in the human cases in the same years. Monophasic S. Typhimurium was detected in poultry and meat from broilers, but it has never been reported among the Salmonella isolates from eggs over the period 2004–2011.

In pigs and meat from pigs *S*. Typhimurium was by far the most frequently reported serovar over the period 2004–2011 (Table SA18 and Figure SA25). During the last two reporting years monophasic *S.* Typhimurium either become more prevalent or was reported separately from *S*. Typhimurium. In 2011 it was the third most frequently reported serovar in pigs and meat from pigs.

In bovine animals and meat from bovine *S*. Typhimurium and *S.* Dublin were the two most reported serovars over the period 2004–2011 (Table SA19 and Figure SA26). Monophasic *S*. Typhimurium was also detected in bovine animals and bovine meat and was, in 2011, the eighth most frequently reported serovar.

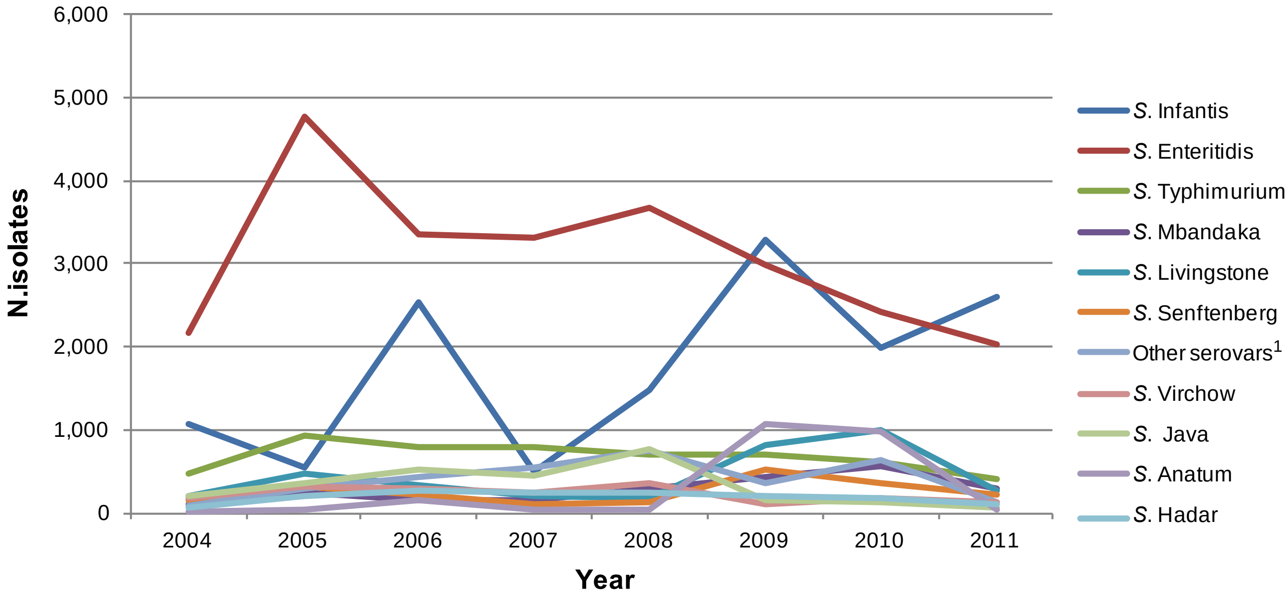
For detailed data on serovars in foodstuffs, animals, and feedingstuffs, refer to the Level 3 Tables.

Table SA17. Distribution of number of* Salmonella *isolates from* Gallus gallus, *meat from* Gallus gallus *and eggs, by serovar (10 most frequent serovars) in the EU and non-MSs, 2004–2011

Salmonella Serovars	2004	2005	2006	2007	2008	2009	2010	2011	Total
S. Infantis	1,069	536	2,526	490	1,469	3,273	1,980	2,589	13,932
S. Enteritidis	2,160	4,768	3,360	3,297	3,666	2,986	2,422	2,031	24,690
S. Typhimurium	482	938	795	803	689	702	616	408	5,433
S. Mbandaka	106	234	144	142	281	417	566	295	2,185
S. Livingstone	192	482	337	195	183	819	991	275	3,474
S. Senftenberg	143	322	229	105	125	507	363	216	2,010
Other serovars[1]	74	283	434	547	740	364	627	132	3,201
S. Virchow	168	318	289	253	362	110	175	128	1,803
S. Java	188	365	507	443	766	145	134	64	2,612
S. Anatum	13	41	142	31	31	1,064	986	28	2,336
S. Hadar	53	186	276	252	249	208	183	117	1,524
Total number MSs	**18**	**17**	**22**	**22**	**22**	**21**	**23**	**24**	
Total number non-MSs	**-**	**-**	**2**	**1**	**-**	**1**	**1**	**1**	

Note: The table is ranked according to the number reported *Salmonella* serovar isolates in 2011.
1. 'Other *Salmonella* serovars' were reported as 'other *Salmonella* serotypes' from 2004 to 2009.

Figure SA24. Number of* Salmonella *isolates from* Gallus gallus, *meat from* Gallus gallus *and eggs, by serovar (10 most frequent serovars) in the EU and non-MSs, 2004–2011



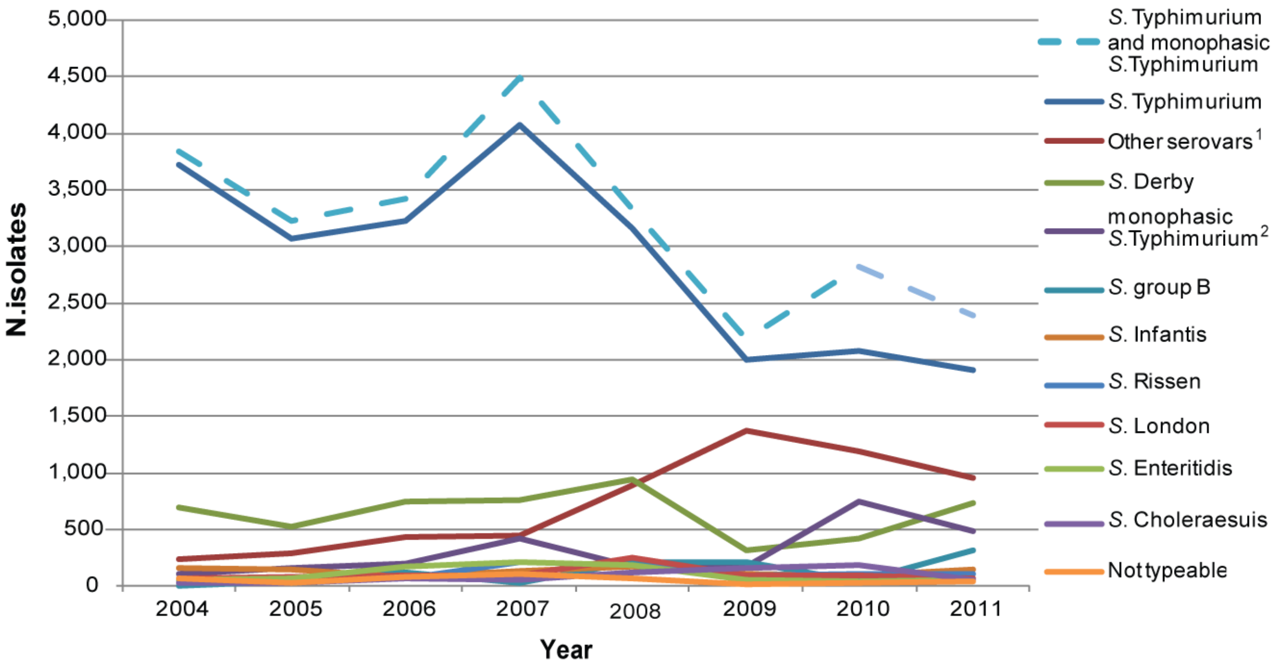
Note: The legend is ranked according to the number reported *Salmonella* serovar isolates in 2011.
1. 'Other *Salmonella* serovars' were reported as 'other *Salmonella* serotypes' from 2004 to 2009.

Table SA18. Distribution of number of* Salmonella *isolates from pigs and pig meat, by serovar (10 most frequent serovars) in the EU and non-MSs, 2004–2011

Salmonella Serovars	2004	2005	2006	2007	2008	2009	2010	2011	Total
S. Typhimurium	3,726	3,069	3,220	4,068	3,156	2,002	2,077	1,907	23,225
Other serovars[1]	242	290	440	451	896	1,371	1,188	960	5,838
S. Derby	691	525	741	760	947	320	417	734	5,135
monophasic *S.*Typhimurium[2]	107	157	198	420	175	179	748	489	2,473
S. group B	1	40	118	32	210	214	39	318	972
S. Infantis	166	151	85	135	168	109	97	148	1,059
S. Rissen	58	46	69	207	181	97	107	105	870
S. London	69	86	94	97	253	94	90	69	852
S. Enteritidis	53	71	176	210	184	58	41	61	854
S. Choleraesuis	32	35	63	51	119	162	181	53	696
Not typeable	71	25	76	114	69	15	31	42	443
Total number MSs	**16**	**18**	**21**	**22**	**21**	**20**	**20**	**23**	
Total number non-MSs	**0**	**0**	**2**	**1**	**0**	**0**	**1**	**1**	

Note: The table is ranked according to the number reported *Salmonella* serovar isolates in 2011.
1. 'Other *Salmonella* serovars' were reported as 'other *Salmonella* serotypes' from 2004 to 2009. In 2009 'other serovars' includes '*Salmonella* spp.' reported data.
2. Monophasic *S.*Typhimurium includes *S.* 1,4,[5],12:i:-, *S.* 1,4,5,12:i:-, *S.* 4,12:i:-, *S.* 4,12:i:-, *S.* 1,4,12:i:-, *S.* 4,5,12:i:-.

Figure SA25. Number of* Salmonella *isolates from pigs and pig meat, by serovar (10 most frequent serovars) in the EU and non-MSs, 2004–2011.



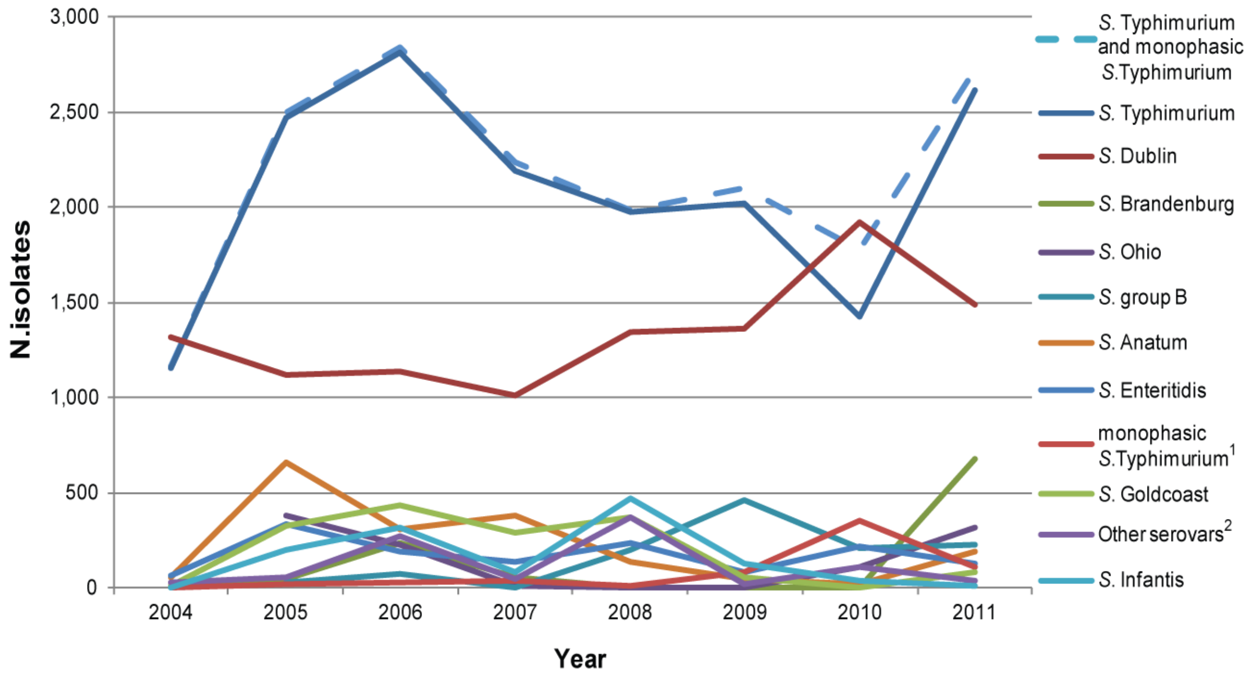
Note: The legend is ranked according to the number reported *Salmonella* serovar isolates in 2011.
1. 'Other *Salmonella* serovars' were reported as 'other *Salmonella* serotypes' from 2004 to 2009. In 2009 'other serovars' includes '*Salmonella* spp.' reported data.
2. Monophasic *S.*Typhimurium includes *S.* 1,4,[5],12:i:-, *S.* 1,4,5,12:i:-, *S.* 4,12:i:-, *S.* 4,12:i:-, *S.* 1,4,12:i:-, *S.* 4,5,12:i:-.

Table SA19. Distribution of number of* Salmonella *isolates from bovine animals and bovine meat, by serovar (10 most frequent serovars) in the EU and non-MSs, 2004–2011

Salmonella Serovars	2004	2005	2006	2007	2008	2009	2010	2011	Total
S. Typhimurium	1,160	2,474	2,812	2,190	1,973	2,021	1,423	2,612	16,665
S. Dublin	1,320	1,119	1,135	1,010	1,347	1,360	1,919	1,485	10,695
S. Brandenburg	5	51	235	54	4	3	1	675	1,028
S. Ohio	0	379	228	9	4	6	107	318	1,051
S. group B	0	28	79	0	204	462	214	232	1,219
S. Anatum	54	660	309	385	142	46	22	196	1,814
S. Enteritidis	70	332	192	139	241	80	222	128	1,404
monophasic *S.*Typhimurium[1]	4	23	28	43	8	85	354	108	653
S. Goldcoast	7	326	431	293	376	54	2	85	1,574
Other serovars[2]	34	56	276	50	373	20	115	36	960
S. Infantis	5	202	317	83	473	126	40	14	1,260
Total number MSs	**17**	**16**	**20**	**20**	**20**	**18**	**18**	**21**	
Total number non-MSs	**0**	**0**	**2**	**1**	**1**	**1**	**1**	**1**	

Note: The table is ranked according to the number reported *Salmonella* serovar isolates in 2011.
1. Monophasic *S.*Typhimurium includes *S.* 1,4,[5],12:i:-, *S.* 1,4,5,12:i:-, *S.* 4,12:i:-, *S.* 4,12:i:-, *S.* 1,4,12:i:-, *S.* 4,5,12:i:-.
2. 'Other *Salmonella* serovars' were reported as 'other *Salmonella* serotypes' from 2004 to 2009.

Figure SA26. Number of* Salmonella *isolates from bovine animals and bovine meat, by serovar (10 most frequent serovars) in the EU and non-MSs, 2004–2011.



Note: The legend is ranked according to the number reported *Salmonella* serovar isolates in 2011.
1. Monophasic *S.*Typhimurium includes *S.* 1,4,[5],12:i:-, *S.* 1,4,5,12:i:-, *S.* 4,12:i:-, *S.* 4,12:i:-, *S.* 1,4,12:i:-, *S.* 4,5,12:i:-.
2. 'Other *Salmonella* serovars' were reported as 'other *Salmonella* serotypes' from 2004 to 2009.

3.1.7. Discussion

Although salmonellosis in humans was still the second most commonly reported zoonotic disease, a significant decrease has been observed in recent years, representing a decrease of 58,000 cases (38 %) in 2011 when compared to the case numbers reported in 2007.

The reduction in salmonellosis was most evident among cases of *S.* Enteritidis. The decrease observed in *S.* Typhimurium could to a large extent be explained by the introduction of a separate code for the reporting of monophasic *S.* Typhimurium. Of the top five serovars in humans and the additional two covered in the *Salmonella* reduction targets for breeding flocks of *Gallus gallus*, *S.* Infantis was the only serovar for which a significant increasing trend could be observed. This is in accordance with the finding in poultry (*Gallus gallus*) and eggs and meat from poultry, wherein S. Infantis was more commonly reported during the last three-year period. The number of cases in humans of monophasic *S.* Typhimurium 1,4,[5],12:i:- increased in 2011, moving it from the fourth to the third most commonly reported serovar in humans. This increase could be explained by more countries reporting the now harmonised serovar code and two large outbreaks of food-borne salmonellosis in France.

Slightly less than half of the confirmed salmonellosis cases were hospitalised, which was more than expected if it is taken into account that the symptoms often are relatively mild. Information on hospitalisation status was, however, provided for only a tenth of the cases, with a possible bias towards the information being provided for a larger proportion of hospitalised cases than for non-hospitalised cases. It was also noticeable that the countries reporting the lowest notification rate for salmonellosis had the highest proportion of hospitalisation. This may reflect the detection of only the most severe cases by the surveillance systems in these countries. It could potentially also reflect differences between countries on when and for which diseases hospital admission is recommended. A total of 56 deaths due to non-typhoidal salmonellosis were reported in the EU in 2011, resulting in an EU case-fatality rate of 0.12 %.

The continuing decrease in the numbers of salmonellosis cases in humans is likely mainly related to the successful *Salmonella* control programmes in poultry populations. The majority of MSs met their *Salmonella* reduction targets for breeding flocks, laying hens and broilers of *Gallus gallus* and for turkey flocks in 2011, and the prevalence of the target serovars, including *S.* Enteritidis, continued to decline at the EU level, although more slowly than in the previous year. All these results indicate that MSs have invested in *Salmonella* control and this work is yielding positive results.

These results are in line with the most recent source attribution estimation by the BIOHAZ Panel,[23] in which the contribution of laying hens and eggs to the human cases was estimated to be lower and that of pigs higher than in the previous source attribution studies by the Panel. In this most recent BIOHAZ study, the model estimated that around 56.8 % of the human salmonellosis cases could be attributable to pigs, while the contibutions of total reservoirs associated with laying hens (eggs), broilers and turkeys were 17.0 %, 10.6 % and 2.6 %, respectively. However, when considering the risk related to the different sources weighted according to the tonnage of food available for consumption, the risk of infection is highest when consuming table eggs closely followed by pig meat, whereas the risks associated with broiler and turkey meat are similar and approximately two-fold lower.

The reported food-borne outbreaks caused by *Salmonella* within the EU have also decreased, and this decline was noticed in outbreaks caused by egg and egg products, bakery products, mixed food and different types of meats.

An interesting development in 2011 was that monophasic *S.* Typhimurium appeared in third place on the top ten list of the most commonly reported serovars in human cases. In 2011, monophasic *S.* Typhimurium was reported less frequently than in 2010, yet it fell within the top ten *Salmonella* serovars from pigs and pig meat and from bovine animals and bovine meat. Monophasic *S.* Typhimurium was detected in poultry and meat from broilers, but it has never been reported among the *Salmonella* isolates from eggs over the period 2004–2011. The BIOHAZ Panel concluded in its recent opinion[24] that monophasic *S.* Typhimurium appears to be

23 EFSA Panel on Biological Hazards (BIOHAZ), 2012. Scientific Opinion on an estimation of the public health impact of setting a new target for the reduction of *Salmonella* in turkeys. EFSA Journal,10(4):2616, 89 pp.

24 EFSA Panel on Biological Hazards (BIOHAZ), 2010. Scientific Opinion on monitoring and assessment of the public health risk of '*Salmonella* Typhimurium-like' strains. EFSA Journal, 8(10):1826, 48 pp.

of increasing importance in many MSs and has caused a substantial number of infections in both humans and animals bred for food. However, the recently agreed reporting guidelines for these strains may have partly contributed to these increased reports in 2011.

There were also some indications that the importance of *S*. Infantis was increasing in both human cases and in poultry populations. In poultry (*Gallus gallus*) and eggs and meat from poultry S. Infantis was the most commonly reported serovar in 2011.

As regards the findings in food, *Salmonella* was often detected in fresh broiler meat, less often in pig meat and rarely in table eggs. The highest levels of non-compliance with *Salmonella* criteria generally occurred once again in foods of meat origin. The findings of the occurrence of *Salmonella* in minced meat and meat preparations intended to be eaten raw are of particular relevance because of the risk such foods pose to human health.

3. INFORMATION ON SPECIFIC ZOONOSES AND ZOONOTIC AGENTS

3.2. *Campylobacter*

Campylobacteriosis in humans is caused by thermotolerant *Campylobacter* spp. The infective dose of these bacteria is generally low. The species most commonly associated with human infection are *Campylobacter jejuni* (*C. jejuni*) followed by *C. coli*, and *C. lari*, but other *Campylobacter* species are also known to cause human infection.

The incubation period in humans averages from two to five days. Patients may experience mild to severe symptoms, with common clinical symptoms including watery, sometimes bloody diarrhoea, abdominal pain, fever, headache and nausea. Usually infections are self-limiting and last only a few days. Extra-intestinal infections or post-infection complications such as reactive arthritis and neurological disorders can also occur. *C. jejuni* has become the most recognised antecedent cause of Guillain–Barré syndrome, a polio-like form of paralysis that can result in respiratory failure and severe neurological dysfunction and even death.

Thermotolerant *Campylobacter* spp. are widespread in nature. The principal reservoirs are the alimentary tract of wild and domesticated birds and mammals. These bacteria are prevalent in food-producing animals such as poultry, cattle, pigs and sheep, in pets, including cats and dogs; in wild birds and in environmental water sources. Animals rarely succumb to disease caused by these organisms. However, *C. jejuni* is known to be causing abortions in sheep, and lately, a highly virulent clone that causes outbreaks of ovine abortions has emerged in the United States and its zoonotic nature has been recently suggested.

Campylobacter can readily contaminate various foodstuffs, including meat, raw milk and dairy products, and, less frequently, fish and fishery products, mussels and fresh vegetables. Among sporadic human cases, contact with live poultry, consumption of poultry meat, drinking water from untreated water sources, and contact with pets and other animals have been identified as the major sources of infections. Cross-contamination during food preparation at home has also been described as an important transmission route. Raw milk and contaminated drinking water have been implicated in both small and large outbreaks.

Table CA1 presents the countries reporting data for 2011.

Table CA1. Overview of countries reporting data for* Campylobacter*, 2011

Data	Total number of reporting MSs	Countries
Human	25	**All MSs** except GR, PT **Non-MSs:** CH, IS, NO
Food	21	**All MSs** except BG, FI, FR, GR, LV, MT **Non-MS:** CH
Animal	19	**All MSs** except BE, BG, CY, FR, GR, HU, LT, MT **Non-MSs:** CH, IS, NO
Feed	1	**MS:** IT
Species[1]	23	**All MSs** except BG, FR, GR, MT **Non-MSs:** CH, IS, NO

1. Species includes the list of countries that reported the species level (for example *C. jejuni*, *C. coli*, etc.)

In the following chapter thermotolerant *Campylobacter* spp. will be referred to as *Campylobacter*.

3.2.1. Campylobacteriosis in humans

In 2011, *Campylobacter* continued to be the most commonly reported gastrointestinal bacterial pathogen in humans in the EU since 2005. The number of reported confirmed cases of human campylobacteriosis in the EU in 2011 was 220,209, which was an increase of 2.2 % compared to 2010. The EU notification rate was 50.28 per 100,000 population in 2011 (Table CA2).

The EU trend in confirmed cases of campylobacteriosis showed a statistically significant (p <0.001) increase in the last four years (2008–2011) (Figure CA1). There was a clear seasonal trend (Figure CA1). The highest country-specific notification rates were observed in the Czech Republic and Luxembourg (178 and 138 cases per 100,000 population, respectively). In individual MSs, statistically significant increasing trends in campylobacteriosis from 2008 to 2011 were observed in 13 MSs: Belgium, Cyprus, Denmark, Estonia, France, Germany, Hungary, Ireland, Italy, Lithuania, Luxemburg, Malta and the Netherlands. A significant decreasing trend was observed in only one country, Austria.

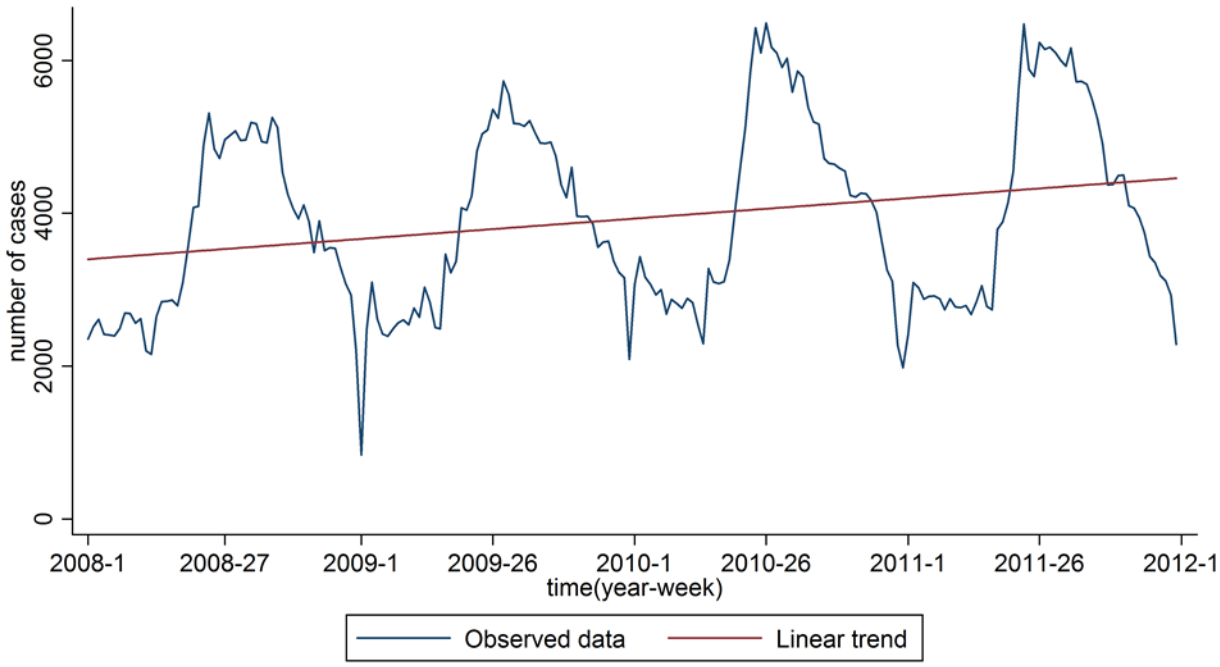
Data on hospitalisation rates for campylobacteriosis have been collected in the case-based reporting in TESSy since 2010. Information on hospitalisation was provided for only 7.7 % of the confirmed campylobacteriosis cases in 2011, reported by nine MSs (Figure CA2). Of these, on average 47.9 % of cases were hospitalised, ranging from 22 % to 60 % in different MSs, except the United Kingdom where 83.7 % of cases for which this information was provided (only 7.9 % of the United Kingdom cases) were hospitalised. In 2011, 43 deaths due to campylobacteriosis were reported by thirteen MSs, with the United Kingdom accounting for 34 of these. This results in an EU case fatality rate of 0.04 % among the 114,793 confirmed cases for which this information was provided (52.1 % of all reported cases).

Table CA2. Reported cases of human campylobacteriosis in 2007–2011 and notification rates for confirmed cases in the EU, 2011

Country	2011				2010	2009	2008	2007
	Report Type[1]	Cases	Confirmed Cases	Confirmed cases/ 100,000	Confirmed cases			
Austria	C	5,130	1,345	16.00	4,404	1,516	4,280	5,822
Belgium	C	7,716	7,716	70.46	6,047	5,697	5,111	5,895
Bulgaria	A	73	73	0.97	6	26	19	38
Cyprus	C	62	62	7.71	55	37	23	17
Czech Republic	C	18,811	18,743	177.95	21,075	20,259	20,067	24,137
Denmark	C	4,060	4,060	73.01	4,037	3,353	3,470	3,868
Estonia	C	214	214	15.97	197	170	154	114
Finland	C	4,262	4,262	79.29	3,944	4,050	4,453	4,107
France	C	5,538	5,538	8.51	4,324	3,956	3,424	3,058
Germany	C	71,307	70,812	86.62	65,110	62,787	64,731	66,107
Greece	-[4]	-	-	-	-	-	-	-
Hungary	C	6,135	6,121	61.30	7,180	6,579	5,516	5,809
Ireland	C	2,435	2,433	54.30	1,660	1,810	1,752	1,885
Italy	C	468	468	0.77	457	531	265	676
Latvia	C	7	7	0.31	1	0	0	0
Lithuania	C	1,124	1,124	34.64	1,095	812	762	564
Luxembourg	C	704	704	137.54	600	523	439	345
Malta	C	220	220	52.68	204	132	77	91
Netherlands[2]	C	4,408	4,408	50.89	4,322	3,782	3,341	3,462
Poland	C	354	354	0.93	367	359	270	192
Portugal	-[4]	-	-	-	-	-	-	-
Romania	C	149	149	0.70	175	254	2	0
Slovakia	C	4,736	4,565	83.99	4,476	3,813	3,064	3,380
Slovenia	C	998	998	48.68	1,022	952	898	1,127
Spain[3]	C	5,469	5,469	47.40	6,340	5,106	5,160	5,331
Sweden	C	8,214	8,214	87.24	8,001	7,178	7,692	7,106
United Kingdom	C	72,150	72,150	115.44	70,298	65,043	55,609	57,849
EU Total		**224,744**	**220,209**	**50.28**	**215,397**	**198,725**	**190,579**	**200,980**
Iceland	C	123	123	38.62	55	74	98	93
Norway	C	3,005	3,005	61.07	2,682	2,848	2,875	2,836
Switzerland[5]	C	7,964	7,964	100.80	6,604	7,795	7,552	5,834

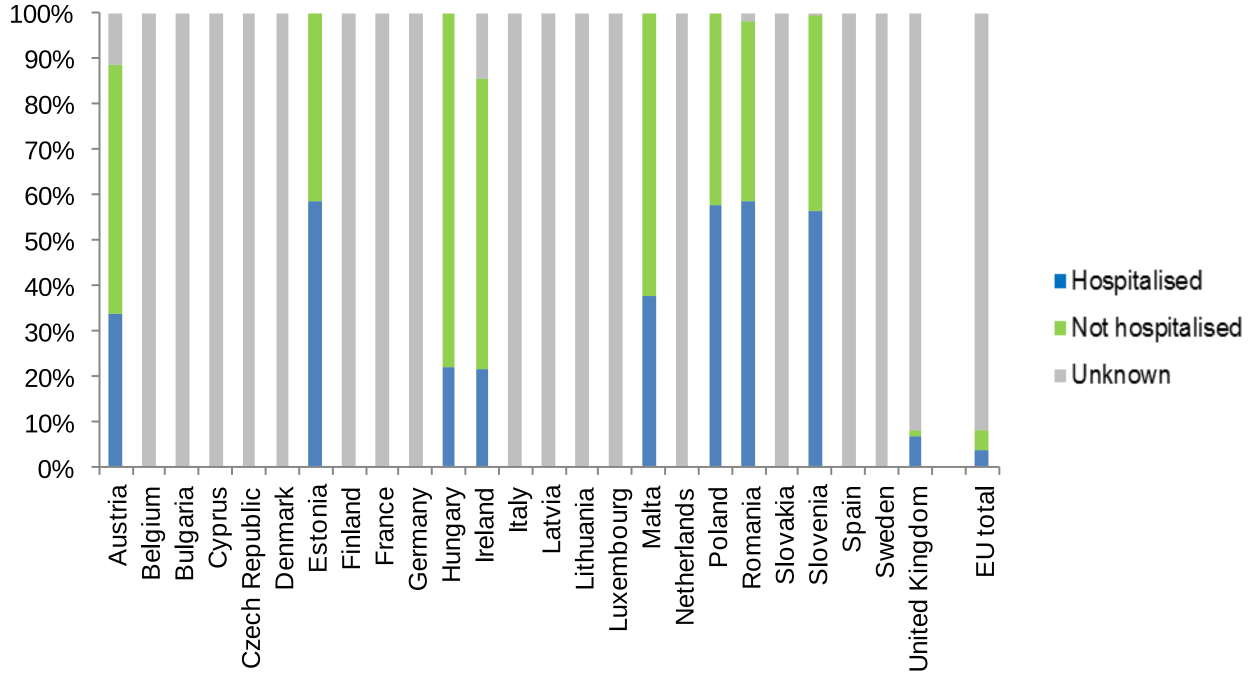
1. A: aggregated data report; C: case-based report; '–': no report.
2. Sentinel surveillance; notification rates calculated on estimated coverage 52 %.
3. Sentinel surveillance; notification rates calculated on estimated coverage 25 %.
4. No surveillance system.
5. Switzerland provided data directly to EFSA.

Figure CA1. Trend in reported confirmed cases of human campylobacteriosis in the EU, 2008-2011



Source: Data for EU trend 24 MSs: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, and United Kingdom. Bulgaria is excluded because only monthly data were reported.

Figure CA2. Proportion of reported confirmed cases of human campylobacteriosis hospitalised in the EU, 2011



3.2.2. *Campylobacter* in food

Twenty-one MSs and Switzerland reported data on *Campylobacter* in food in 2011 (Table CA1). The number of samples, within the food categories tested, ranged from a few to more than a thousand. Most of the MSs reported data on food of animal origin (Table CA3), primarily poultry meat, which is considered to be one of the major vehicles of *Campylobacter* infections in humans. In the following sections, only results based on 25 or more units tested are presented. Moreover, results from industry own-check programmes and HACCP sampling, as well as specified suspect sampling, selective sampling and outbreak investigations, have also been excluded owing to difficulties in the interpretation of the data. These data are presented in the Level 3 Tables.

Table CA3. Overview of countries reporting data on foodstuffs, 2011

Data	Total number of reporting MSs	Countries
Poultry meat[1]	19	**MSs:** AT, BE, DE, DK, EE, ES, HU, IE, IT, LT, LU, NL, PL, PT, RO, SK, SI, SE, UK **Non-MS:** CH
Pig meat	16	**MSs:** AT, BE, CZ, DE, ES, HU, IE, IT, LT, LU, NL, PL, PT, RO, SE, SK
Bovine meat	14	**MSs:** AT, BE, CZ, DE, ES, HU, IE, IT, LU, NL, PL, PT, SE, SK
Other types of meat[2]	13	**MSs:** AT, BE, CY, DE, ES, IE, IT, LT, LU, NL, PL, PT, SE
Milk and dairy products	9	**MSs:** AT, BE, DE, HU, IE, IT, NL, SE, SK
Other food[3]	11	**MSs:** AT, BE, CZ, DE, DK, ES, IE, IT, LT, SE, SK

Note: The overview table includes all data reported by MSs. In the following sections, data reported as HACCP and industry own-check programmes are not included in the detailed tables, and, unless stated otherwise, suspect sampling, selective sampling, and outbreak investigations are also excluded. Also, only countries reporting 25 samples or more have been included in the analysis.

1. Poultry meat includes broiler meat, turkey meat, and meat from ducks, geese, other poultry or unspecified poultry.
2. Other types of meat includes meat from horse, rabbit, sheep, mixed meat (including "meat from bovine animals and pigs"), red meat (meat from bovines, pigs, goats, sheep, horses, donkeys, bison and water buffalos) and meat from other animal species or unspecified.
3. Other food includes bakery products, non-alcoholic beverages, cereals and meals, confectionery products and pastes, crustaceans, egg products, eggs, fish, fishery products unspecified, fruits and vegetables, infant formula, live bivalve molluscs, molluscan shellfish, other food, other processed food products and prepared dishes, RTE salads, sauce and dressings, sprouted seeds, soups, spices and herbs, vegetables and water.

It is important to note that the results from the different countries are not directly comparable owing to the between-country variation in the sampling and testing methods used. Also, it should be taken into consideration that the proportion of positive samples observed may be influenced by the sampling season, as in many countries *Campylobacter* infections are known to be more prevalent during the summer than during the winter.

Fresh poultry meat

Broiler meat is considered to be the main food-borne source of human campylobacteriosis. In 2011, 13 MSs reported data on fresh broiler meat from investigations with 25 or more samples. Overall, 31.3 % of the samples (single or batch) were found to be positive in the reporting MSs. The occurrence of *Campylobacter* in fresh broiler meat sampled at slaughter, processing and at retail in 2011 is presented in Table CA4. As in previous years, the proportions of *Campylobacter*-positive broiler meat samples (single or batch), at any sampling level, varied widely among MSs, with the prevalence ranging from 3.2 % to 84.6 %. Notably, four MSs (Ireland, Luxembourg, Poland, and Spain) reported very high (>50 %) or extremely high proportions (>70 %) of positive samples.

At the slaughterhouse, Denmark, Hungary, Ireland, Poland and Spain reported testing of single carcases, with the proportion of positive samples ranging from 10.6 % in Denmark[25] to 72.1 % in Ireland. Belgium, Estonia and Germany reported testing of batches of carcases at slaughterhouse, with the proportion of positive batches ranging from 6.4 % in Estonia to 40.9 % in Germany.

In the five MSs reporting data on the testing of single samples at processing level, the prevalence of *Campylobacter*-positive samples ranged from 21.0 % in Portugal to 84.6 % in Luxembourg. Only Belgium reported data on batches at processing, with 13.9 % of positive batches out of the 711 tested.

At retail, eight MSs reported data on testing of single samples, with the proportion of *Campylobacter*-positive samples ranging from 22.8 % in the Netherlands to 82.7 % in Poland. Belgium and Romania reported data on the testing of broiler batches at retail, with a prevalence of 17.1 % and 22.9 %, respectively.

In 2011, several MSs also reported *Campylobacter* findings in fresh turkey meat and other poultry meat, excluding broiler meat, sampled at different stages in the production chain. For detailed information on the occurrence of *Campylobacter* in the different fresh meat categories refer to the Level 3 Tables.

25 Prevalence at two major slaughterhouses, representing >98 % of the total Danish production.

Table CA4. **Campylobacter *in fresh broiler meat, 2011***

Country	Description	Sample unit	Sample weight	2011		
				N	N pos	% pos
At slaughter						
Belgium	Carcase, neck skin	Batch	1 g	335	130	38.8
Denmark[1]	Fresh - chilled	Single	-	898	95	10.6
Estonia	Carcase, neck skin	Batch	25 g	47	3	6.4
Germany	Carcase, neck skin, domestic production	Batch	25 g	337	138	40.9
Hungary	Carcase, meat	Single	25 g	31	9	29.0
Ireland[2]	Carcase	Single	25 g	68	49	72.1
Poland	Carcase, carcase swab	Single	-	405	226	55.8
Spain	Carcase, meat	Single	-	138	76	55.1
At processing plant or cutting plant						
Belgium	Fresh, meat	Batch	1 g	711	99	13.9
Hungary	Fresh, meat	Single	25 g	193	90	46.6
Luxembourg	Fresh, meat	Single	10 g	26	22	84.6
Netherlands	Fresh, meat	Single	25 g	180	62	34.4
Portugal	Fresh	Single	25 g	81	17	21.0
Spain	Fresh, meat	Single	-	69	26	37.7
At retail						
Belgium	Fresh, meat	Batch	-	403	69	17.1
Denmark[1]	Fresh - chilled, domestic production	Single	-	829	279	33.7
	Fresh - frozen, domestic production	Single	-	428	129	30.1
Germany	Fresh meat, surveillance	Single	25 g	1096	343	31.3
	Fresh, meat, monitoring	Single	25 g	402	127	31.6
Hungary	Fresh, meat	Single	25 g	206	85	41.3
Ireland	Fresh, meat	Single	25 g	291	154	52.9
Luxembourg	Fresh, meat	Single	10 g	49	23	46.9
Netherlands	Fresh, meat	Single	25 g	500	114	22.8
Poland	Fresh, meat	Single	10 g	110	91	82.7
Romania	Fresh, meat	Batch	25 g	485	111	22.9
Spain	Fresh, meat	Single	-	260	197	75.8
Sampling level not stated						
Austria	Fresh, domestic production	Single	25 g	279	9	3.2
EU Total (13 Member States)				**8,857**	**2,773**	**31.3**

Note: Data presented include only investigations with sample size ≥25. Only data specified as fresh or carcase are included.
1. Denmark: sample weight is in all cases 10 g or 15 g.
2. Ireland: sample weight is most usually 25 g but occasionally there are other sample weights recorded (range from 10 g – 26 g).

Other findings in food

In 2011, seven and four MSs reported data on the occurrence of *Campylobacter* in pig meat and bovine meat, respectively, sampled at different stages in the production chain. However, *Campylobacter* was only infrequently detected in fresh pig and bovine meat. Positive samples were also infrequently reported from RTE minced meat, meat preparations and meat products.

In addition, several MSs tested other food categories for the presence of *Campylobacter*. Some positive findings were reported by two MSs in samples from cheeses, milk, and other dairy products excluding cheeses. Few MSs have also infrequently reported positive samples from fishery products, fruit and vegetables, spices and herbs, as well as other processed food products and prepared dishes.

Refer to the Level 3 Tables for detailed information on the data reported and on the occurrence of *Campylobacter* in the different food categories.

3.2.3. *Campylobacter* in animals

In 2011, 19 MSs and three non-MSs reported data on *Campylobacter* in animals (Table CA1), primarily in broiler flocks, but also in pigs, cattle and to some extent in goats, sheep and pets (Table CA5). In the following sections, only results based on 25 or more units tested are presented. Moreover, results from industry own-check programmes and HACCP sampling, as well as results from clinical investigations, specified suspect sampling, selective sampling and outbreak investigations, have also been excluded owing to difficulties in the interpretation of the data. These data are, however, presented in the Level 3 Tables.

Table CA5. Overview of countries reporting animal data, 2011

Data	Total number of reporting MSs	Countries
Poultry[1]	16	**MSs:** AT, CZ, DE, DK, EE, ES, FI, IE, IT, LV, NL, RO, SE, SI, SK, UK **Non-MSs:** CH, IS, NO
Pigs	9	**MSs:** DE, ES, IE, IT, LV, NL, RO, SK, UK **Non-MS:** CH
Cattle	12	**MSs:** AT, DE, ES, IE, IT, LU, LV, NL, PL, RO, SK, UK **Non-MSs:** CH, NO
Sheep and goats	7	**MSs:** DE, IE, IT, NL, RO, SK, UK **Non-MSs:** CH, NO
Pets[2]	8	**MSs:** DK, EE, IT, LV, NL, RO, SK, UK **Non-MSs:** CH, NO
Other animals	10	**MSs:** DE, DK, IE, IT, LV, NL, PL, PT, SK, UK **Non-MSs:** CH, NO

Note: The overview table includes all data reported by MSs. In the following sections, data reported as HACCP and industry own-check programmes are not included in the detailed tables, and, unless stated otherwise, suspect sampling, selective sampling, and outbreak or clinical investigations are also excluded. Also, only countries reporting 25 samples or more have been included in the analysis.

1. Poultry includes ducks, *Gallus gallus* (fowl), other poultry, pigeons, poultry unspecified, quails and turkeys.
2. Pets include cats, dogs, canaries, birds, ferrets, turtles, and all animals specified as “pet animals”.

It should be noted that results are not directly comparable between countries and sometimes within countries and between years owing to differences in sampling and testing schemes, as well the impact of the season of sampling.

Broilers and other poultry

In 2011, 10 MSs and three non-MSs provided information on the occurrence of *Campylobacter* in broiler flocks, batches or individual animals based on a sample size ≥25 (Table CA6). In three of the four MSs reporting flock-based data, the reported prevalence was very high (≥60 %) to extremely high (≥80 %). The occurrence of *Campylobacter* varied widely among the six MSs reporting slaughter batch-based data, with prevalence ranging from 0 % to 92.0 %. The only MS reporting animal-based data was Romania, and the prevalence was 96.1 % (out of 102 units tested).

Denmark, Sweden, and Norway reported the highest numbers of broiler flocks tested, while Finland reported the highest number of slaughter batch-based data. These four countries have a *Campylobacter* control or monitoring programme in place. They reported a low to moderate prevalence. In Slovenia, the same number (100) of faecal and skin samples was tested, leading to a prevalence of 77.0 % and 92.0 %, respectively.

Finland provided information on different sampling periods and reported a higher *Campylobacter* prevalence in slaughter animal batches sampled during June–October (3.1 %) than in those sampled during January–May and November–December (2.7 %).

In 2011, a survey of broilers slaughtered in small-scale abattoirs was performed in Sweden using the same sampling strategy as in the Swedish *Campylobacter* official monitoring programme that covers 99 % of slaughtered broilers (from seven abattoirs, all belonging to the Swedish Poultry Meat Association). At the flock level, the occurrence of *Campylobacter* in samples from small-scale abattoirs (60.1 %) was much higher than in samples collected within the framework of the official monitoring programme (12.8 %).

Table CA6. Campylobacter *in broilers,*[1] *2011*

Country	Description	2011 N	2011 N pos	2011 % pos
Broilers (flock-based data)				
Czech Republic[2]	At slaughterhouse, caecum, monitoring, official sampling	145	92	63.4
Denmark[3]	At farm (before slaughter), boot swabs, control and eradication programmes	3,379	487	14.4
Ireland	At slaughterhouse, caecum, domestic production, monitoring	201	162	80.6
Sweden	At slaughterhouse, domestic production, monitoring	2,788	357	12.8
	At slaughterhouse, domestic production, small scale slaughterhouses, national survey	143	86	60.1
Total flock-based (4 MSs)		**6,656**	**1,184**	**17.8**
Norway[4]	At farm (before slaughter), faeces, surveillance	2,282	139	6.1
Iceland[3]	At farm, faeces, monitoring	628	33	5.3
Broilers (slaughter batch-based data)				
Austria[5]	At slaughterhouse, cloacal swab, domestic production, monitoring-active, official sampling	342	165	48.2
Estonia[6]	At slaughterhouse, caecum, monitoring, official sampling	47	0	0
Finland[7]	At slaughterhouse, caecum, sampling between June-October, control and eradication programmes, industry sampling	1,486	46	3.1
	At slaughterhouse, caecum, sampling in January-May and November-December, control and eradication programmes, industry sampling	333	9	2.7
Germany	At slaughterhouse, caecum, domestic production, monitoring	331	83	25.1
Slovenia[8]	At slaughterhouse, faeces, monitoring	100	77	77.0
	At slaughterhouse, neck skin, monitoring	100	92	92.0
Spain	At slaughterhouse, cloacal swab, monitoring	237	162	68.4
Total slaughter batch-based (6 MSs)		**2,976**	**634**	**21.3**
Iceland[9]	At slaughterhouse, caecum, domestic production, monitoring	695	60	8.6
Switzerland[10]	At slaughterhouse, cloacal swab, monitoring, official sampling	445	166	37.3

Note: Data are presented include only investigations with sample sizes ≥25.
1. One MS, Romania, also reported animal-based data, with 96.1 % of positive broilers out of 102 birds tested.
2. In the Czech Republic, sampling was carried out once a month.
3. Every flock is sampled.
4. In Norway, sampling was performed between 1 May and 31 October.
5. In Austria, the randomised sampling was carried out throughout the whole year.
6. In Estonia, sampling was distributed evenly throughout the year.
7. In Finland, between June and October, all broiler slaughter batches were sampled and examined for thermophilic Campylobacter. Between January and May, as well as in November-December random samples were taken according to a specific sampling plan.
8. In Slovenia, sampling was carried out from May to 31 December 2011.
9. Every batch is sampled.
10. In Switzerland, data originate from the antimicrobial resistance monitoring.

Campylobacter-positive findings were also reported in laying hens of *Gallus gallus*, as well as in other poultry species, including turkeys and ducks. For detailed information on the occurrence of *Campylobacter* in the different poultry species refer to the Level 3 Tables.

Other animals

In 2011, only few countries reported data on animals other than poultry. Two and five MSs reported *Campylobacter*-positive findings in pigs and cattle, respectively. In addition, two MSs reported positive samples in sheep and goats, while only one MS reported positive findings in cats and dogs. *Campylobacter*-positive samples from foxes and other unspecified wild animals were also reported by one MS.

Refer to the Level 3 Tables for detailed information on the data reported and on the occurrence of *Campylobacter* in the different animal species.

3.2.4. Discussion

Campylobacteriosis continued to be the most commonly reported zoonosis in humans in the EU since 2005. In 2011, the number of notified cases of thermotolerant *Campylobacter* in the EU increased by 2.2 % compared with 2010. The EU notification rate of confirmed cases of human campylobacteriosis has shown a statistically significant increasing trend in the last four years (2008–2011). The reasons for this increasing trend are not completely understood at present. One possible explanation might be more focused surveillance and/or greater awareness of human campylobacteriosis because of a decrease in human salmonellosis. Owing to the characteristics of this multi-host pathogen and its prevalence in the environment, where climate factors may play an important role, it is difficult to understand all aspects of its epidemiology and the possible reasons for the increase in human cases.

Considering the high number of campylobacteriosis cases, the severity in terms of fatalities reported was low (0.04 %). The proportion of hospitalised cases was, on the other hand, larger than expected taking into account the fact that the symptoms are often relatively mild. For countries that report on the hospitalisation status for only a small fraction of cases, it is likely that this information is skewed towards hospitalised cases. For some other countries, the reason might be that the surveillance is focused on the diagnosis of severe cases. It should be noted that the surveillance of campylobacteriosis varies between countries and is based on voluntary reporting in seven of 25 reporting MSs. The sources of information (laboratories, physicians, hospitals) also vary between surveillance systems and comparisons of notification rates should therefore be made with caution.

Broiler meat is considered to be a major source of human campylobacteriosis, as a result of undercooking and cross-contamination of RTE foods, as well as through direct hand-to-mouth transfer during food preparation. The EFSA's Panel on Biological Hazards (BIOHAZ) concluded in its scientific opinion[26] that handling, preparation and consumption of broiler meat may account for 20 % to 30 % of human campylobacteriosis cases in the EU, while 50 % to 80 % may be attributed to the chicken reservoir as a whole. *Campylobacter* strains from the broiler reservoir may also be transmitted to humans via routes other than food (e.g. via the environment or by direct contact). The principal reservoirs of *Campylobacter* spp. are the alimentary tracts of wild and domesticated birds and mammals. There are multiple pathways of human exposure, and a meta-analysis of case-control studies suggests a variety of risk factors including travelling, animal contact, food, untreated drinking water and surface water.

In 2011, fresh broiler and other poultry meat were again the foodstuffs in which *Campylobacter* was most frequently reported. Overall, about one third of the samples were reported as positive, although there were large differences between the MSs.

The importance of broiler meat as a source of human *Campylobacter* infections was also illustrated by the reported food-borne outbreak data from 2011. Approximately half (17 out of 37) of the *Campylobacter* outbreaks, in which information on the implicated food vehicle was provided, were linked to broiler meat. In five of the outbreaks the implicated food vehicle was milk and, out of these, three outbreaks were attributed to raw or insufficiently heated milk, indicating the importance of risks related to consuming unpasteurised milk. The risk of campylobacteriosis and other diseases associated with the consumption of raw milk has been well documented.[27,28,29]

As in previous years, most MSs reported a high to extremely high prevalence of *Campylobacter* in broiler flocks. Low to moderate prevalence was reported by the Nordic countries and Estonia.

26 EFSA (European Food Safety Authority), 2010. Scientific Opinion of Panel on Biological Hazards (BIOHAZ) on Quantification of the risk posed by broiler meat to human campylobacteriosis in the EU. EFSA Journal 2010, 8(1):1437, 89 pp.

27 Heuvelink A E, Heerwaarden C van, Zwartkruis-Nahuis A, Tilburg J J H C, Bos M H, Heilmann F G C, Hofhuis A, Hoekstra T and de Boer E, 2009. Two outbreaks of campylobacteriosis associated with the consumption of raw cow's milk. International Journal of Food Microbiology, 134, 70-74.

28 Schoder D, Zangana A and Wagner M, 2010. Sheep and goat raw milk consumption: a hygienic matter of concern? Archiv für Lebensmittelhygiene, 61, 229-234.

29 Amato S, Maragno M, Mosele P, Sforzi M, Mioni R, Barco L, Pozza M, Antonello K and Ricci A, 2007. An outbreak of *Campylobacter jejuni* linked to the consumption of raw milk in Italy. Zoonoses and public health, 54 (Suppl 1), 23.

3. INFORMATION ON SPECIFIC ZOONOSES AND ZOONOTIC AGENTS

3.3. *Listeria*

The bacterial genus *Listeria* currently comprises 10 species (two new species described in 2012[30,31]), but human cases of listeriosis are almost exclusively caused by the species *Listeria monocytogenes* (*L. monocytogenes*). Listeria species are ubiquitous organisms that are widely distributed in the environment, especially in plant matter and soil. The principal reservoirs of Listeria are soil, forage and water. Other reservoirs include infected domestic and wild animals. The main route of transmission to both humans and animals is believed to be through consumption of contaminated food or feed. The bacterium can be found in raw foods and in processed foods that are contaminated after processing. Although rare, infection can also be transmitted directly from infected animals to humans as well as between humans. Cooking at temperatures higher than 65 °C destroys *Listeria*, but the bacteria are known to multiply at temperatures as low as +2/+4°C, which makes presence of *Listeria* in RTE foods with a relatively long shelf-life of particular concern.

In humans severe illness mainly occurs in developing fetuses, newborn infants, the elderly and those with weakened immune systems. Symptoms vary, ranging from mild flu-like symptoms and diarrhoea to life-threatening infections characterised by septicaemia and meningoencephalitis. In pregnant women the infection can spread to the fetus, leading to severe illness at birth or death in the uterus, resulting in abortion. Illness is often severe with high hospitalisation and mortality rates. Human infections are rare yet important, given the associated high mortality rate. These organisms are among the most important causes of death from food-borne infections in industrialised countries.

In domestic animals (especially sheep and goats) clinical symptoms of listeriosis include encephalitis, abortion, mastitis or septicaemia. However, animals may commonly be asymptomatic intestinal carriers and shed the organism in significant numbers, contaminating the environment.

Table LI1 presents the countries that have reported data on *L. monocytogenes* for 2011.

Table LI1. Overview of countries reporting* L. monocytogenes *data, 2011

Data	Total number of reporting MSs	Countries
Human	26	**All MSs** except PT **Non-MSs:** CH, IS, NO
Food	25	**All MSs** except FI, MT **Non-MSs:** CH, NO
Animals	13	**MSs** DE, EE, ES, FI, GR, IE, IT, LV, NL, PL, PT, SK, UK **Non-MSs:** CH, NO

3.3.1. Listeriosis in humans

In 2011, 26 MSs reported 1,476 confirmed human cases of listeriosis (Table LI2). This represented a 7.8 % decrease compared with 2010. The overall EU notification rate was 0.32 cases per 100,000 population with the highest country-specific notification rates observed in Denmark, Finland and Spain (0.88, 0.80 and 0.79 cases per 100,000 population, respectively). The lowest notification rates were reported in Romania, Bulgaria and Greece (0.04, 0.05 and 0.08 cases per 100,000 population, respectively).

There was no statistically significant EU trend in listeriosis cases between 2008 and 2011 when reported cases were analysed by week (Figure LI1). There was a seasonal trend, particularly evident in 2009 and 2010 (Figure LI1). No country-specific decreasing trends were observed and, for several countries, too few

30 Bertsch D, Rau J, Eugster M R, Haug M C, Lawson P A, Lacroix C and Meile L, 2012. *Listeria fleischmannii* sp. nov., isolated from cheese. International Journal of Systematic and Evolutionary Microbiology. Published online ahead of print 20 April 2012, doi: 10.1099/ijs.0.036947-0.

31 Lang Halter E, Neuhaus K and Scherer S, 2012. *Listeria weihenstephanensis* sp. nov., isolated from the water plant *Lemna trisulca* of a German fresh water pond. International Journal of Systematic and Evolutionary Microbiology. Published online ahead of print 27 April 2012, doi: 10.1099/ijs.0.036830-0.

cases were reported for a trend analysis to be possible. Significant increasing trends in listeriosis cases were observed in the Netherlands and in Poland.

Data on hospitalisation for listeriosis have been collected in the case-based reporting in TESSy for the last two years. Sixteen MSs provided this information for all or the majority of their cases, representing 43.7 % of all confirmed cases reported in the EU in 2011 (Figure LI2). On average, 93.6 % of the cases were hospitalised and, in 10 MSs, this proportion was 100 %. This is the highest hospitalisation of all zoonoses under EU surveillance and reflects the focus of surveillance on severe, systemic infections.

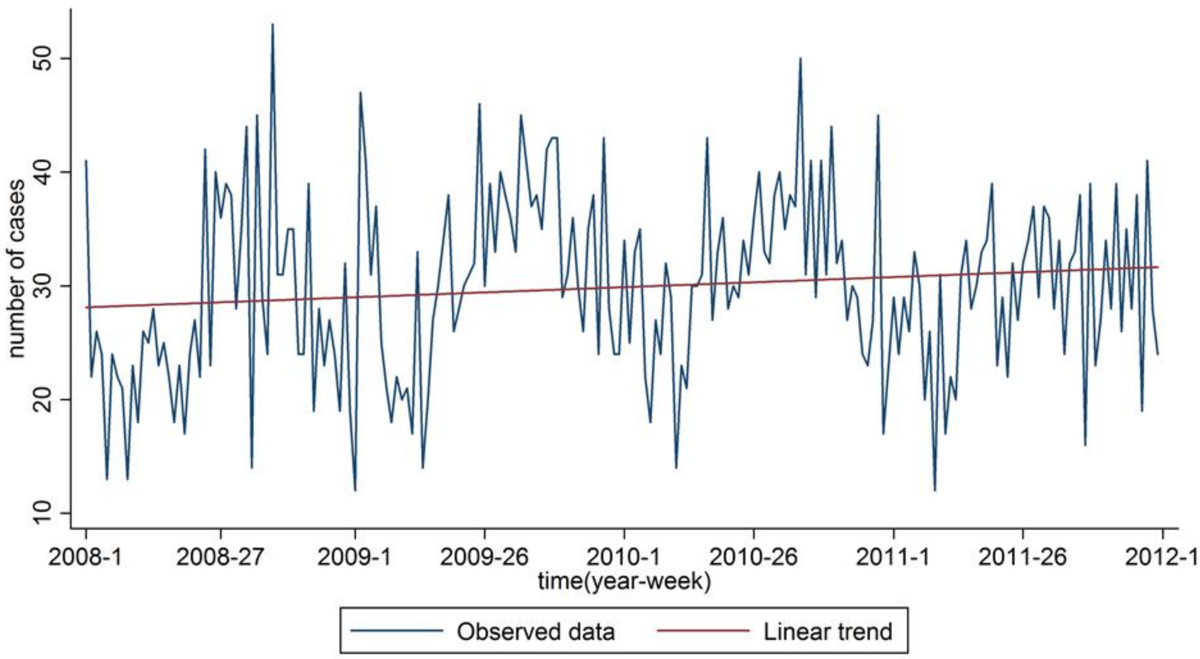
A total of 134 deaths due to listeriosis were reported by nineteen MSs in 2011. Twelve of these MSs reported one or more fatal case with France reporting the highest number, 46 cases. The EU case fatality rate was 12.7 % among the 1,054 confirmed cases for which this information was reported (71.4 % of all confirmed cases).

Table LI2. Reported cases of human listeriosis in 2007-2011, and notification rate for confirmed cases in the EU, 2011

Country	2011				2010	2009	2008	2007
	Report Type[1]	Cases	Confirmed Cases	Confirmed cases/ 100,000	Confirmed cases			
Austria	C	26	26	0.31	34	46	31	20
Belgium	C	70	70	0.64	40	58	64	57
Bulgaria	A	4	4	0.05	4	5	5	11
Cyprus	C	2	2	0.25	1	0	0	0
Czech Republic	C	35	35	0.33	26	32	37	51
Denmark	C	49	49	0.88	62	97	51	58
Estonia	C	3	3	0.22	5	3	8	3
Finland	C	44	43	0.80	71	34	40	40
France	C	282	282	0.43	312	328	276	319
Germany	C	337	330	0.40	377	394	306	356
Greece	C	9	9	0.08	10	4	1	10
Hungary	C	11	11	0.11	20	16	19	9
Ireland	C	7	7	0.16	10	10	13	21
Italy	C	83	83	0.14	95	88	118	89
Latvia	C	7	7	0.31	7	4	5	5
Lithuania	C	6	6	0.18	5	5	7	4
Luxembourg	C	2	2	0.39	0	3	1	6
Malta	C	2	2	0.48	1	0	0	0
Netherlands	C	87	87	0.52	72	44	45	68
Poland	C	62	62	0.16	59	32	33	43
Portugal	-[2]	-	-	-	-	-	-	-
Romania	C	9	9	0.04	6	6	0	0
Slovakia	C	31	31	0.57	5	10	8	9
Slovenia	C	5	5	0.24	11	6	3	4
Spain[3]	C	91	91	0.79	129	121	88	82
Sweden	C	56	56	0.59	63	73	60	56
United Kingdom	C	164	164	0.26	176	235	206	260
EU Total		**1,484**	**1,476**	**0.32**	**1,601**	**1,654**	**1,425**	**1,581**
Iceland	C	1	1	0.31	1	0	0	4
Norway	C	21	21	0.43	22	31	34	49
Switzerland[4]	C	47	47	0.70	67	41	43	51

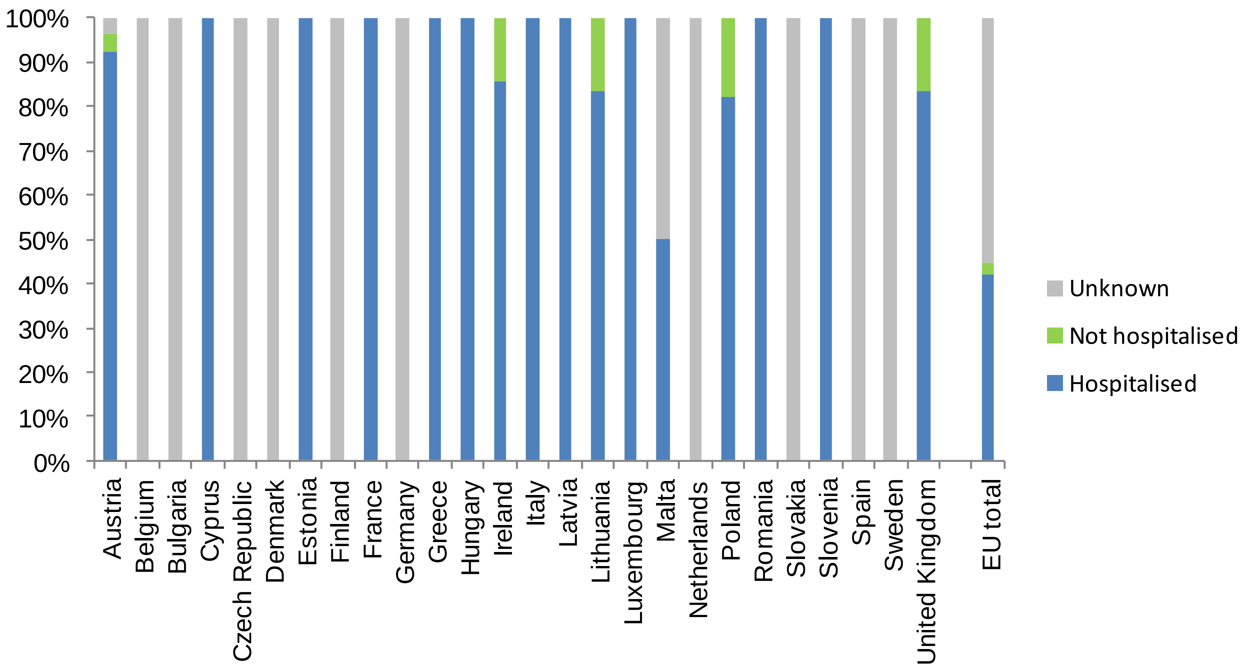
1. A: aggregated data report; C: case-based report; –: no report.
2. No surveillance system.
3. Sistema de Informacion Microbiologica (SIM), notification rates calculated on estimated coverage, 25 %.
4. Switzerland provided data directly to EFSA.

Figure LI1. Trend in reported confirmed cases of human listeriosis in the EU, 2008-2011



Source: TESSy data from 25 MSs: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, and United Kingdom. Bulgaria excluded since only monthly data were reported.

Figure LI2. Proportion of hospitalisation of reported confirmed cases of human listeriosis in the EU, 2011



3.3.2. *Listeria* in food

EU legislation (Regulation (EC) No 2073/2005) lays down food safety criteria for *L. monocytogenes* in RTE foods. This regulation came into force in January 2006, and the criteria laid down are described below. Data reported reflect the Regulation and investigations have therefore focused on testing RTE foods for compliance within these limits.

In 2011, 25 MSs and two non-MSs reported data on *Listeria* in food. These data cover a substantial number of food samples and food categories. The data presented in this section focus on RTE foods, in which *L. monocytogenes* was detected either by qualitative (absence or presence) or quantitative (enumeration) investigations (findings of *L. monocytogenes* exceeding 100 cfu/g) or both.

Compliance with microbiological criteria

In total, 24 MSs and Switzerland reported data that were included in the evaluation of compliance with microbiological criteria (Table LI3 and Figure LI3).

A wide range of different foodstuffs can be contaminated with *L. monocytogenes*. For a healthy human population, foods not exceeding the level of 100 cfu/g are considered to pose a negligible risk. Therefore, the EU microbiological criterion for *L. monocytogenes* in RTE food is set as ≤100 cfu/g for RTE products on the market.

The reported results of *L. monocytogenes* testing in RTE food samples were interpreted according to the microbiological criteria indicated in EU legislation and applying certain assumptions where appropriate.

Regulation (EC) No 2073/2005 covers primarily RTE food products, and requires that:

- In RTE products intended for infants and for special medical purposes *L. monocytogenes* must not be present in 25 g.
- *L. monocytogenes* must not be present in levels exceeding 100 cfu/g during the shelf-life of other RTE products.
- In RTE foods that are able to support the growth of the bacterium, *L. monocytogenes* may not be present in 25 g at the time of leaving the production plant; however, if the producer can demonstrate, to the satisfaction of the competent authority, that the product will not exceed the limit of 100 cfu/g throughout its shelf-life this criterion does not apply.
- In the case of RTE foods that are able to support the growth of *L. monocytogenes*, the microbiological criterion to be applied depends on the stage in the food chain and whether the producer has demonstrated that *L. monocytogenes* will not multiply to levels exceeding 100 cfu/g throughout the shelf-life.

For many of the reported data, it was not evident whether the RTE food tested was able to support the growth of *L. monocytogenes* or not. This information is difficult to collect as the ability of a product to support growth is dependent on various factors such as the pH, water activity and composition of the specific product, which can vary even within the same food category. Also, information from studies, carried out by the producers, on the growth capacity of *L. monocytogenes* in individual products was not available. Furthermore, in some cases, it was not possible to establish the stage in the production chain from which samples were collected.

For the reasons described above, the following assumptions were applied to the analyses:

- For samples reported to be taken at processing, a criterion of absence in 25 g was applied for single samples. Samples from hard cheeses and fermented sausages are an exception, as these categories are assumed to be unable to support the growth of *L. monocytogenes*. For these samples the limit ≤ 100 cfu/g was applied at processing.
- For all investigations, for which the sampling stage was not reported, it was assumed that samples were collected from products placed on the market, and the criterion ≤100 cfu/g was applied.
- For food intended for infants and special medical purposes the criterion, “absence in 25 g”, was applied throughout the food chain.

- Samples collected at farm level are reported separately but compliance is evaluated with the criteria stated for the processing plant level.
- Unspecified cheeses were reported separately but compliance was evaluated with criteria applied for soft and semi-soft cheeses.

Data reported on *L. monocytogenes* in food were aggregated at MS level according to the food categories listed in Table LI3. This included MSs' investigations with fewer than 25 samples.

Samples reported as HACCP or own controls were not included for analysis. Also data from suspect and selective sampling and from outbreak or clinical investigations were not included, unless stated differently in footnotes of Table LI3. Imported samples have been included in the analysis. The results from qualitative examinations have been used to analyse the compliance with the criterion "absence in 25 g" (unless stated otherwise), and the results from quantitative analyses have been used to analyse compliance with the limit 100 cfu/g.

The number of samples not complying with the *L. monocytogenes* criteria is shown in Table LI3. For RTE products on the market, very low proportions of samples were generally found not to comply with the criterion of ≤100 cfu/g. However, higher levels of non-compliant samples were reported in samples analysed using the detection method (absence in 25 g) for RTE products at the processing stage.

RTE products at processing and farm level

The highest level of non-compliance in single food samples at processing was observed in RTE fishery products (6.7 %), while the percentage of non-compliance for this food category at the batch level was 2.3 %.

In cheeses sampled at processing, the highest level of non-compliance was in unspecified cheeses: 2.1 % in single samples and 5.4 % in batches. This food category covered investigations not providing information on whether the cheese was soft, semisoft or hard. In soft and semi-soft cheeses, the proportion of samples not complying with the *L. monocytogenes* criterion was 0.5 % in single samples and 0.8 % in batch samples, while in hard cheeses collected at processing, all samples met the criterion.

In RTE milk samples collected at processing plants the proportion of non-compliance was 0.2 % in single samples, whereas it was higher, 3.7 %, for such samples collected at the farm. The samples at the farm level were mainly from raw milk intended for direct human consumption. The proportion of non-compliance in other dairy products for single samples at processing was <0.1 % and 1 % at farm level, where the numbers of samples were limited.

Among samples from RTE products of meat origin, other than fermented sausages at processing, the non-compliance was 2.4 % for single samples and 0.8 % when batches were sampled. In the case of fermented sausages 1.0 % were found not to meet the *L. monocytogenes* criterion at processing. Some non-compliance was also detected in the food category "other RTE products", at levels of 1.6 % and 0.8 % for single and batch samples, respectively.

RTE products at retail level

At retail the highest proportions of non-compliant samples were reported for hard cheeses (0.1 % in single samples and 1.6 % in batches), fermented sausages (0.6 % in single samples), RTE fishery products (0.6 % in single samples and 0.2 % in batches) and soft and semi-soft cheeses (0.6 % in batches). Lower levels of non-compliance with the *L. monocytogenes* criteria were observed in RTE products of meat origin other than fermented sausages (0.2 % and 0.1 % in single and batch samples, respectively).

In RTE milk, unspecified cheeses, dairy products other than cheeses, and other RTE products, no or very few samples were not compliant with the criterion.

Figure LI3 presents the proportions of non-compliance of single samples of selected RTE foods in 2006-2011.

All data submitted by MSs and other reporting countries are presented in the Level 3 Tables.

Table LI3.Compliance with the* L. monocytogenes *criteria laid down by Regulation (EC) No 2073/2005 in food categories in the EU, 2011

Food category[1]	Sampling unit	Absence in 25 g[2]		≤100 cfu/g	
		Units tested	% non-compliant	Units tested	% non-compliant
RTE food intended for infants and for medical purposes					
Processing plant	Single	75	0		
Retail	Single	658	0		
	Batch	601	0		
RTE products of meat origin other than fermented sausage					
Processing plant	Single	18,451	2.4		
	Batch	5,503	0.8		
Retail	Single			13,485	0.2
	Batch			3,168	0.1
RTE products of meat origin, fermented sausage					
Processing plant	Single			615	1.0
Retail	Single			1,768	0.6
Milk, RTE					
At farm[3]	Single	1,421	3.7		
Processing plant	Single	1,890	0.2		
	Batch	562	0.4		
Retail	Single			1,810	0.1
	Batch			49	0
Soft and semi-soft cheeses, RTE					
At farm	Batch	83	1.2		
Processing plant	Single	3,941	0.5		
	Batch	5,268	0.8		
Retail	Single			4,381	<0.1
	Batch			2,705	0.6
Hard cheeses, RTE					
Processing plant	Single			5,897	0
	Batch			2,965	0
Retail	Single			1,399	0.1
	Batch			737	1.6
Unspecified cheeses, RTE					
At farm	Single	157	0		
	Batch	54	0		
Processing plant	Single	1,691	2.1		
	Batch	349	5.4		
Retail	Single			4,598	<0.1
	Batch			393	0
	Batch			1,034	0

Table continued overleaf.

Table LI3 (continued).Compliance with the* L. monocytogenes *criteria laid down by Regulation (EC) No 2073/2005 in food categories in the EU, 2011

Food category[1]	Sampling unit	Absence in 25 g[2]		≤100 cfu/g	
		Units tested	% non-compliant	Units tested	% non-compliant
Other Dairy products, RTE					
At farm	Single	100	1.0		
	Batch	328	0.3		
Processing plant	Single	5,418	<0.1		
	Batch	3,359	0.7		
Retail	Single			5,110	0
	Batch			1,034	0
Fishery products, RTE					
Processing plant	Single	13,578	6.7		
	Batch	751	2.3		
Retail	Single			4,535	0.6
	Batch			821	0.2
Other RTE products					
Processing plant	Single	879	1.6		
	Batch	1,609	0.8		
Retail	Single			14,278	<0.1
	Batch			3,436	0

Note: RTE: ready-to-eat products.

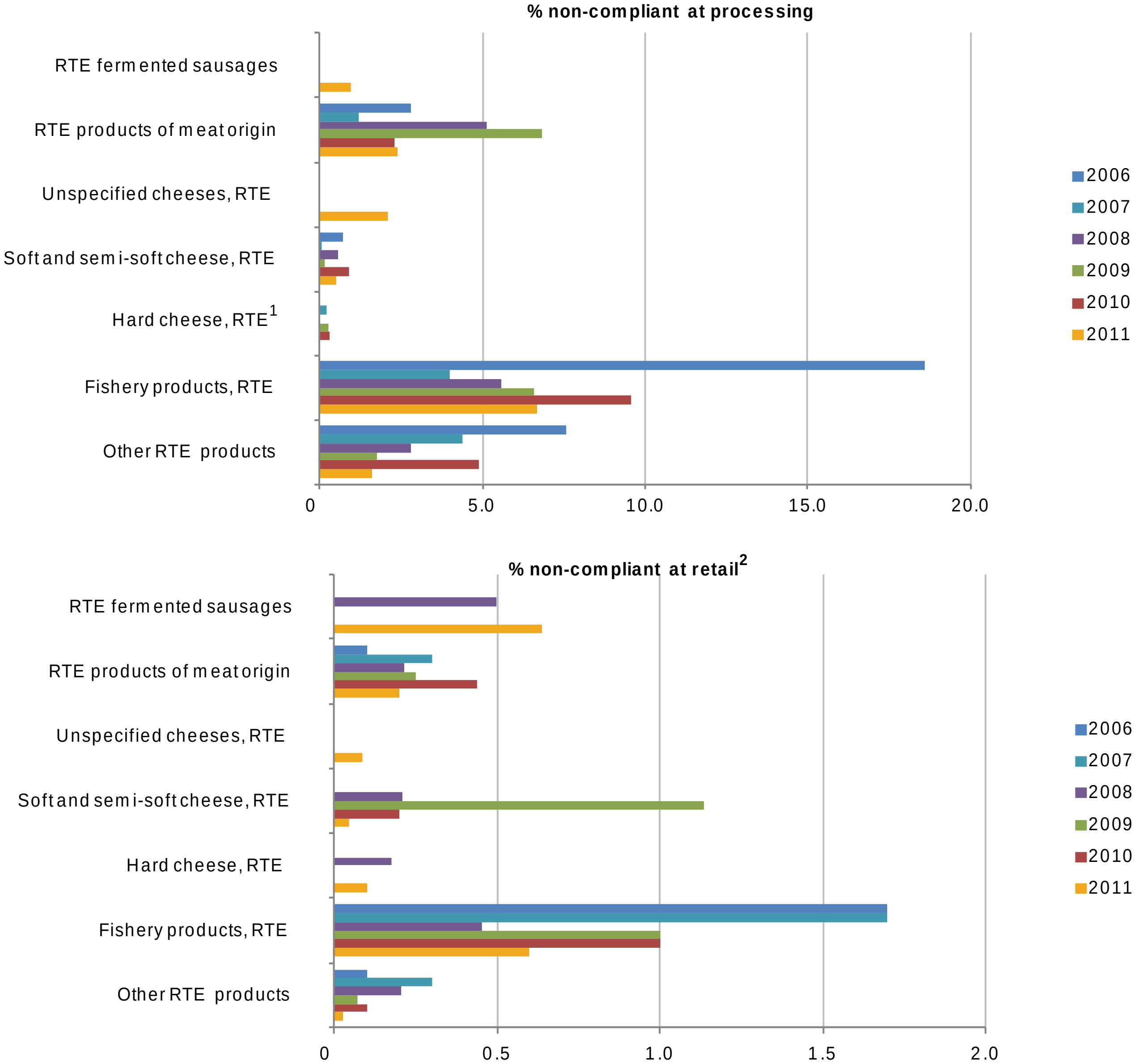
Soft and semi-soft cheeses at farm, or at processing plant, or at retail, include data on fresh cheeses.

Data reported by Denmark for samples collected under 'selective sampling for compliance evaluation' are included.

Germany reported data on food samples tested by standard microbiologic test. These samples were assumed to be tested for *Listeria* detection if no information was provided for the variable 'quantity'.

1. Retail include data with "unspecified" sampling stage.
2. Data reported for detection method from single sample unit and sample weight less than 25 g were excluded.
3. RTE milk sampled at farm level originates solely from Italy.

Figure LI3. Proportion of single samples at processing and retail non-compliant with EU **L. monocytogenes** ***criteria, 2006–2011***



Note: RTE: ready-to-eat products.

For 2011 investigations covering fewer than 25 samples are also included. For previous years, data are presented only for samples sizes ≥25.

1. In 2006, there were no investigations with 25 samples or more reporting results for evaluation of non-compliance in hard cheese at the processing plant.
2. Retail include data with “unspecified” sampling stage.

3.3.3. Discussion

Human listeriosis is a relatively rare but serious zoonotic disease, with high morbidity, hospitalisation and mortality in vulnerable populations. In 2011, 1,476 confirmed human cases were reported in the EU, which was a 7.8 % decrease compared with 2010 (1,601). There was no EU-level trend in cases reported by week during 2008–2011. At country level significant increasing trends were observed in two MSs. Of all the zoonotic diseases under EU surveillance, listeriosis caused the most severe human disease with 93.6 % of the cases hospitalised and 134 fatal cases (case fatality rate 12.7 %). This also reflects the focus of EU surveillance on severe, systemic infections.

In 2011, three strong-evidence food-borne outbreaks caused by *L. monocytogenes* were reported by the MSs; two were general and one was a household outbreak (for further information, see the foodborne outbreaks chapter four). One general *Listeria* outbreak involved 11 human cases, all admitted to hospital and resulting in four fatalities. The food vehicle was identified as domestically produced cheese. The other two *Listeria* outbreaks involved five persons in total (all admitted to hospital) and were linked to bakery products and mixed food.

A wide range of different foodstuffs can be contaminated with *L. monocytogenes*. For a healthy human population, foods not exceeding the level of 100 cfu/g are considered to pose a negligible risk. Therefore, the EU microbiological criterion for *L. monocytogenes* in RTE food is set as ≤100 cfu/g for RTE products on the market.

In 2011, MSs reported substantial numbers of food samples tested for *L. monocytogenes.* The highest proportions of units exceeding the level of 100 cfu/g at point of retail were observed in RTE fishery products, cheeses and fermented sausages.

3. INFORMATION ON SPECIFIC ZOONOSES AND ZOONOTIC AGENTS

3.4. Verocytoxigenic *Escherichia coli*

Verocytoxigenic *Escherichia coli* (VTEC) are a group of *Escherichia coli (E. coli*) that are characterised by the ability to produce toxins that are designated verocytotoxins.[32] Human pathogenic VTEC usually harbour additional virulence factors that are important in the development of the disease in man. A large number of serogroups of *E. coli* have been recognised as verocytotoxin producers. Human VTEC infections are, however, most often associated with a minor number of O:H serogroups. Of these, O157:H7 and O157:H- (VTEC O157) are the ones most frequently reported to be associated with human disease. The terms VTEC and STEC (Shiga toxin-producing *E. coli*) are synonymous.

The majority of reported human VTEC infections are sporadic cases. The symptoms associated with VTEC infection in humans vary from mild to bloody diarrhoea, which is often accompanied by abdominal cramps, usually without fever. VTEC infections can result in Haemolytic-Uraemic Syndrome (HUS). HUS is characterised by acute renal failure, anaemia and lowered platelet counts. HUS develops in up to 10 % of patients infected with VTEC O157 and is the leading cause of acute renal failure in young children.

Human infection may be acquired through the consumption of contaminated food or water, or by direct transmission from person to person or from infected animals to humans.

VTEC (including VTEC O157) have been isolated from many different animal species. The gastrointestinal tract of healthy ruminants, which include cows, goats, sheep and wild ruminants, seems to be the foremost important reservoir for VTEC, and these bacteria are shed in the animals' faeces. Foods of bovine and ovine origin are frequently reported as a source for human VTEC infections. Other important food sources include faecally contaminated vegetables and drinking water. For many VTEC serogroups isolated from animals and foodstuffs, the significance for human infections is not yet clear.

Table VT1 presents the countries reporting data for 2011.

Table VT1. Overview of countries reporting data for 2011

Data	Total number of reporting MSs	Countries
Human	26	**All MSs** except PT **Non-MSs:** CH, IS, NO
Food	22	**All MSs** except DK, GR, MT, SE, UK
Animal	13	**MSs:** AT, BE, DE, DK, EE, ES, FI, IT, LV, NL, PT, SE, UK

Note: The overview Table includes all data reported by MSs. In the following chapter, data reported as HACCP or own control are not included in the detailed Tables, and, unless stated otherwise, suspect sampling, selective sampling and outbreak or clinical investigations are also excluded. Also, only countries reporting 25 samples or more have been included in the analysis.

3.4.1. VTEC in humans

In 2011, the total number of confirmed VTEC cases in the EU was 9,485 based on 23 MSs reporting at least one confirmed case and three MSs reporting zero cases. This represents an increase of 159.4 % compared with 2010 (N = 3,656, Table VT2). This large increase was the result of an outbreak starting in May 2011 caused by an enteroaggregative Shiga toxin-producing *E. coli* (STEC/VTEC) O104:H4 that affected more than 3,816 persons in Germany with linked cases in an additional 15 countries (see separate text box below).

The overall EU notification rate of VTEC, in 2011, was 1.93 cases per 100,000 population (Table VT2). Among the reporting MSs, Germany had the highest notification rate, 6.80 cases per 100,000 population,

32 Verotoxigenic *E. coli* (VTEC) is also known as verocytotoxigenic *E. coli*, verocytotoxin producing *E. coli* and Shiga toxin-producing *E. coli* (STEC).

followed by Ireland, the Netherlands and Sweden with 6.14, 5.07 and 4.96 cases per 100,000 respectively. Bulgaria, Greece, Poland and Romania reported the lowest notification rate of VTEC infections in 2011 with 0.01 cases per 100,000 population.

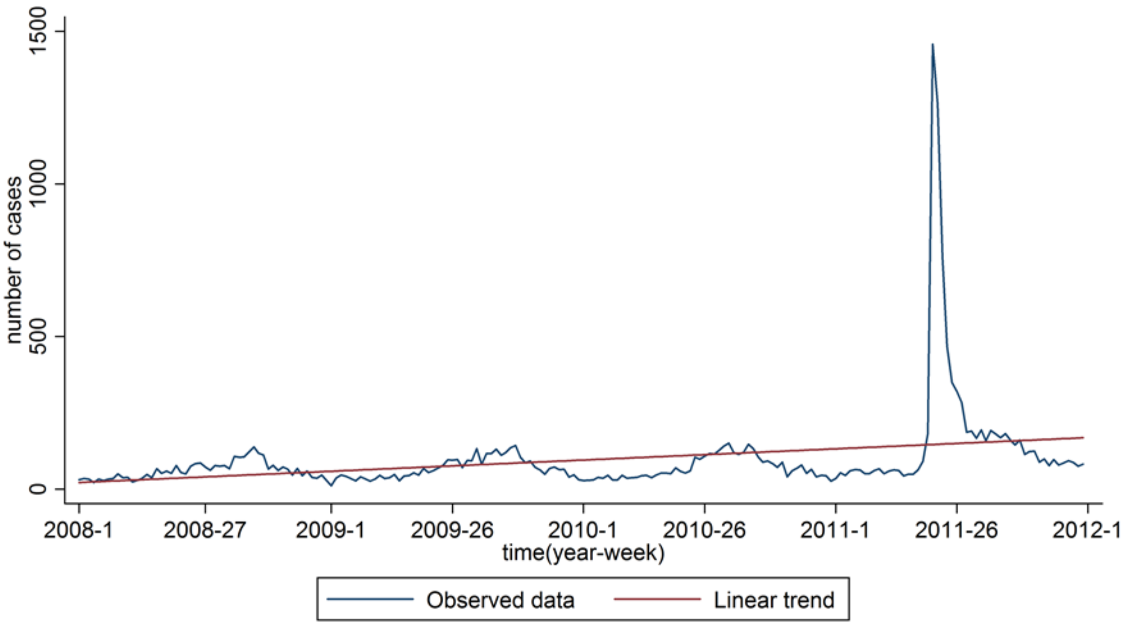
Table VT2. Reported cases of VTEC in humans, 2007–2011 and notification rates for confirmed cases in the EU, 2011

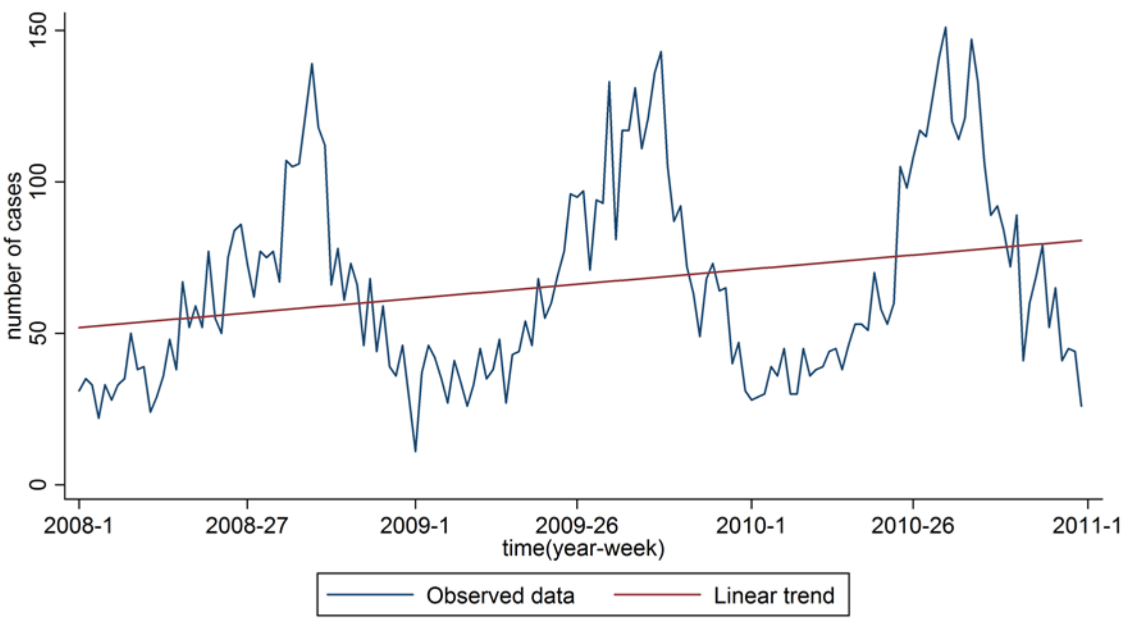
Country	2011				2010	2009	2008	2007
	Report Type[1]	Cases	Confirmed cases	Confirmed cases/ 100,000	Confirmed cases			
Austria	C	129	120	1.43	88	91	69	82
Belgium	C	100	100	0.91	84	96	103	47
Bulgaria	A	1	1	0.01	0	0	0	0
Cyprus	U	0	0	0	0	0	2	0
Czech Republic	C[2]	7	7	0.07	-	-	-	-
Denmark	C	225	215	3.87	178	160	161	156
Estonia	C	4	4	0.30	5	4	3	3
Finland	C	28	27	0.50	21	29	8	12
France	C	221	221	0.34	103	93	85	58
Germany	C	5,638	5,558	6.80	955	887	876	1,234
Greece	C	1	1	0.01	1	0	0	1
Hungary	C	11	11	0.11	7	1	0	1
Ireland	C	285	275	6.14	197	237	213	115
Italy	C	69	51	0.08	33	51	26	27
Latvia	U	0	0	0	0	0	0	0
Lithuania	U	0	0	0	1	0	0	0
Luxembourg	C	14	14	2.74	7	5	4	1
Malta	C	2	2	0.48	1	8	8	4
Netherlands	C	845	845	5.07	478	314	92	88
Poland	C	5	5	0.01	3	0	3	2
Portugal	-[3]	-	-	-	-	-	-	-
Romania	C	2	2	0.01	2	0	4	-
Slovakia	C	5	5	0.09	10	14	8	6
Slovenia	C	25	25	1.22	20	12	7	4
Spain	C	20	20	0.04	18	14	24	19
Sweden	C	477	467	4.96	334	228	304	262
United Kingdom	C	1,509	1,509	2.41	1,110	1,339	1,164	1,149
EU Total		**9,623**	**9,485**	**1.93**	**3,656**	**3,583**	**3,159**	**3,271**
Iceland	C	2	2	0.63	2	8	4	13
Norway	C	47	47	0.96	52	108	22	26
Switzerland[4]	C	71	71	0.90	31	42	67	53

1. A: aggregated data report; C: case-based report; U: unspecified; –: no report.
2. Mandatory notification of VTEC in 2008 and reported to ECDC from 2011.
3. No surveillance system.
4. Switzerland provided data directly to EFSA.

There was a statistically significant (p <0.001) increasing EU trend of confirmed VTEC cases in 2008–2011 (Figure VT1, top). Since the 2011 outbreak data may have caused bias, trend analysis was also performed for the period 2008–2010, i.e. with the 2011 outbreak data removed. Still, the increasing EU trend was statistically significant albeit only at the 0.05 level (p = 0.016) (Figure VT1, bottom). The analyses showed a clear seasonal trend in VTEC cases (Figure VT1). By country, there was a significant increasing trend in case numbers, from 2008 to 2011, in Austria, Denmark, Finland, France, Germany, Italy, the Netherlands, Sweden and the United Kingdom. No significantly decreasing trends were observed in any MS. The significant increase in cases in the Netherlands could be attributed to an increase in laboratories implementing polymerase chain reaction (PCR) analyses for the detection of all VTEC strains.

Figure VT1. Trend in reported confirmed cases VTEC infections in humans in the EU, 2008–2011 (top) and 2008–2010 (bottom)

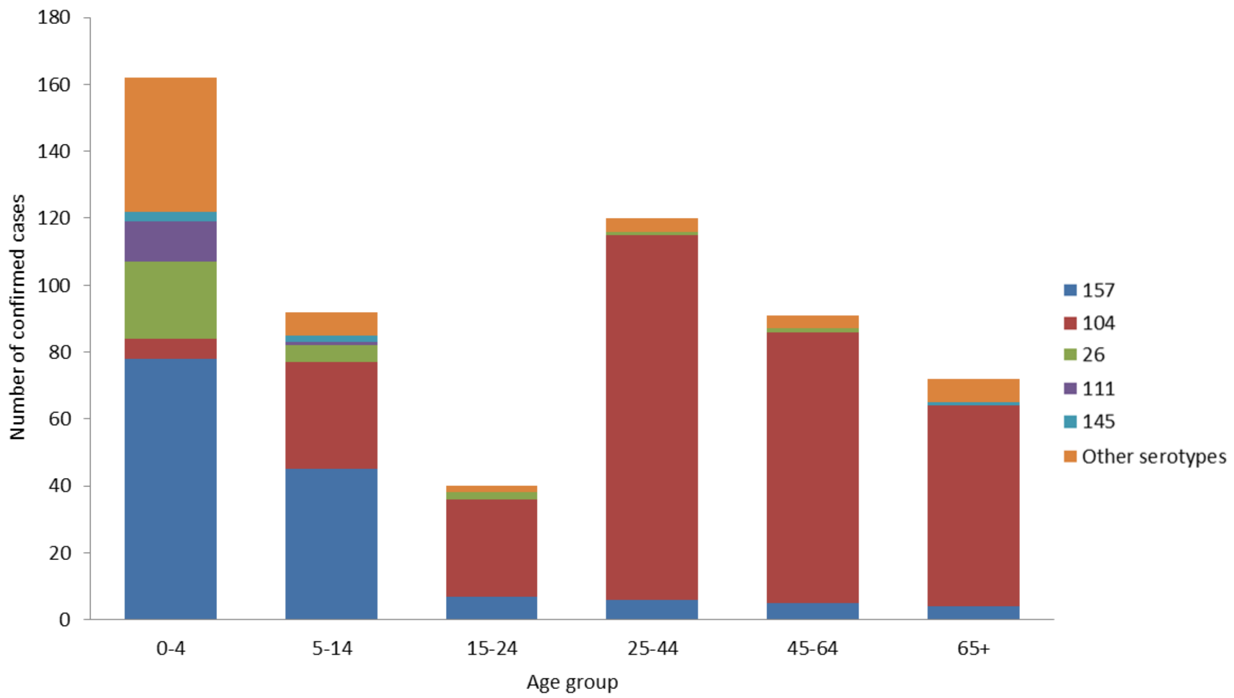




Source: 24 MSs: Austria, Belgium, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, Malta, Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom. Latvia reported zero cases throughout the period. Bulgaria was excluded as only monthly data were provided.

A total of 1,006 confirmed cases developed HUS; this represented a 4.5-fold increase compared with the number of confirmed HUS cases reported in 2010 (N = 222). Only 318 of these cases were reported to be due to STEC/VTEC O104, but, of the 411 HUS cases of unknown serogroup reported from Germany, the majority was expected to have been caused by the outbreak strain as 845 German HUS cases associated with the outbreak were reported from other sources.[33] By age (provided for 577 HUS cases with known serogroup) 28.1 % of the HUS cases were reported in children up to 4 years old followed by 20.8 % in age group 25- to 44-year olds. VTEC O157 was the most commonly reported VTEC serogroup in the 0- to 14-year-old age groups while STEC/VTEC O104 was the predominant serogroup of confirmed cases in the rest of the age groups and the second most common in 5- to 14-year-olds (Figure VT2).

Figure VT2. Haemolytic-Uraemic Syndrome (HUS) by age and serogroup in reporting MSs, 2011



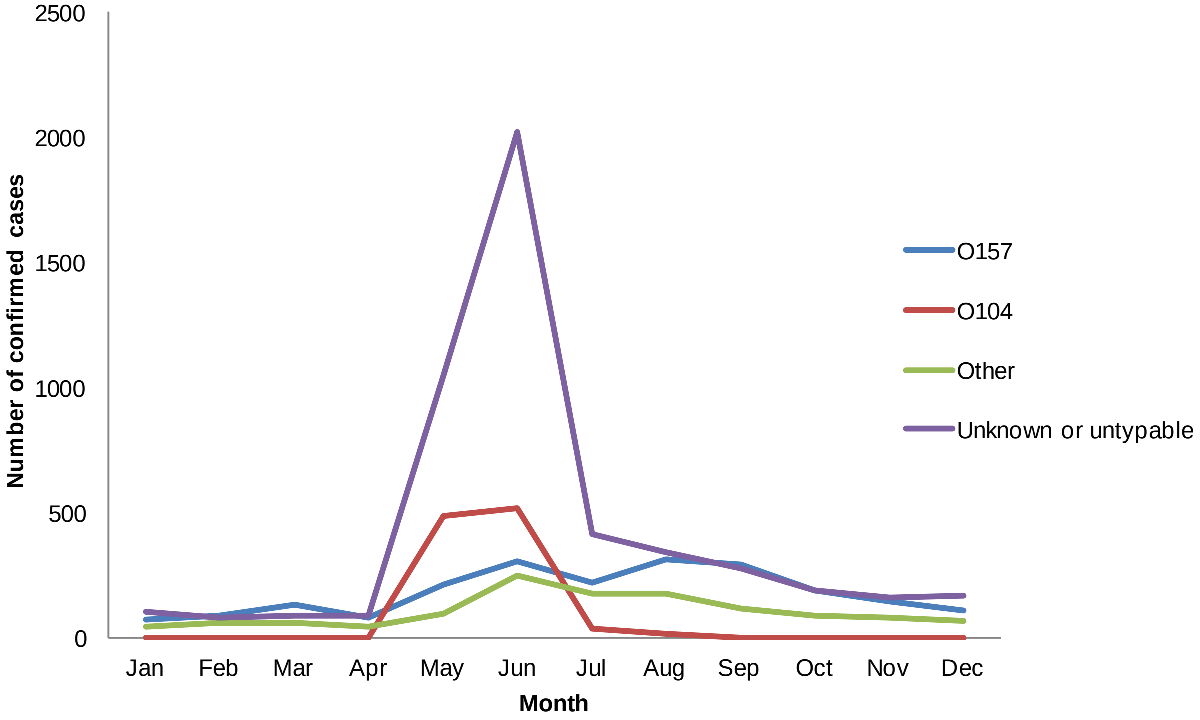
Source: Austria, Belgium, Czech Republic, Denmark, France, Germany, Hungary, Italy, Ireland, Netherlands, Poland, Slovenia, Spain, Sweden and United Kingdom (N = 577).

The STEC/VTEC O104:H4 outbreak peaked in May–June, which is clear from the monthly case distribution (Figure VT3). Also, the untyped or untypeable VTEC cases peaked in June, dominated by cases with unknown serogroup reported from Germany. In contrast, cases of O157 and other serogroups continued to be reported throughout the summer and the beginning of the autumn.

Data on hospitalisation for cases of VTEC infections have been collected in the case-based reporting in TESSy for the past two years. Fourteen MSs provided this information for all or some of their cases (Figure VT4). On average, 33.8 % of the confirmed VTEC cases were hospitalised, and hospitalisation status was provided for 22.5 % of all confirmed cases (information missing from German cases). The proportion of hospitalised cases varied substantially between countries, ranging from 17% to 100 %. The case fatality rate for human VTEC infection in 2011 was 0.75 %, with 56 deaths reported among 7,494 confirmed cases for which information was available. Germany accounted for 89 % of the total number of reported deaths.

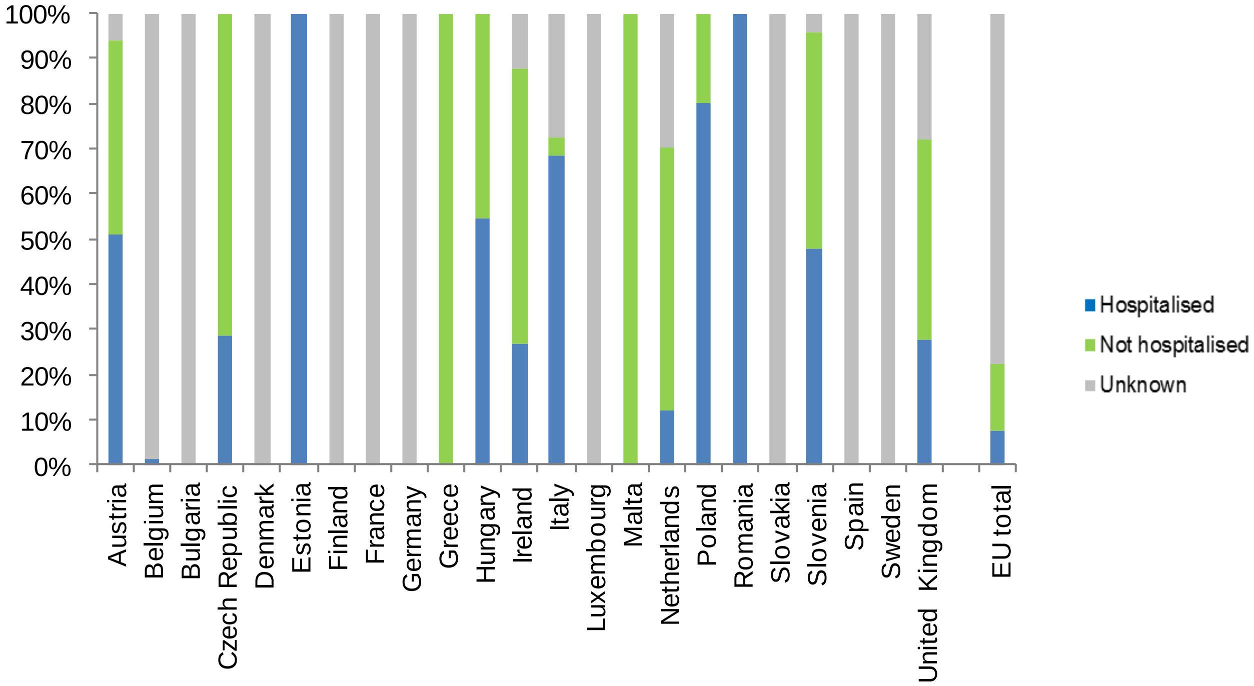
33 Frank C, Werber D, Cramer J P, Askar M, Faber M, Heiden an der M, Bernard H, Fruth A, Prager R, Spode A, Wald M, Zoufaly A, Jordan S, Kemper J M, Follin P, Muller L, King L A, Rosner B, Buchholz U, Stark K and Krause G, 2011. Epidemic profile of Shiga-toxin-producing *Escherichia coli* O104:H4 outbreak in Germany. New England Journal of Medicine, 2011;365(19):1771-1780.

Figure VT3. Number of reported confirmed cases of VTEC infection in humans for serogroups O157, O104, other and unknown/untypeable, by month, in the EU, 2011



Source: Austria, Belgium, Bulgaria, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, Malta, Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom (N = 9,478)

Figure VT4. Proportion of reported confirmed cases of VTEC infection in humans hospitalised in the EU, 2011



VTEC serogroups and virulence characteristics

Full serotype on O and H antigen data were reported for 686 (7.2 %) of the VTEC cases, whereas data on antigen O were reported for 55.9 % of the confirmed human infections reported in 2011. Of cases with known O serogroup, the most commonly reported in 2011 were O157 (41.2 %) followed by O104 (20.1 %) (Table VT3). Of the cases for which no serogroup was reported (4,184 cases), it is probable that a large proportion were also of serogroup O104 as Germany accounted for 94 % of these cases. In comparison, only two cases of O104 were reported in 2010 by two MSs. As in previous years, the highest percentage of O157-associated confirmed cases (76.4 %) was reported by the United Kingdom and Ireland. Germany accounted for 88.7 % of the reported STEC/VTEC O104 cases (Table VT4).

The virulence characteristics, in terms of presence of the genes encoding verocytotoxin 1 and 2 (*vtx1* and *vtx2*) and the attaching and effacing adhesin "intimin" (*eae*), of the most commonly reported VTEC serogroups are listed in Table VT5. For VTEC O157, *eae* in combination with *vtx2* or with both toxin genes were the most common virulence factors. This contrasts with the characteristics reported for most of the STEC/VTEC O104 cases, which were intimin-*eae* negative and *vtx2* positive, as has also been reported elsewhere.[34] Most cases associated with serogroups O103, O26 and O111 were *eae* and *vtx1* positive (Table VT5).

The most commonly reported O:H serogroup in 2011 was O157:H- (N = 117) followed by O157:H7 (N = 114) and O104:H4 (N = 70) (Table VT6). Only countries reporting full serogroup for some or all of their isolates are shown in the table.

Table VT3. Reported confirmed VTEC cases in humans by serogroup (top 10), 2010–2011

2011			2010		
Serogroup	No. of cases	% total	Serogroup	No. of cases	% total
O157	2,185	41.2	O157	1,502	41.1
O104	1,064	20.1	O26	258	7.1
O26	287	5.4	O103	91	2.5
O103	141	2.7	O145	61	1.7
O91	116	2.2	O91	57	1.6
O145	76	1.4	O63	42	1.1
O128	53	1.0	O111	41	1.1
O111	52	1.0	O128	30	0.8
O146	48	0.9	O146	28	0.8
NT[1]	795	15.0	NT[1]	1,230	33.7
Other	484	9.1	Other	315	8.6
Total	**5,301**		**Total**	**3,655**	

Source: Austria, Belgium, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Malta, Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom (N = 5,301).
1. NT = untyped/untypeable.

34 Bielaszewska M, Mellmann A, Zhang W, Köck R, Fruth A, Bauwens A, Peters G and Karch H, 2011. Characterisation of the *Escherichia coli* strain associated with an outbreak of haemolytic uraemic syndrome in Germany, 2011: a microbiological study. Lancet Infectious Diseases, 11(9), 671–676. Epub Jun 22 2011.

Table VT4. VTEC serogroups in humans by country, 2011

Country	Serogroup										
	O157	O104	O26	O103	O91	O145	O128	O111	O146	NT	Other
Austria	30	4	14	4	5	3	1	10	5	14	27
Belgium	65	-	7	4	-	3	-	-	1	-	6
Denmark	27	25	15	22	-	10	7	7	13	8	78
Czech Republic	3	1	2	-	-	1	-	-	-	-	-
Estonia	-	-	-	-	-	-	1	-	-	3	-
France	79	18	36	7	2	3	5	4	-	50	3
Germany	138	944	85	54	90	38	29	18	13	56	182
Greece	-	1	-	-	-	-	-	-	-	-	-
Hungary	3	-	2	-	1	-	-	-	-	2	1
Ireland	200	-	49	-	-	2	3	1	3	6	11
Italy	14	-	9	7	-	4	-	5	-	3	-
Luxembourg	1	2	2	1	1	2	-	-	-	4	1
Malta	2	-	-	-	-	-	-	-	-	-	-
Netherlands	65	11	20	8	8	4	-	2	8	603	116
Poland	2	3	-	-	-	-	-	-	-	-	-
Romania	1	-	1	-	-	-	-	-	-	-	-
Slovakia	-	-	-	-	-	-	-	-	-	5	-
Slovenia	7	-	4	1	1	-	-	-	2	4	6
Spain	16	1	1	-	-	-	1	1	-	-	-
Sweden	62	48	29	32	8	6	6	4	3	32	49
United Kingdom	1,470	6	11	1	-	-	-	-	-	5	4
EU Total	**2,185**	**1,064**	**287**	**141**	**116**	**76**	**53**	**52**	**48**	**795**	**484**

Table VT5. Virulence characteristics of main reported VTEC serogroups in 2011

Serogroup	Virulence[1] characteristics					
	eae, vxt1	*eae, vtx2*	*eae, vtx1, vtx2*	*vtx1*	*vtx2*	*vtx1, vtx2*
O157	9	1,155	808	-	5	-
O104	-	-	2	-	116	1
O26	124	22	34	6	-	-
O103	70	1	3	1	-	1
O91	-	-	-	15	6	4
O145	3	30	1	-	-	-
O128	-	2	-	1	9	8
O111	14	9	4	1	-	1
O146	-	-	-	5	12	18
NT	14	31	5	18	40	16
Other	55	1,332	9	64	65	29
Total	**289**	**2,582**	**866**	**111**	**253**	**78**

1. *eae:* presence of intimin-coding gene; *vtx1*- presence of verocytotoxin 1 genes; *vtx2* – presence of verocytotoxin 2 genes

Table VT6. VTEC O:H serogroups most commonly reported in humans by country, 2011

Country	Serogroup											
	O157: H-	O157:H7	O104:H4	O26:H11	O103:H2	O146:H21	O111:H-	O26: H-	O145:H-	O145:H34	O128:H2	O91:H14
Austria	21	6	3	4	4	2	6	8	1	-	-	-
Belgium	64	-	-	-	-	-	-	-	-	-	-	-
Czech Republic	-	3	1	2	-	-	-	-	-	-	-	-
Denmark	20	7	25	11	21	8	7	3	2	8	6	-
France	10	13	18	-	-	-	-	-	-	-	-	-
Hungary	-	-	-	-	-	-	-	-	-	-	-	1
Ireland	-	9	-	-	-	-	-	-	-	-	-	-
Luxembourg	-	1	2	1	-	-	-	1	2	-	-	-
Netherlands	-	-	11	18	5	6	1	1	4	-	-	4
Poland	2	-	3	-	-	-	-	-	-	-	-	-
Romania	-	1	-	-	-	-	-	-	-	-	-	-
Spain	-	16	1	1	-	-	-	-	-	-	1	-
Sweden	-	58	48	-	-	-	-	-	-	-	-	-
United Kingdom	-	-	6	2	-	-	-	-	-	-	-	-
Total	**117**	**114**	**118**	**39**	**30**	**16**	**14**	**13**	**9**	**8**	**7**	**5**

A large outbreak caused by enteroaggregative STEC/VTEC O104:H4 occurred in Germany between May-July 2011.[33] There were 3,816 human cases (including 54 deaths) and of those, 845 cases developed HUS. The majority of HUS cases occurred in adults, mostly women.

The microbiological features of this *E. coli* strain include a combination of genes that are typical of enteroaggregative *E. coli* (*attA, aggR. Aap. aggA* and *aggC*), located in a virulence plasmid, and EHEC/VTEC (*stx2a*). Actually, the outbreak strain was an enteroaggregative *E. coli* that had acquired a *stx2a*-converting bacteriophage, typical of STEC/VTEC.[33] Furthermore, all strains isolated from this outbreak presented a distinctive pattern of antimicrobial resistance to beta-lactam antibiotics and third-generation cephalosporins and partial resistance to fluoroquinolones.

The investigations concluded that the outbreak was associated with the consumption of imported fenugreek sprouts. The outbreak had an international dimension as 15 other countries, including the United States of America, reported cases occurring among people who travelled to Germany during that period of time. The outbreak was also linked to an outbreak in France in June 2011 caused by the same STEC/VTEC O104:H4 strain and associated with the consumption of fenugreek sprouts produced with seeds from the same batch used in Germany. The batch was imported into Europe in 2009.[35,36]

35 King L A , Nogareda F, Weill F X, Mariani-Kurkdjian P, Loukiadis E, Gault G, Jourdan-DaSilva N, Bingen E, Macé M, Thevenot D, Ong N, Castor C, Noël H, Van Cauteren D, Charron M, Vaillant V, Aldabe B, Goulet V, Delmas G, Couturier E, Le Strat Y, Combe C, Delmas Y, Terrier F, Vendrely B, Rolland P and de Valk H, 2012. Outbreak of Shiga toxin-producing *Escherichia coli* O104:H4 associated with organic fenugreek sprouts, France, June 2011. Clinical and Infectious Diseases, 54(11), 1588–1594. Epub 28 Mar. 2012.

36 EFSA (European Food Safety Authority), 2011. Technical report of EFSA. Tracing seeds, in particular fenugreek (*Trigonella foenum-graecum*) seeds, in relation to the Shiga toxin-producing *E. coli* (STEC) O104:H4 2011 outbreaks in Germany and France. Available on line: http://www.efsa.europa.eu/en/supporting/doc/176e.pdf

3.4.2. VTEC in food

In total, 22 MSs reported data on VTEC in food for 2011. Many of these MSs reported more data on VTEC in sprouted seeds, vegetables and fruits than in 2010, most likely prompted by the large STEC/VTEC O104 outbreak in Europe in 2011.

As with information on human cases, when interpreting the VTEC data from food it is important to note that data from different investigations are not necessarily directly comparable owing to differences in sampling strategies and the analytical methods applied. The most widely used analytical method, ISO 16654/2001, aims to detect only VTEC O157, whereas fewer investigations have been conducted with analytical methods aiming at detecting all VTEC or selected non-O157 serotypes of VTEC.

In the case of food samples, Belgium, the Czech Republic, Hungary and Poland reported having used the ISO 16654/2001 analytical method, which is designed to detect only VTEC O157. Ireland used a method based on ISO 16654/2001. Luxembourg used the VIDAS *E. coli* O157 test kit, Slovenia used real-time PCR and Lithuania a PCR method. Austria reported the use of a PCR method for screening for the *vtx* gene followed by VTEC isolation and serotyping. Slovakia used cultivation, VIDAS and PCR methods.

Finland reported using the ISO/PRF TS 13136 method specifically for testing seed samples. This PCR method aims to detect the VTEC serogroups O157, O111, O26, O103 and O145. Poland used the EU Reference Laboratory's method for detection and identification of STEC/VTEC O104:H4 in food but only for vegetables. The other MSs did not provide information on the analytical method used for testing food samples.

Bovine meat

Contaminated bovine meat is considered to be a major source of food-borne VTEC infections in humans. In 2011, eight MSs reported data on VTEC in fresh bovine meat from investigations with 25 or more samples. VTEC was detected in nine of these 12 investigations. A total of 4,347 bovine meat units (single or batch) were tested for VTEC and 62 units (1.4 %) were found to be VTEC-positive and 11 units (0.3 %) VTEC O157-positive (Table VT7).

Belgium and the Czech Republic reported testing batches of carcases at the slaughterhouse with substantial numbers of batches sampled. Both countries reported VTEC and VTEC O157 findings, Belgium finding 4.2 % and 0.7 % of the batches positive for VTEC and VTEC O157, respectively, while the Czech Republic reported 0.3 % of samples positive for VTEC and VTEC O157. Both countries used carcase swabs, but in the Belgian investigation, the area swabbed was larger. Furthermore, Belgium reported 0.3 % of fresh meat batches positive for VTEC and VTEC O157 at the processing plant. Belgium also examined the presence of other human pathogenic VTEC serogroups in the bovine meat samples and detected isolates from the VTEC O26, O103, O111 and O145 serogroups.

Germany, Ireland and the Netherlands reported large investigations of single carcase or meat samples for VTEC. Germany found 2.3 % of the carcase surface samples at the slaughterhouse positive for VTEC but none for VTEC O157, and Ireland reported 1.0 % of carcases positive for VTEC and 0.3 % for VTEC O157 at processing. At point of retail, Germany found 1.8 % of samples of fresh meat and 3.8 % samples of minced meat VTEC positive but none for VTEC O157. The Netherlands reported 0.3 % of the samples of fresh meat positive for VTEC and VTEC O157.

Hungary, Poland and Spain reported smaller investigations at processing and point of retail, and Hungary and Spain did not find any positive samples, while Poland reported the highest proportion of units positive for VTEC O157 (2.6 %) in 2011. However, Poland took only 38 samples, of which one was positive.

In addition, many MSs investigated other products from bovine meat. Germany, Ireland and Romania reported large surveys of minced meat. Germany found 3.0 % (N = 733) of single minced meat samples positive for VTEC, while Ireland reported no positive findings from the 374 tested samples of minced meat intended to be eaten cooked. Romania tested batches of minced meat intended to be eaten cooked finding 1.4 % of them VTEC O157 positive (N = 144). The Netherlands, Belgium and France reported data from minced meat intended to be eaten raw. The Netherlands found 0.8 % of the 663 single samples VTEC positive and Belgium reported no positive samples from the 296 tested, whereas France found 0.5 % VTEC positive samples from the 1,878 tested and three of these samples were positive for VTEC O157. The

Netherlands also tested substantial numbers of meat preparations for VTEC and reported 1.1 % VTEC positive samples from meat preparations intended to be eaten cooked (N = 722) and 0.2 % VTEC positive samples from meat preparations intended to be eaten raw (N = 513).

The other data reported on bovine meat and products thereof are presented in the Level 3 Tables.

> Belgium has a monitoring programme for VTEC in bovine meat which covers more than 200 slaughterhouses, 100 meat cutting plants and 100 retail outlets. The samples taken include carcase swabs (four areas from the same carcase half, constituting an area of 1600 cm^2), meat cuts and minced meat. Sampling is carried out on a weekly basis.

Table VT7. VTEC in fresh bovine meat, 2011

Country	Description	Sample unit	Sample weight	N	VTEC		VTEC O157		Other VTEC serogroups
					N pos	% pos	N pos	% pos	
Belgium	Carcase at slaughterhouse, carcase swab	Batch	600 cm^2	427	18	4.2	3	0.7	O26 (4)[1], O103 (3), O111 (5), O103 and O111 (1), O145 (2)
	Fresh at processing	Batch	25 g	294	1	0.3	1	0.3	
Czech Republic	Carcase at slaughterhouse, carcase swab	Batch	100 cm^2	1,159	4	0.3	3	0.3	
Germany	Carcase at slaughterhouse, domestic production, carcase sponge	Single	400 cm^2	261	6	2.3	0	0	
	Fresh at retail, domestic production	Single	25 g	492	9	1.8	0	0	
	Minced meat at retail, domestic production	Single	25 g	479	18	3.8	0	0	
Hungary	Fresh at processing	Single	25 g	98		0	0	0	
	Fresh at retail	Single	25 g	61		0	0	0	
Ireland	Carcase at processing	Single	25 g	291	3	1.0	1	0.3	
Netherlands	Fresh at retail	Single	25 g	702	2	0.3	2	0.3	
Poland	Fresh at processing	Single	25 g	38	1	2.6	1	2.6	
Spain	Fresh at retail	Single	25 g	45	0	0	0	0	
Total (8 MSs)				**4,347**	**62**	**1.4**	**11**	**0.3**	

Note: Data presented include only investigations with sample size ≥25.
1. Figures in parentheses are the number of isolates from the 15 non-VTEC strains.

Meat from animal species other than bovines

Five MSs provided data on VTEC in fresh meat from animal species other than bovines derived from investigations with 25 or more samples (Table VT8).

The Czech Republic tested 1,395 batches of pig carcases at the slaughterhouse for VTEC without any positive findings. Ireland and the Netherlands reported investigations of carcases and fresh sheep meat with no positive VTEC findings. Spain and Luxembourg had investigated fresh poultry meat at point of retail, and Spain reported one VTEC O157- positive sample out of the 34 tested ones (2.9 %), whereas Luxembourg did not find any of the 30 samples of imported turkey meat VTEC positive.

In addition, some MSs tested other types of products from pig and sheep meat. Among these investigations, Portugal reported 10.0 % of the 50 single samples of meat preparations from pig meat intended to be eaten cooked to be positive for VTEC O157, and Germany found 14.5 % of the tested sheep meat samples at the processing level VTEC positive (N = 62).

Other submitted data on VTEC, in meat from other animal species and products thereof, are reported in the Level 3 Tables. VTEC was also reported in deer meat.

Table VT8. VTEC in fresh meat other than bovine meat, 2011

Country	Description	Sample unit	Sample weight	N	VTEC		VTEC O157	
					N pos	% pos	N pos	% pos
Ireland	Sheep meat, carcase at processing	Single	25 g	134	0	0	0	0
Netherlands	Sheep meat, fresh at retail	Single	25 g	86	0	0	0	0
Czech Republic	Pig meat, carcase at slaughterhouse, carcase swabs	Batch	-	1,395	0	0	0	0
Spain	Poultry meat fresh at retail	Single	25 g	34	1	2.90	1	2.90
Luxembourg	Meat for turkeys, fresh at retail, imported	Single	25 g	30	0	0	0	0

Note: Data presented include only investigations with sample size ≥25.

Milk and dairy products

Five MSs reported data on VTEC in milk and dairy products from investigations with at least 25 samples (Table VT9). Most of the positive samples detected were derived from raw cow's milk. Four MSs provided data from raw cows' milk. Belgium tested 39 batches of raw cows' milk intended for direct human consumption, at farm level, and found one batch positive for VTEC O157 (2.6 %). Germany also found one VTEC-positive sample (1.1 %) from 94 tested single samples of raw milk intended for direct human consumption at processing and three VTEC-positive samples (5.3 %) of such milk at retail. Furthermore, three samples (3.8 %) of raw cows' milk intended for manufacture of pasteurised/UHT products at processing, tested positive in Germany. None of the German samples were positive for VTEC O157. Hungary reported no positive samples from raw milk intended for direct human consumption as did Slovenia from raw cows' milk samples.

Three MSs provided data on VTEC in cheeses. Belgium tested substantial numbers of fresh and soft and semi-soft cheeses made from raw or low heat-treated milk at farm, processing and retail level but did not find any VTEC-positive samples. Also Germany tested many cheese samples for VTEC and reported only one positive finding in hard cheeses made from pasteurised milk (0.6 %) at point of retail. Italy reported 5.9 % of the tested unspecified cheeses as VTEC-positive. None of the VTEC findings in cheeses were of VTEC O157.

Among other dairy products, Belgium tested butter and cream made of raw or low heat-treated milk at farm level without finding positive samples. Italy reported testing of butter at farm level with 4.4 % and 0.9 % samples positive for VTEC and VTEC O157, respectively. Other submitted data on VTEC, in milk and products thereof, are reported in the Level 3 Tables. VTEC was also reported in milk from other animal species by the reporting countries.

Table VT9. VTEC in milk and dairy products, 2011

Country	Description	Sample unit	Sample weight	N	VTEC		VTEC O157	
					N pos	% pos	N pos	% pos
Raw cows' milk								
Belgium	Intended for direct human consumption, at farm	Batch	25 g	39	1	2.6	1	2.6
Germany	Intended for direct human consumption, at processing, domestic	Single	25 g	94	1	1.1	0	0
	Intended for direct human consumption, at retail, domestic		25 g	57	3	5.3	0	0
	Intended for manufacture of pasteurised/UHT products, at processing, domestic	Single	25 g	79	3	3.8	0	0
Hungary	Intended for direct human consumption, at farm	Single	25 g	102	0	0	0	0
Slovenia		Single	25 g	128	0	0	0	0
Cheeses								
Belgium	Fresh and soft and semi-soft, made from raw or low heat-treated cows' milk, at farm, processing and retail	Batch	200 g	226	0	0	0	0
	Made from made from raw or low heat-treated goats' milk, at farm, processing and retail	Batch	200 g	114	0	0	0	0
	Made from raw or low heat-treated sheep's milk, at retail	Batch	200 g	86	0	0	0	0
Germany	Hard, made from raw or low heat-treated cows' milk, at processing and retail, domestic production	Single	25 g	76	0	0	0	0
	Soft and semi-soft, made from raw or low heat-treated cows' milk, at retail, domestic production	Single	25 g	56	0	0	0	0
	Hard, made from pasteurised cows' milk, at retail, domestic production	Single	25 g	154	1	0.6	0	0
	Soft and semi-soft, made from pasteurised cows' milk, at retail, domestic production	Single	25 g	109	0	0	0	0
Italy	Unspecified, at farm and unspecified	Single	25 g	374	22	5.9	0	0
Other dairy products								
Belgium	Butter made from raw or low heat-treated milk at farm	Batch	200 g	116	0	0	0	0
	Cream made from raw or low heat-treated milk at farm	Batch	200 g	45	0	0	0	0
Germany	At retail domestic production	Single	25 g	76	0	0	0	0
Italy	Butter at farm	Single	25 g	114	5	4.4	1	0.9
Total (5 MSs)				**2,045**	**36**	**1.8**	**2**	**0.1**

Note: Data presented include only investigations with sample size ≥25.

Seeds, sprouts, vegetables and other food

Eight MSs reported data on VTEC in seeds, sprouts and vegetables in 2011 from investigations with at least 25 samples. These investigations were probably prompted by the STEC/VTEC O104 outbreaks in Germany and France (Table VT10).

Finland did not find any VTEC positive samples in 33 batches of dried seeds. Finland used the ISO TS 13136 method, which aims to detect the VTEC serogroups of O157, O111, O26, O103 and O145. In addition to investigating the dried seeds, the seed batches were sprouted and samples of soaking water, rinsing water and sprouts were investigated, all with negative results for VTEC.

Out of the three MSs reporting data on sprouted seeds, Germany and the Netherlands reported 0.7 % (N = 278) and 3.6 % (N = 83) of the samples as VTEC positive, respectively, but no VTEC O157 was detected. Among the MSs reporting data from investigations of sprouted seeds with fewer than 25 samples, only Slovakia found positive samples, reporting one out of the nine batches positive for VTEC O157.

Seven MSs provided data on VTEC in vegetables, many of them pre-cut and ready-to-eat, from investigations with at least 25 samples. None of the samples investigated tested positive. Furthermore, no VTEC-positive samples were reported from spices and herbs. Among the reported investigations with fewer than 25 samples, Spain found four out of the 24 single samples of vegetables positive for VTEC O157.

In other investigations of foods having at least 25 samples, only Austria found one VTEC-positive sample from other processed food products and prepared dishes at point of retail.

The other data submitted on VTEC in food are reported in the Level 3 Tables. No isolation of STEC /VTEC O104 was reported by the MSs and reporting non-MSs in any of the food samples tested.

Table VT10. VTEC in other food, 2011

Country	Description	Sample unit	Sample weight	N	VTEC		VTEC O157	
					N pos	% pos	N pos	% pos
Seeds and sprouts								
Belgium	Seeds, sprouted, ready-to-eat, at retail	Batch	150 g	31	0	0	0	0
Finland	Seeds, dried, at retail	Batch	50 g	33	0	0	0	0
Germany	Seeds, sprouted, at processing, domestic	Single	25 g	61	0	0	0	0
	Seeds, sprouted, at retail, domestic	Single	25 g	278	2	0.7	0	0
Netherlands	Seeds, sprouted, ready-to-eat, at retail	Single	25 g	83	3	3.6	0	0
Vegetables								
Austria	Vegetables, at retail, domestic	Single	25 g	29	0	0	0	0
	Vegetables, at retail, imported	Single	25 g	32	0	0	0	0
Belgium	Vegetables, non-pre-cut, at retail	Batch	150 g	815	0	0	0	0
Germany	Vegetables, at processing, domestic	Single	25 g	35	0	0	0	0
	Vegetables, at retail, domestic	Single	25 g	457	0	0	0	0
Lithuania	Vegetables, pre-cut, ready-to-eat	Batch	25 g	73	0	0	0	0
Netherlands	Vegetables, pre-cut, ready-to-eat, cucumber, at retail	Single	25 g	170	0	0	0	0
	Vegetables, pre-cut, ready-to-eat, different sorts, at retail	Single	25 g	556	0	0	0	0
Poland	Vegetables, pre-cut, ready-to-eat, at retail	Single	25 g	443	0	0	0	0
Slovakia	Vegetables, pre-cut, ready-to-eat, at processing	Single	10 g	35	0	0	0	0
	Vegetables, pre-cut, ready-to-eat, at retail	Single	10 g	72	0	0	0	0

Table continued overleaf.

Table VT10 (continued). VTEC in other food, 2011

Country	Description	Sample unit	Sample weight	N	VTEC		VTEC O157	
					N pos	% pos	N pos	% pos
Spices and herbs								
Germany	Spices and herbs, at processing, domestic	Single	25 g	31	0	0	0	0
	Spices and herbs, at retail, domestic	Single	25 g	59	0	0	0	0
Slovakia	Spices and herbs, dried, at retail	Batch	1 g	29	0	0	-	-
Other food								
Austria	Other processed food products and prepared dishes, ready-to-eat, at retail, domestic	Single	25 g	46	1	2.2	0	0
Belgium	Fruits and vegetables, pre-cut, at farm	Batch	-	49	0	0	0	0
	Fruits and vegetables, pre-cut, at processing	Batch	200 g	97	0	0	0	0
Germany	Other food, at processing and retail	Single	25 g	792	0	0	0	0
	Fishery products, at retail, domestic	Single	25 g	25	0	0	0	0
Netherlands	Fruits, pre-cut, ready-to-eat, at retail	Single	25 g	99	0	0	0	0
Slovakia	Infant formula, dried - intended for infants below 6 months	Single	10 g	42	0	0	0	0
	Other processed food products and prepared dishes, at retail, domestic	Single	10 g	67	0	0	0	0
	Ready-to-eat salads, containing mayonnaise, at retail	Single	10 g	88	0	0	0	0
	Bottled water, at retail, domestic	Single	-	100	0	0	0	0
Total (9 MSs)				**4,727**	**6**	**0.1**	**0**	**0**

Note: Data presented include only investigations with sample size ≥25.

3.4.3. VTEC in animals

In total 13 MSs provided data on VTEC in animals. When interpreting the VTEC data from animals it is important to note that data from different investigations are not necessarily directly comparable owing to differences in sampling strategies and the analytical methods applied. In the case of cattle samples, Belgium, Estonia, Finland and the Netherlands reported having used the ISO 16654/2001 analytical method, which is meant to detect only VTEC O157. Spain used this method for the cattle hide samples, whereas PCR was used for the faeces samples. Denmark used a modified ISO 16654/2001. Germany reported results whereby toxin production was examined by means of SLT-PCR, ELISA or cyto-toxin testing. Austria used ELISA to screen the samples for presence of verotoxins. The toxin-positive samples were then cultivated to isolate VTEC and finally real-time fluorescent PCR was used to detect the toxin genes.

The other MSs did not report the analytical method used for cattle samples, and none of the MSs reported the method used for the other animal species.

Cattle

Altogether nine MSs provided data on VTEC in cattle for the year 2011 from investigations with 25 or more samples (Table VT11). In all reported investigations VTEC was detected from the animals tested.

Austria, Denmark, Estonia, Finland and Italy reported data from animals sampled in slaughterhouses. Austria found 41.5 % and 32.5 % of the tested cattle, over two years old, and of the young cattle (one to two years old), positive for VTEC and 3.7 % and 5.0 % of these samples positive for VTEC O157, respectively, using recto-anal swabs. Austria used an analytical method that is able to detect many VTEC serogroups, and this is very likely the reason for its reporting a higher VTEC prevalence than other MSs.

Denmark, Estonia and Finland reported a lower prevalence of VTEC and VTEC O157, at levels of 1.7 %, 3.3 % and 0.3 %, respectively. Denmark and Finland sampled faeces, while Estonia used hide samples in accordance with EFSA's VTEC monitoring specifications. Italy found 20.9 % of the bovine animals at slaughterhouse positive for VTEC but none of them positive for O157. Belgium tested animals at farm for VTEC, reporting 1.8 % of samples positive for VTEC.

Germany and the Netherlands provided data at herd level from farms using faeces samples. Germany found 18.4 % of young meat production animal herds and 3.5 % of calf herds positive for VTEC, but none of them positive for VTEC O157. The Netherlands tested 807 cattle herds at farm level and 5.0 % of them were VTEC and VTEC O157 positive.

Spain reported data on VTEC in slaughter batches of young cattle at the slaughterhouse. In the investigation using EFSA's VTEC monitoring specifications for testing cattle hide, 11.1 % of the 198 batches tested were found VTEC and VTEC O157 positive. In the investigation of faeces samples, 21.1 % of the units tested VTEC positive.

Austria reported the detection of VTEC O91, O103 and O145 serogroups, which are other human pathogenic VTEC serogroups, from adult cattle. Also Belgium, Estonia and Spain reported more specific data on the VTEC isolates.

The other submitted data on VTEC in cattle are reported in the Level 3 Tables.

Spain implements a VTEC monitoring programme in cattle, which includes random sampling of animals in 15 slaughterhouses across the country, representing 50 % of the national slaughter. Every month during one slaughter day all the slaughter batches, or up to 30 batches in the slaughterhouse, are sampled. From each batch one hide swab and two faeces samples are taken and analysed for VTEC.

Finland has a compulsory VTEC control programme for all cattle slaughterhouses and a representative sample size is divided between the slaughterhouses based on their slaughter capacity. Faecal samples are taken and in total 1,501 animals were tested in 2011. In the case of positive samples, the farm of origin is officially sampled and, if found positive, the farm must implement a specific risk management plan.

Table VT11. VTEC in cattle, 2011

Country	Description	Sample unit	Sample weight	N	VTEC		VTEC O157		VTEC serogroups
					N pos	% pos	N pos	% pos	
Austria	Adult cattle over 2 years at slaughterhouse, domestic, recto-anal swab	Animal	-	82	34	41.5	3	3.7	O91 *eae* negative, *vtx1* negative, *vtx2* positive (2)[1], O91 *eae* negative, *vtx1* positive, *vtx2* positive (2), O103 *eae* positive, *vtx1* positive, *vtx2* negative (1), O145 *eae* positive, *vtx1* positive, *vtx2* negative (1), O145 *eae* positive, *vtx1* negative, *vtx2* positive (1)
	Young cattle (1-2 years) at slaughterhouse, domestic, recto-anal swab	Animal	-	40	13	32.5	2	5.0	
Belgium	At farm	Animal	-	545	10	1.8	0	0	*vtx1/eae* positive (4), *vtx1* positive (2), *vtx1/vtx2/eae* positive (1), *vtx2* positive (2), *vtx2/eae* positive (1), *vtx2*/STa (1).
Denmark	At slaughterhouse, faeces	Animal	-	237	4	1.7	4	1.7	
Estonia	At slaughterhouse, EFSA monitoring specifications, hide	Animal		244	8	3.3	8	3.3	VTEC O157:H7 *eae* positive, *vtx1* and *vtx2* positive (4); VTEC O157:H7 *eae* positive, *vtx1* negative *vtx2* positive (4); VTEC O157:H7 *eae* positive, *vtx1* negative, *vtx2* negative (0)
Finland	At slaughterhouse, faeces	Animal	10 g	1,501	5	0.3	5	0.3	
Germany	At farm, domestic, faeces	Herd	-	703	120	17.1	0	0	
	Meat production animals, young cattle (1-2 years), at farm, domestic, faeces	Herd	25 g	878	162	18.4	0	0	
	Calves (under 1 year) at farm, domestic, faeces	Herd	-	229	8	3.5	0	0	
Italy	At slaughterhouse, domestic	Animal	-	139	29	20.9	0	0	
Netherlands	At farm, faeces	Herd	25 g	807	40	5.0	40	5.0	
Spain	Young cattle (1-2 years) at slaughterhouse, faeces	Slaughter batch	-	204	43	21.1	0	0	*vtx1* positive (16); *vtx2* positive (21); *vtx1* and *vtx2* positive (7)
	Young cattle (1-2 years) at slaughterhouse, EFSA monitoring specifications, hide	Slaughter batch	-	198	22	11.1	22	11.1	*vtx2* positive (12); *vtx1* and *vtx2* positive (10)
Total (9 MSs)				**5,807**	**498**	**8.6**	**84**	**1.4**	

Note: Data presented include only investigations with sample size ≥25.

1. Number of isolates, *eae*: presence of intimin-coding gene, *vtx1:* verocytotoxin 1 gene, *vtx2:* verocytotoxin 2 gene, STa: heat stable toxins.

Other animals

Three MSs reported data on VTEC from animal species other than cattle with 25 or more samples in 2011 (Table VT12). The Netherlands tested sheep and goats at farm level without finding any VTEC-positive animals. However, in a survey carried out at the slaughterhouse using sheep wool as a sample, 13.6 % of 374 animals were found VTEC O157 positive. Austria provided data on 116 sheep tested at farm level and 68.1 % of the animals were found VTEC positive. Two of the isolates were found to be VTEC O91 and one isolate was VTEC O103. Both these serogroups are commonly associated with human infections.

Germany reported investigations of pig herds at farm level, and 8.9 % of the 146 herds tested were found VTEC positive.

Additional information on VTEC findings in animals can be found in the Level 3 Tables.

Table VT12. VTEC in animals other than cattle, 2011

Country	Description	Sample unit	N	VTEC		VTEC O157		VTEC serogroups
				N pos	% pos	N pos	% pos	
Austria	Sheep at farm, domestic, Recto-anal swab	Animal	116	79	68.1	0	0	O91 *eae* negative, *vtx1* positive, *vtx2* positive (2)[1], O103 *eae* positive, *vtx1* positive, *vtx2* negative (1)
Netherlands	Goats at farm	Animal	214	0	0	0	0	
	Sheep at farm	Animal	564	0	0	0	0	
	Sheep at slaughterhouse, wool	Animal	374	51	13.6	51	13.6	
Germany	Pigs at farm	Herd	146	13	8.9	0	0	

Note: Data presented include only investigations with sample size ≥25.

1. Number of isolates, *eae*: presence of intimin-coding gene, *vtx1*: verocytotoxin 1 gene, *vtx2*: verocytotoxin 2 gene

No isolation of STEC/VTEC O104 was reported by the MSs from the animal samples tested. Apart from the animal species reported above, VTEC was reported from camels, cats, wild deer, dogs, fowl (*Gallus gallus*), exotic pet animals, pet rabbits, zoo animals and water buffalos.

3.4.4 Discussion

In 2011, the number of reported human cases of VTEC infection was more than 2.5 times higher than in 2010. This was on account of an outbreak of enteroaggregative STEC/VTEC O104:H4 outbreak in May to July 2011, which primarily affected Germany but had related cases in 14 other MSs and the United States. This was the largest STEC/VTEC outbreak ever reported in the EU. A common food vehicle, fenugreek sprouts imported from outside the EU, was identified after comparison of the results of French and German investigations of the outbreak. This lead to the implementation of EU-wide control measures in July 2011.

The increase in HUS cases was, however, as much as 4.5-fold in 2011 compared to 2010 and affected older age groups to a much greater extent than in 'normal' years. This observation probably reflects the difference in virulence characteristics of the STEC/VTEC O104 strain compared with normal STEC/VTEC strains, as the STEC/VTEC O104 strain was a combination of an enteroaggregative *E. coli* and a STEC/VTEC, as well as the different level of exposure to the sprouts.

On average, one-third of the confirmed VTEC cases in the EU were hospitalised, which was probably an underestimation as no data were available from Germany, and 56 deaths were reported, of which German cases accounted for 89 %.

There was a statistically significant increasing EU trend in the number of reported human cases of VTEC infection during 2008–2011. Even without 2011 data, and thus also excluding the STEC/VTEC O104:H4 outbreak cases, the EU trend for VTEC infections during 2008–2010 remained significantly increasing.

With regards to the data reported on VTEC isolated from food and animal samples, it is evident that the analytical method used to detect the bacteria has a major influence on the number of positive samples observed. Most MSs used the standard ISO method, which is intended to detect only the O157 serogroup and, consequently, the investigations in these MSs yielded fewer VTEC-positive samples than the investigations carried out in those MSs using analytical methods able to detect the presence of any VTEC serogroup or a wider range of VTEC serogroups.

Probably as a result of the STEC/VTEC O104 outbreak in May–July 2011, the MSs provided more information on investigations of VTEC in food, particularly in seeds and vegetables, than in the previous years. Within these investigations, VTEC and VTEC O157 were the strains most frequently reported from bovine meat and products thereof, raw cow's milk and sprouted seeds. Of particular concern for human health are the VTEC findings in minced meat, meat preparations and cow's milk intended to be consumed raw, even though VTEC was mostly detected at low or very low levels in these foods. The VTEC findings from sprouted seeds show a similar risk for human health, as in many countries sprouts are considered as RTE food and consumed without further heat treatment. According to the data received, VTEC was rarely reported from cheeses and vegetables.

Among animals, most of the reported data on VTEC were from cattle, and in all reported investigations on cattle, VTEC was found in the sampled animals. Fewer data were reported in other animal species and by few countries. Nevertheless, VTEC was found by two MSs from investigations on sheep. Occasional detections were also made in other animal species.

The human pathogenic VTEC serogroups, other than VTEC O157, were also isolated from foodstuffs and animals by few MSs, and these serogroups included O26, O91, O103, O111 and O145. No isolations of STEC/VTEC O104 were found from food and animals.

According to the opinion from EFSA's BIOHAZ Panel on the monitoring of VTEC,[37] the serogroups that are currently considered the most important regarding pathogenicity to humans are: O26, O91, O103, O111, O145 and O157. Furthermore, in order to improve the quality of the data from VTEC monitoring in the EU, EFSA issued technical specifications for the monitoring and reporting of VTEC in animals and food in 2009.[38] These guidelines were developed to facilitate the generation of data that would enable a more thorough analysis of VTEC in food and animals in the future. The specifications encourage MSs to monitor and report data on serogroups defined by the BIOHAZ panel as most important regarding human pathogenicity. The outbreak in 2011, due to a novel pathotype, enteroaggregative STEC O104:H4, suggests that new pathogenic strain combinations may also evolve from the human reservoir.[39]

37 EFSA (European Food Safety Authority), 2007. Scientific Opinion of the Panel on Biological Hazards (BIOHAZ) on monitoring of verotoxigenic *Escherichia coli* (VTEC) and identification of human pathogenic VTEC types. The EFSA Journal, 579, 1-61.

38 EFSA (European Food Safety Authority), 2009. Scientific Report of EFSA on technical specifications for the monitoring and reporting of verotoxigenic *Escherichia coli* (VTEC) on animals and food (VTEC surveys on animals and food). EFSA Journal, 7(11):1366, 43 pp.

39 Scheutz F, Møller Nielsen E, Frimodt-Møller J, Boisen N, Morabito S, Tozzoli R, Nataro J P and Caprioli A, 2011. Characteristics of the enteroaggregative Shiga toxin/verotoxin-producing *Escherichia coli* O104:H4 strain causing the outbreak of haemolytic uraemic syndrome in Germany, May to June 2011. Euro Surveillaince. 2011;16(24):pii=19889. Available online: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19889

3. INFORMATION ON SPECIFIC ZOONOSES

3.5. *Yersinia*

The bacterial genus *Yersinia* comprises three main species that are known to cause human infections: *Yersinia enterocolitica (Y. enterocolitica*), *Y. pseudotuberculosis* and *Y. pestis* (plague). The third and last *Y pestis* pandemic started in the mid-19th century in China and caused sporadic outbreaks of plague in Europe until 1920. Today it is believed to no longer exist in Europe. *Y. pseudotuberculosis* and pathogenic biotypes of *Y. enterocolitica* cause food-borne enteric infections in humans. This chapter describes only infections caused by *Y. enterocolitica* and *Y. pseudotuberculosis*.

Yersiniosis caused by *Y. enterocolitica* most often results in diarrhoea, at times bloody, and occurs mostly in young children. In elderly persons and in patients with underlying conditions (iron overload, cirrhosis, diabetes, cancer, etc.), systemic forms of the disease are often observed. Symptoms typically develop four to seven days after exposure and last on average one to three weeks. In older children and adults, right-sided abdominal pain and fever may be the predominant symptoms and can often be confused with appendicitis. Other symptoms such as a rash, joint pain and/or bacteraemia may occur. Infection is most often acquired by eating contaminated food, particularly raw or undercooked pig meat, but also raw (un-pasteurised) milk. The bacterium is able to grow below +4°C, thus contaminated refrigerated food can be a source of infection. Contaminated untreated water can also be a source of infection.

Yersiniosis caused by *Y. pseudotuberculosis* shows many similarities with the disease pattern of *Y. enterocolitica*. *Y. pseudotuberculosis* infections are more common in adults than those caused by *Y. enterocolitica* and typically cause abdominal pain resembling appendicitis and, less frequently, diarrhoea. The infection is often more severe than infection caused by *Y. enterocolitica*. Infections with *Y. pseudotuberculosis* are caused by the ingestion of the bacteria from raw vegetables, other contaminated foodstuffs or water or direct contact with infected animals (e.g. wild mammals or birds).

Y. enterocolitica is closely related to a large array of *Yersinia* spp. that have no reported public health significance. Within *Y. enterocolitica*, the majority of isolates from food and environmental sources are non-pathogenic types. It is, therefore, crucial that investigations discriminate between which strains are pathogenic for humans and which ones are not. Biotyping of the isolates is essential to determine whether or not isolates are pathogenic to humans, and this method is ideally complemented by serotyping. Pathogenicity can also be determined by using PCR methods. In Europe, the majority of human pathogenic *Y. enterocolitica* belong to biotype 4 (serotype O:3) or, less commonly, biotype 2 (serotype O:9, O:5,27). Pigs are considered to be the primary reservoir for the human pathogenic types of *Y. enterocolitica*, mainly biotype 4 (serotype O:3). Biotype 2 (serotype O:9) has been isolated from other animal species, such as cattle, sheep and goats. Clinical disease in animal reservoirs is uncommon.

An overview of data reported for 2011 is presented in the tables and figures below. Additional information on the data provided by MSs on *Yersinia* in 2011 is presented in the Level 3 Tables.

Table YE1 lists the countries reporting *Yersinia* data for 2011.

Table YE1. Overview of countries reporting data on* Yersinia *spp., 2011

Data	Total number of reporting MSs	Countries
Human	24	**All MSs** except GR, NL, PT **Non-MS:** NO
Food	9	**MSs:** AT, BE, DE, ES, IT, LT, RO, SE, SK
Animal	11	**MSs:** DE, ES, IE, IT, LV, NL, PL, PT, SE, SK, UK **Non-MSs:** CH, NO

3.5.1. Yersiniosis in humans

A total of 7,017 confirmed cases of yersiniosis were reported in the EU in 2011. The number of cases increased by 3.5 % compared to 2010 (N = 6,780), which was the first time a slight increase was observed since 2006. There was, however, a statistically significant (p <0.001) decreasing five-year trend in the EU in 2007–2011 (Figure YE1). Yersiniosis was the fourth most frequently reported zoonosis in the EU with an overall notification rate of 1.63 cases per 100,000 population in 2011 (Table YE2). Seasonality in the trend was also observed (Figure YE1).

The highest country-specific notification rates were observed in Lithuania and Finland (11.40 and 10.31 cases per 100,000 population, respectively) (Table YE2). In individual MSs, statistically significant decreasing trends were noted in six MSs: Denmark, Germany, Lithuania, Slovenia, Spain and Sweden, while statistically significant increasing trends were noted in three MSs: Hungary, Romania and Slovakia.

More than half, 55.2 %, of the confirmed yersiniosis cases (427 out of 773 cases for which the information was available), were hospitalised in 2011. The proportion of confirmed cases with known hospitalisation status was, however, only 11.0 %, reported by nine MSs (Figure YE2). The highest proportion of hospitalised cases by country was reported in Romania (80.9 %). The highest number of hospitalised cases was observed in Lithuania (258 cases, 60 % of all hospitalised cases in the EU). The EU case fatality rate was 0.02 %; one death due to yersiniosis was reported in 2011 among the 4,918 confirmed cases for which this information was reported (70.1 % of all case-based reported cases). As for most diseases, however, the case fatality rates should be interpreted with caution as the final fate of cases is often unknown after the initial sampling.

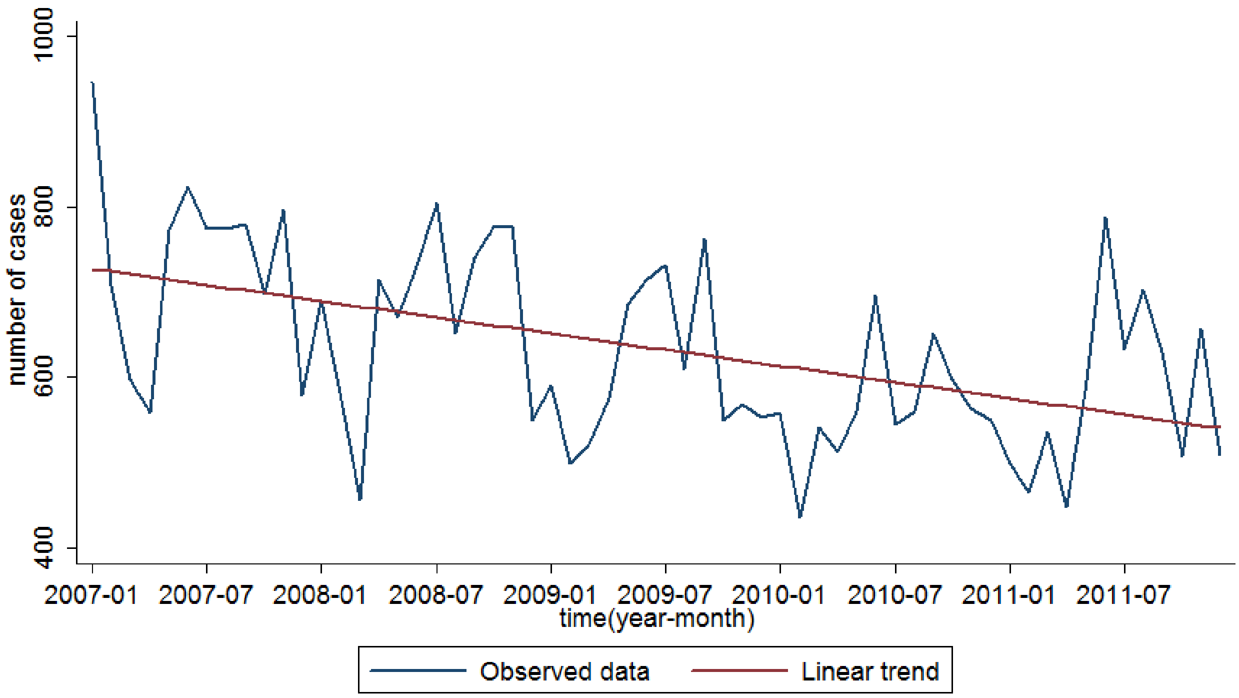
Species information was reported for 6,830 of 7,017 confirmed yersiniosis cases in 2011. Of these, *Y. enterocolitica* was the most common species reported, isolated from 98.4 % of the confirmed cases, followed by *Y. pseudotuberculosis,* which represented only 0.9 %, while the remaining 0.6 % were other species.

Table YE2. Reported cases of human yersiniosis in 2007–2011, and notification rates for confirmed cases in the EU, 2011

Country	2011				2010	2009	2008	2007
	Report Type[1]	Cases	Confirmed Cases	Confirmed cases/ 100,000	Confirmed cases			
Austria	C	142	119	1.42	84	140	93	142
Belgium	C	214	214	1.95	216	238	273	248
Bulgaria	A	4	4	0.05	5	8	10	8
Cyprus	U	0	0	0	0	0	0	0
Czech Republic	C	460	460	4.37	447	463	557	576
Denmark	C	225	225	4.05	193	238	331	274
Estonia	C	69	69	5.15	58	54	42	76
Finland	C	554	554	10.31	522	633	608	480
France	A	294	294	0.45	238	208	213	0
Germany	C	3,397	3,381	4.14	3,346	3,731	4,352	4,987
Greece	-	-	-	-	-	-	-	-
Hungary	C	93	93	0.93	87	51	40	55
Ireland	C	6	6	0.13	3	3	3	6
Italy	C	15	15	0.02	15	11	-	-
Latvia	C	28	28	1.26	23	45	50	41
Lithuania	C	370	370	11.40	428	483	536	569
Luxembourg	C	33	33	6.45	39	36	17	22
Malta	U	0	0	0	1	0	0	0
Netherlands	-	-	-	-	-	-	-	-
Poland	C	258	250	0.65	205	288	214	182
Portugal	-[2]	-	-	-	-	-	-	-
Romania	C	47	47	0.22	27	5	9	0
Slovakia	C	170	166	3.05	166	167	68	71
Slovenia	C	16	16	0.78	16	27	31	32
Spain[3]	C	264	264	2.29	325	291	315	381
Sweden	C	350	350	3.72	281	397	546	567
United Kingdom	C	59	59	0.09	55	61	48	86
EU Totals	-	**7,068**	**7,017**	**1.63**	**6,780**	**7,578**	**8,356**	**8,803**
Iceland	-[2]	-	-	-	-	-	-	-
Norway	C	60	60	1.22	52	60	50	71

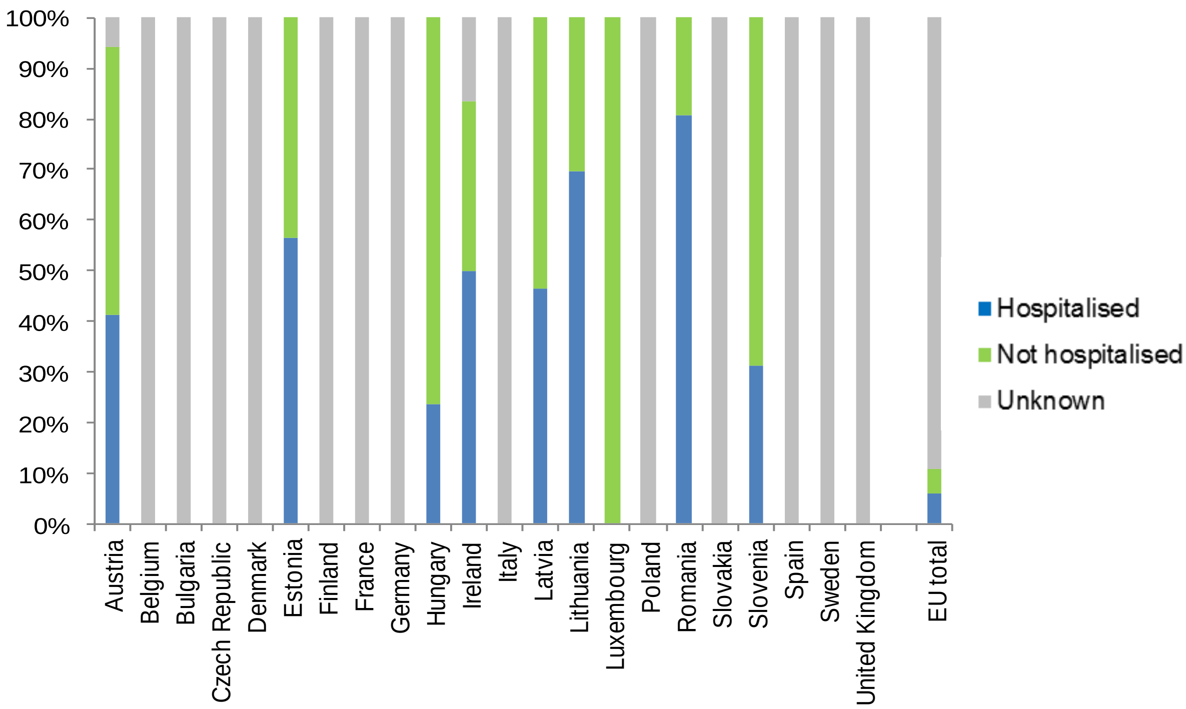
1. A: aggregated data report; C: case-based report; –: no report; U: unspecified.
2. No surveillance system.
3. Surveillance system only covers 25 % of the total population.

Figure YE1. Trend in reported confirmed cases of human yersiniosis in the EU, 2007–2011



Source: (Data for EU-trend; 23 MSs): Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Malta, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, and United Kingdom. Cyprus reported zero cases throughout the period. Italy has been excluded since data for the whole period were not reported.

Figure YE2. Proportion of reported confirmed cases of human yersiniosis hospitalised in the EU, 2011



3.5.2. *Yersinia* in food

In 2011, nine MSs provided data on food tested for *Yersinia,* and particularly for *Y. enterocolitica*. Data were provided on samples from meat, milk, cheeses and other dairy products, vegetables, and other types of food and prepared dishes. Positive findings were reported by four MSs and mostly in meat samples. Overall, out of 107 *Yersinia*-positive units, 102 were from meat samples.

Pig meat and products thereof are considered to be the most important food source for *Y. enterocolitica* infections in humans. The detailed results of the testing for *Yersinia* in this food category are presented in the Level 3 Tables. In 2011, four MSs reported positive *Yersinia* findings in pig meat and products thereof. Overall, out of 1,146 pig meat samples tested, 30 were positive for *Yersinia*, and, among these, 28 were positive for *Y. enterocolitica* (13 positive for *Y. enterocolitica* biotype 4 serotype O:3).

In 2011, only one MS reported one positive sample for *Yersinia* (*Y. enterocolitica*) in bovine meat or products thereof. Positive findings were also reported in red meat from different animal species (bovines, pigs, goats, sheep, horses, donkeys, bison and water buffalos), as well as in meat from other animal species.

In addition, positive findings were also found in samples from milk, vegetables and fish.

There were no findings of *Y. pseudotuberculosis* in any food items tested in 2011.

The detailed data reported in 2011 on the different food categories can be found in the Level 3 Tables.

3.5.3. *Yersinia* in animals

In 2011, 11 MSs and two non-MSs submitted data on the testing of animals for *Yersinia*.

Three MSs and one non-MS reported positive findings in pigs, mostly for *Y. enterocolitica*. In 2011, out of the 213 porcine isolates that were positive for *Y. enterocolitica,* 114 were reported with serotype information. Specifically, 111 isolates were reported as serotype O:3 with no details regarding the biotype, two isolates were identified as biotype 3 (serotype O:3) and one isolate was reported as biotype 2 (serotype O:9). One MS also reported positive findings in wild boars.

Yersinia was also detected by MSs in other animal species. As for cattle, two MSs reported positive findings for *Y. enterocolitica,* while two animal samples tested positive for *Y. pseudotuberculosis* in one additional MS.

In sheep and goats, *Y. enterocolitica* was seldom detected in the few investigations reported in 2011. As in the previous year, Ireland reported on large investigations in sheep without positive findings. Two MSs and one non-MS also reported *Y. pseudotuberculosis* in goats and sheep.

Five MSs reported data on the testing for *Yersinia* in poultry, but with no positive findings except for the animal category ‘poultry unspecified’ in which positive samples were reported in one MS. Positive findings were also reported in other animal species, including hares, rabbits, cats, dogs, domestic solipeds, etc.

Detailed data on the testing of animals for *Yersinia* can be found in the Level 3 Tables.

3.5.4. Discussion

Yersiniosis was in 2011 the fourth most commonly reported zoonosis in the EU, even considering the continuous decreasing five-year trend (2007–2011). In 2011, 7,017 confirmed human cases were reported in the EU and this was the first time that the number of yersiniosis cases had shown a slight increase since 2006. More than half (55.2 %) of the human cases with known hospitalisation status were hospitalised, but the case fatality ratio was low; one death due to yersiniosis was reported in 2011.

In 2011, a total of 17 food-borne *Yersinia* outbreaks, affecting 71 people, were reported by seven MSs. One of them, reported by Denmark, was supported by strong evidence and accounted for seven human cases with no hospitalisations or deaths. Among the outbreaks with weak evidence, one in Denmark was relatively large (30 human cases) compared with the others. In addition, one strong-evidence outbreak due to *Y. enterocolitica* O:9 was reported by Norway and affected 21 people with four hospitalised and no deaths. Epidemiological studies showed that the Norwegian *Yersinia* outbreak was associated with the consumption of RTE salad products.

Pigs are considered to be a major reservoir and pork products are considered to be the most important source for pathogenic *Y. enterocolitica* infection in humans. In 2011, four MSs reported positive findings for *Yersinia* (mostly *Y. enterocolitica*) in pig meat and products thereof. Positive findings were also reported in bovine meat and red meat from different animal species (bovines, pigs, goats, sheep, horses, donkeys, bison and water buffalo), as well as in meat from other animal species or species not specified. Three MSs and one non-MS reported positive findings in pigs, mainly for *Y. enterocolitica*. Positive findings were also reported in other animal species, including wild boars, cattle, sheep and goats, hares, rabbits, dogs, cats, domestic solipeds, etc.

According to the Opinion published by the Biological Hazard Panel in 2007,[40] the majority of human pathogenic *Y. enterocolitica* strains in Europe belong to biotype 4 (serotype O:3), followed by biotype 2 (serotype O:9). Biotypes 1B, 3 and 5 are also human pathogenic, whereas biotype 1A is not. Therefore, it is crucial that information is provided on the biotype of each *Y. enterocolitica* isolate in order to gauge its public health significance. It is recommended that biotyping, and preferably also serotyping, is increased in the future. In 2011, *Y. enterocolitica* serotypes and biotypes that are recognised as pathogenic for humans were reported by two MSs from pigs, supporting the role of this animal species as a major source of human infection.

40 EFSA (European Food Safety Authority), 2007. Scientific Opinion of the Panel on Biological Hazard (BIOHAZ) on monitoring and identification of human enteropathogenic *Yersinia* spp. The EFSA Journal, 595, 1-30.

3. INFORMATION ON SPECIFIC ZOONOSES AND ZOONOTIC AGENTS

3.6. Tuberculosis due to *Mycobacterium bovis*

Tuberculosis is a serious disease of humans and animals caused by species in the *Mycobacterium tuberculosis* (*M. tuberculosis*) complex. This group includes *M.* bovis, responsible for bovine tuberculosis, which is a highly contagious disease that can easily spread from one cow to another. *M. bovis* is capable of infecting a wide range of mammals, including humans. In humans, infection with *M. bovis* causes a disease that is indistinguishable from that caused by infections with *M. tuberculosis*, the primary agent of human tuberculosis. Furthermore, the recently defined *M. caprae* also causes tuberculosis among animals, and to a limited extent in humans.

The main transmission routes of *M. bovis* to humans are through contaminated food (especially through drinking raw milk from infected cows, or eating raw milk products). But as pasteurization kills *M. bovis,* cases of transmission of this bacterium to humans are extremely rare. *M. bovis* can also be transmitted to humans through direct contact with infected animals. A number of wildlife animal species, such as deer, wild boars, badgers and the European bison, may contribute to the spread and/or maintenance of *M. bovis* infection in cattle.

This chapter focuses on zoonotic tuberculosis caused by *M. bovis.*

Table TB1 presents the countries reporting data for 2011.

Table TB1. Overview of countries that reported data for tuberculosis due to* M. bovis *for humans and animals, 2011

Data	Total number of reporting MSs	Countries
Human	25	**All MSs** except FR, GR **Non MSs:** CH, NO
Animal	27	**All MSs** **Non-MSs:** CH, NO

3.6.1. *M. bovis* in humans

In 2011, 132 confirmed cases of human tuberculosis due to *M. bovis* were reported by 25 MSs (Table TB2). Thirteen of these MSs reported zero cases. Most cases were reported in Germany, the United Kingdom and Spain. The notification rate was, however, highest in Ireland followed by the Netherlands (0.13 and 0.07 cases per 100,000 population, respectively). The EU notification rate in 2011 was 0.03 cases per 100,000 population.

The number of confirmed cases of tuberculosis due to *M. bovis* decreased in the EU in 2011 by 20.0 % after an increase in 2010 of 23.1 % compared with 2009 (Table TB2). There was no statistically significant EU trend in cases of tuberculosis due to *M. bovis* in 2007–2011 (Figure TB1) and no significant country-specific trends. There was also no seasonal trend observed (Figure TB1).

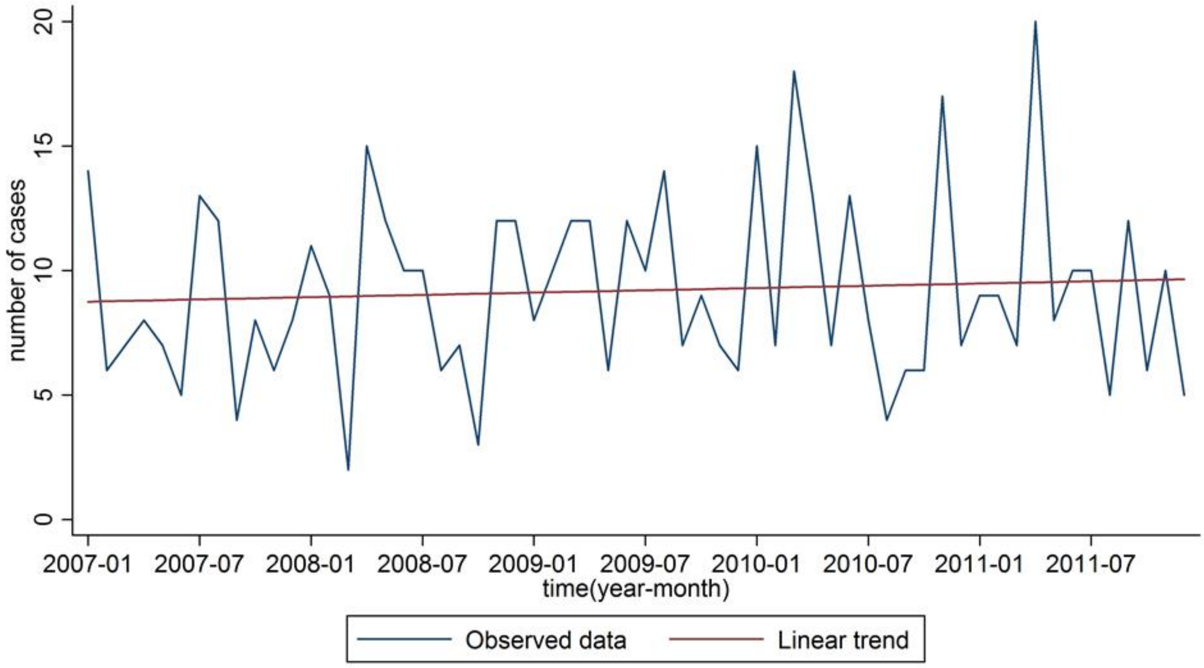
In TESSy a distinction is made between tuberculosis cases infected within the country and those “imported” by classifying cases into those born in the reporting country and those moving there at a later stage. On average, 70.1 % of the cases were born in the reporting country. However, there was a larger proportion (84.6 %) of native cases in countries not free of bovine tuberculosis than in countries officially bovine tuberculosis free (OTF)(45.4 %).

Table TB2. Reported cases of human tuberculosis due to* M. bovis *in 2007–2011 and notification rates for confirmed cases in the EU, in 2011; OTF[1] status is indicated

Country	2011				2010	2009	2008	2007
	Report Type[2]	Cases	Confirmed cases	Confirmed cases/ 100,000	Confirmed cases			
Austria (OTF)	C	0	0	0	4	2	3	2
Belgium (OTF)	C	5	5	0	9	3	2	0
Bulgaria	C	2	2	0.03	0	0	0	0
Cyprus	U	0	0	0	0	0	0	0
Czech Republic (OTF)	U	2	2	0.02	0	0	0	1
Denmark (OTF)	U	1	1	0.02	2	0	1	1
Estonia (OTF)	U	0	0	0	0	0	0	0
Finland (OTF)	C	1	1	0.02	0	0	0	0
France (OTF)	-[3]	-	-	-	-	-	-	-
Germany (OTF)	C	38	38	0.05	42	57	47	43
Greece	-[3]	-	-	-	0	0	0	0
Hungary	U	0	0	0	0	0	0	0
Ireland	C	6	6	0.13	12	8	12	6
Italy[4,5]	C	11	11	0.02	15	6	4	11
Latvia (OTF)	U	0	0	0	0	0	0	0
Lithuania	U	0	0	0	0	0	0	0
Luxembourg (OTF)	U	0	0	0	0	0	0	0
Malta	U	0	0	0	0	0	0	0
Netherlands (OTF)	C	11	11	0.07	13	11	19	10
Poland (OTF)	U	0	0	0	0	0	0	0
Portugal	C	0	0	0	2	1	1	0
Romania	U	0	0	0	0	0	0	0
Slovakia (OTF)	U	0	0	0	0	0	0	0
Slovenia (OTF)	U	0	0	0	0	0	0	2
Spain	C	22	22	0.05	34	17	11	11
Sweden (OTF)	C	2	2	0.02	2	5	2	4
United Kingdom	C	31	31	0.05	30	24	21	22
EU Total		**132**	**132**	**0.03**	**165**	**134**	**123**	**113**
Iceland [6]	U	0	0	0	0	0	0	0
Norway (OTF)	C	2	2	0.04	1	1	0	2
Switzerland (OTF)[7]	C	13	13	0.20	6	4	5	6

1. OTF: Officially Tuberculosis Free.
2. C: case-based report; –: no report; U: unspecified.
3. Not reporting species of the *M. tuberculosis* complex (France) or only reporting for *M. tuberculosis* (Greece).
4. In Italy, six regions and 13 provinces are OTF.
5. Thirty-seven of the cases reported from Italy to TESSy in 2007-2011 were without laboratory results but were still included in the table since reported as *M. bovis*.
6. Iceland has no special agreement concerning animal health (status) with the EU. The last outbreak of bovine tuberculosis was in 1959.
7. Switzerland provided data directly to EFSA.

Figure TB1. Trend in reported confirmed cases of human tuberculosis due to* M. bovis *in the EU, 2007–2011



Source: 25 MSs: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, Germany, Ireland, Italy, Netherlands, Portugal, Slovenia, Spain, Sweden, and United Kingdom. Cyprus, Estonia, Hungary, Latvia, Lithuania, Luxembourg, Malta, Poland, Romania and Slovakia reported zero cases throughout the period.

3.6.2. Tuberculosis due to *M. bovis* in animals

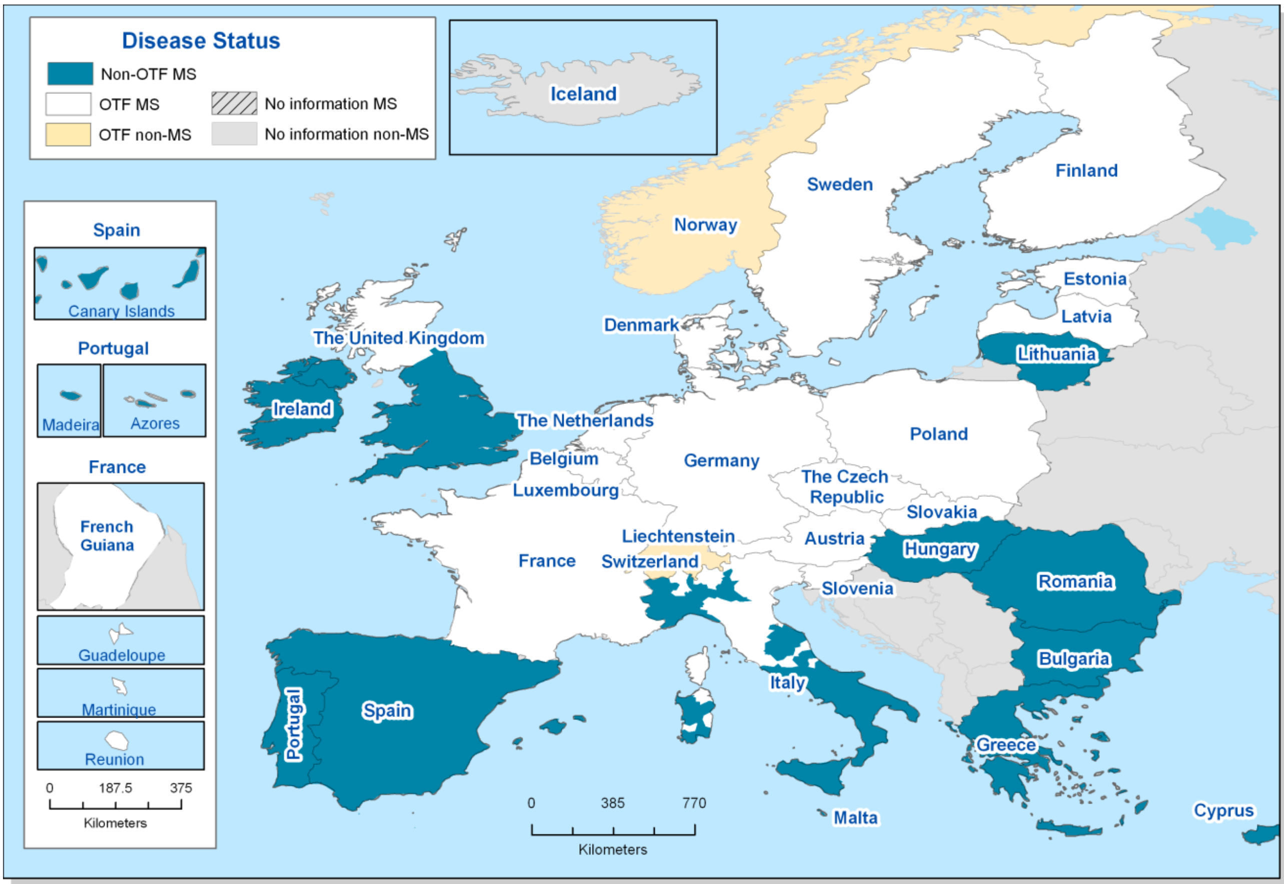
Cattle

The status regarding freedom from bovine tuberculosis (OTF) and the occurrence of the disease in MSs and non-MSs, in 2011, is presented in Figures TB2 and TB3. As regards the OTF status, Council Directive 64/432/EEC[41] stipulates that a MS or part of a MS may be declared OTF if the percentage of bovine herds confirmed as infected with tuberculosis has not exceeded 0,1 % per year of all herds for six consecutive years and at least 99,9 % of herds have achieved OTF status each year for six consecutive years. As in 2010, Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Luxembourg, the Netherlands, Poland, Slovakia, Slovenia, Sweden, Norway and Switzerland were OTF in accordance with EU legislation. Liechtenstein has the same status (OTF) as Switzerland. In Iceland, which has no special agreement concerning animal health (status) with the EU, the last outbreak of bovine tuberculosis was in 1959. In 2011, Latvia also achieved OTF status (Decision 2011/675/EU[42]). Moreover, in Italy the provinces of Rieti and Viterbo in the Lazio region were declared OTF (Decision 2011/277/EU[43]). Italy now has six OTF regions and 13 OTF provinces. In the United Kingdom, Scotland is OTF.

Vaccination of cattle against bovine tuberculosis is prohibited in all MSs and in reporting non-MSs.

All data submitted by MSs and other reporting countries are presented in the Level 3 tables of the report.

Figure TB2. Status of countries regarding bovine tuberculosis, 2011

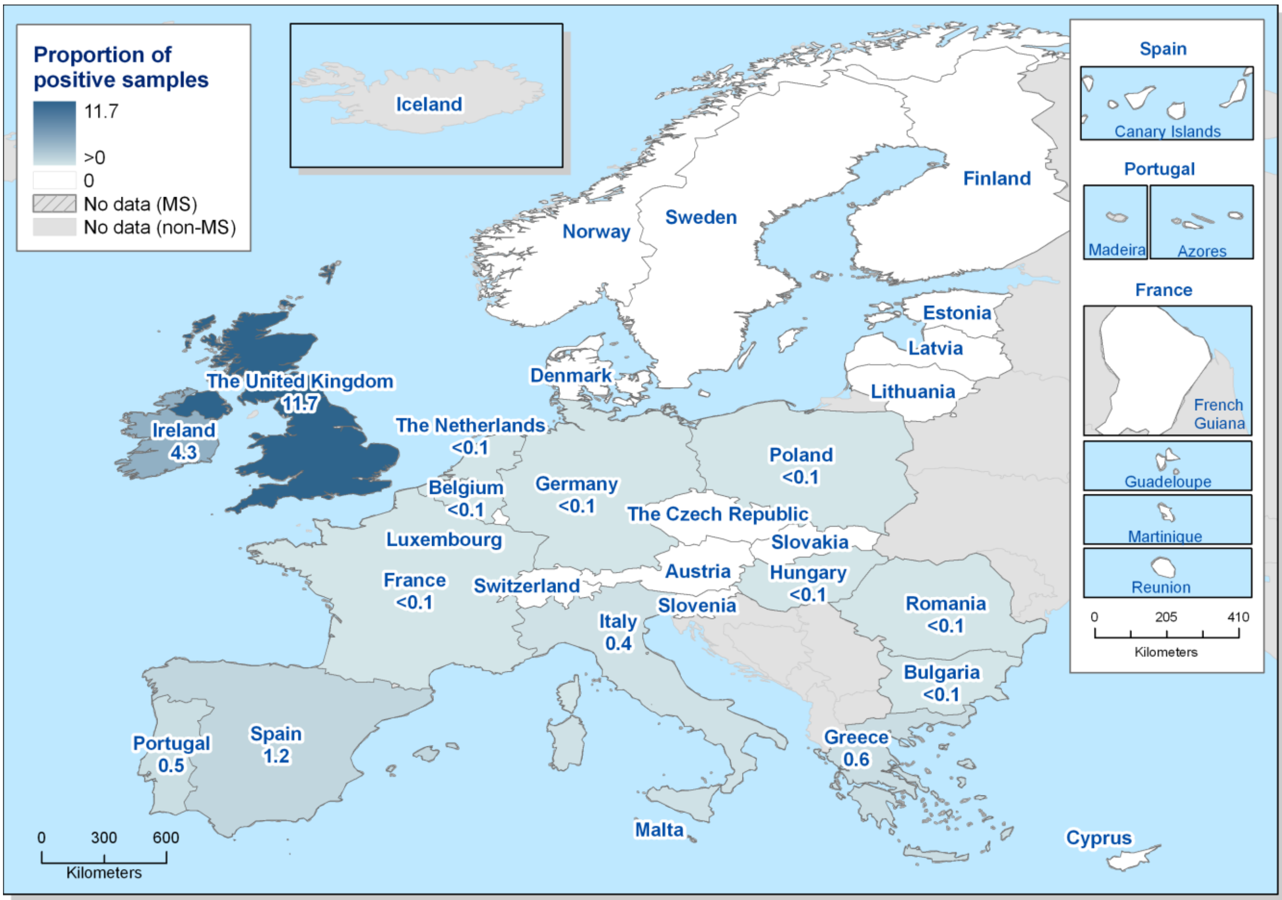


41 Council Directive 64/432/EEC of 26 June 1964 on animal health problems affecting intra-Community trade in bovine animals and swine. OJ L 121, 29.7.1964, p. 1977-2012.

42 Commission Implementing Decision 2011/675/EU of 12 October 2011 amending Decision 2003/467/EC as regards the declaration of Latvia as officially tuberculosis-free Member State and the declaration of certain administrative regions in Portugal as officially enzootic-bovine-leukosis-free regions (notified under document C(2011) 7186). OJ L 268, 13.10.2011, pp. 19–20.

43 Commission Implementing Decision 2011/277/EU of 10 May 2011 amending Annex II to Decision 93/52/EEC as regards the recognition of certain regions in Italy as officially free of brucellosis (*B. melitensis*) and amending the Annexes to Decision 2003/467/EC as regards the declaration that certain regions of Italy, Poland and the United Kingdom are officially free of bovine tuberculosis, bovine brucellosis and enzootic bovine leukosis (notified under document C(2011) 3066). OJ L 122, 11.5.2011, pp. 100–106.

Figure TB3. Proportion of existing cattle herds infected with or positive for* M. bovis*, country based-data, 2011



Trend indicators for tuberculosis

To assess the annual EU trends in bovine tuberculosis and to complement the MS-specific figures, two epidemiological trend indicators have been used since 2005.

The first indicator **"% existing herds infected/positive"** is "the number of infected herds" (or 'the number of positive herds', respectively) divided by "the number of existing herds in the country". This indicator describes the situation in the whole country during the reporting year.

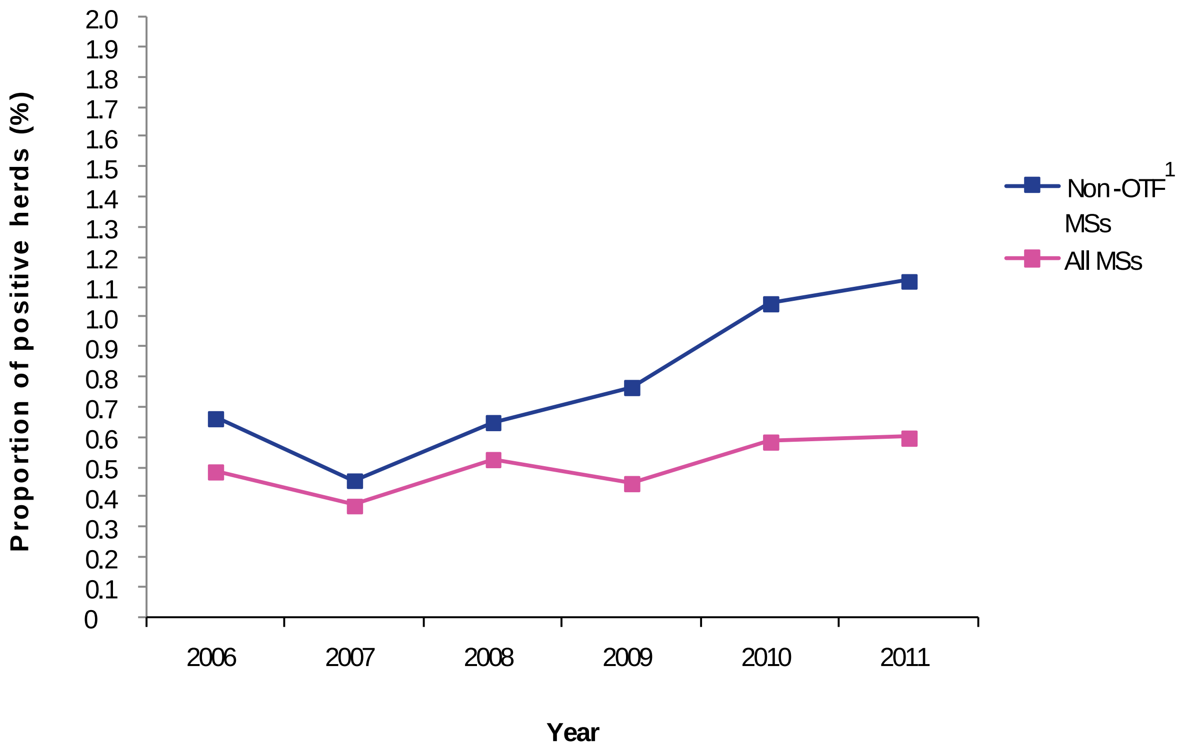
A second indicator **"% tested herds positive"** is "the number of test-positive herds" divided by "the number of tested herds". This indicator gives a more precise picture of the testing results and also estimates the herd prevalence during the whole reporting year. This information is only available from countries or regions with EU co-financed eradication programmes.

Infected herds means all herds under control, which are not OFT at the end of the reporting period. This figure summarises the results of different activities (tuberculin testing, meat inspection, follow-up investigations and tracing). Data for infected herds are reported from countries and regions that do not receive EU co-financing for eradication programmes.

Positive herds are herds with at least one bacteriological or tuberculin skin test-positive animal during the reporting year, independent of the number of times the infection status of each herd has been checked. Data for positive herds are reported from countries and regions that receive EU co-financing for eradication programmes.

During the years 2006–2011, the proportion of existing cattle herds infected or positive for *M. bovis* in the EU (all MSs) was relatively stable at a very low level and ranging from 0.37 % in 2007 to 0.60 % in 2011 (Figure TB4). In the non-OTF MSs the proportion of *M. bovis*-positive herds slightly increased from very low (0.46 %) in 2007 to low (1.12 %) in 2011.

Figure TB4. Proportion of existing cattle herds infected with or positive for* M. bovis*, 2006-2011



Source: All reporting countries that are MSs during the current year are included.
1. OTF: Officially Tuberculosis Free.

Officially Tuberculosis-Free Member States and non-Member States

Bovine tuberculosis was not detected in cattle herds in 10 of the 15 OTF MSs and Norway and Switzerland, during 2011. However, in total, out of the 1,361,555 existing herds in the OTF countries, 194 herds were positive for *M. Bovis*: in Belgium (one herd), France (173 herds), Germany (three herds), Poland (13 herds) and the Netherlands (four herds).

Non-Officially Tuberculosis-Free Member States

All reporting non-OTF MSs have national eradication programmes for bovine tuberculosis in place. Table TB3 shows the reported results from MSs that did not receive EU co-financing for their eradication programmes in 2011, while Table TB4 shows results from those MSs with eradication programmes co-financed by the EU. In 2011, Ireland, Italy, Portugal, Spain and the United Kingdom received EU co-financing (Decision 2009/883/EU[44] as amended by Decision 2011/807/EU[45]).

Three non-OTF MSs, Cyprus, Lithuania and Malta, did not report any infected herds during 2011 (Table TB3).

44 Commission Decision 2009/883/EU of 26 November 2009 approving annual and multi-annual programmes and the financial contribution from the Community for the eradication, control and monitoring of certain animal diseases and zoonoses presented by the Member States for 2010 and following years OJ L 317, 3.12.2009, pp. 36–45.

45 Commission Implementing Decision 2011/807/EU of 30 November 2011 approving annual and multiannual programmes and the financial contribution from the Union for the eradication, control and monitoring of certain animal diseases and zoonoses presented by the Member States for 2012 and following years. OJ L 322, 6.12.2011, pp. 11–22.

In total, the 12 non-OTF MSs reported 1,524,638 existing bovine herds with 17,102 of them (1.12 %) infected with or positive to *M. bovis* in 2011.

Among the non-co-financed non-OTF MSs, Greece reported the highest number of infected herds (176) followed by Romania (61) and Bulgaria (two). Compared with the data from 2010 the overall prevalence of infected herds in the MS group that did not receive EU co-financing for their eradication programmes remained the same (0.02 %).

Table TB3.* Mycobacterium bovis *in cattle herds in non-co-financed non-OTF MSs, 2011

Non-officially free MSs	No of existing herds	No of officially free herds	No of infected herds	% existing herds infected
Bulgaria	103,383	0	2	0.002
Cyprus	324	273	0	0
Greece	30,835	14,295	176	0.57
Hungary	16,608	16,599	1	0.01
Lithuania	86,207	86,207	0	0
Malta	125	125	0	0
Romania	751,595	751,534	61	0.01
Total (7 MSs)	**989,077**	**869,033**	**240**	**0.02**

The non-OTF MSs with eradication programmes co-financed by the EU were the same as in 2010: Ireland, Italy, Portugal, Spain and the United Kingdom. For these five MSs there was an overall slight increase in both indicators (the proportions of positive herds among the existing herds and among the tested herds): from 3.17 % and 4.26 %, respectively, in 2010, to 3.23 % and 4.36 % respectively, in 2011. This was due to the United Kingdom, where both indicators increased, whereas in Ireland, Italy, Portugal and Spain, both indicators decreased. The United Kingdom had the highest percentages of existing positive herds and herds testing positive (9.90 % and 17.84 %, respectively, in Great Britain and 6.45 % and 6.92 %, respectively, in Northern Ireland) (Table TB4). Ireland reported the next highest percentages of existing positive herds (4.31 %) and herds testing positive (4.37 %).

Table TB4.* Mycobacterium bovis *in cattle herds in co-financed non-OTF MSs,[1] 2011

Non-officially free MSs	No of existing herds	No of tested herds	No of positive herds	% existing herds positive	% tested herds positive
Ireland	116,061	114,333	5,002	4.31	4.37
Italy[2]	128,393	58,568	488	0.38	0.83
Portugal	58,503	33,982	267	0.46	0.79
Spain	126,473	111,460	1,485	1.17	1.33
United Kingdom (Great Britain)[3,4]	80,454	44,658	7,965	9.90	17.84
United Kingdom (Northern Ireland)[4]	25,677	23,917	1,655	6.45	6.92
Total (5 MSs)	**535,561**	**386,918**	**16,862**	**3.23**	**4.36**

1. Only tested and positive herds from regions that have co-financed eradication programmes are included. The number of existing herds includes all herds from all regions in the MS.
2. In Italy six regions and 13 provinces are OTF. In the provinces that are OTF or do not have a co-financed eradication programme, none of the 8,413 existing herds were found infected.
3. During 2009, Scotland obtained status as OTF (Decision 2009/761/EC), Great Britain includes results for England, Scotland and Wales. In Scotland, five of the 13,323 existing herds were found infected.
4. In 2011, the overall proportion of existing herds positive in the United Kingdom was 9.06 % (9,620 positive herds out of 106,131 existing herds).

In the United Kingdom data are reported separately for Great Britain (England, Scotland (OTF) and Wales) and for Northern Ireland. Since 2008 the overall proportion of existing herds positive for bovine tuberculosis in the United Kingdom increased from 2.88 % in 2008, through 5.58 % in 2009 and 8.63 % in 2010, to 9.06 % in 2011.

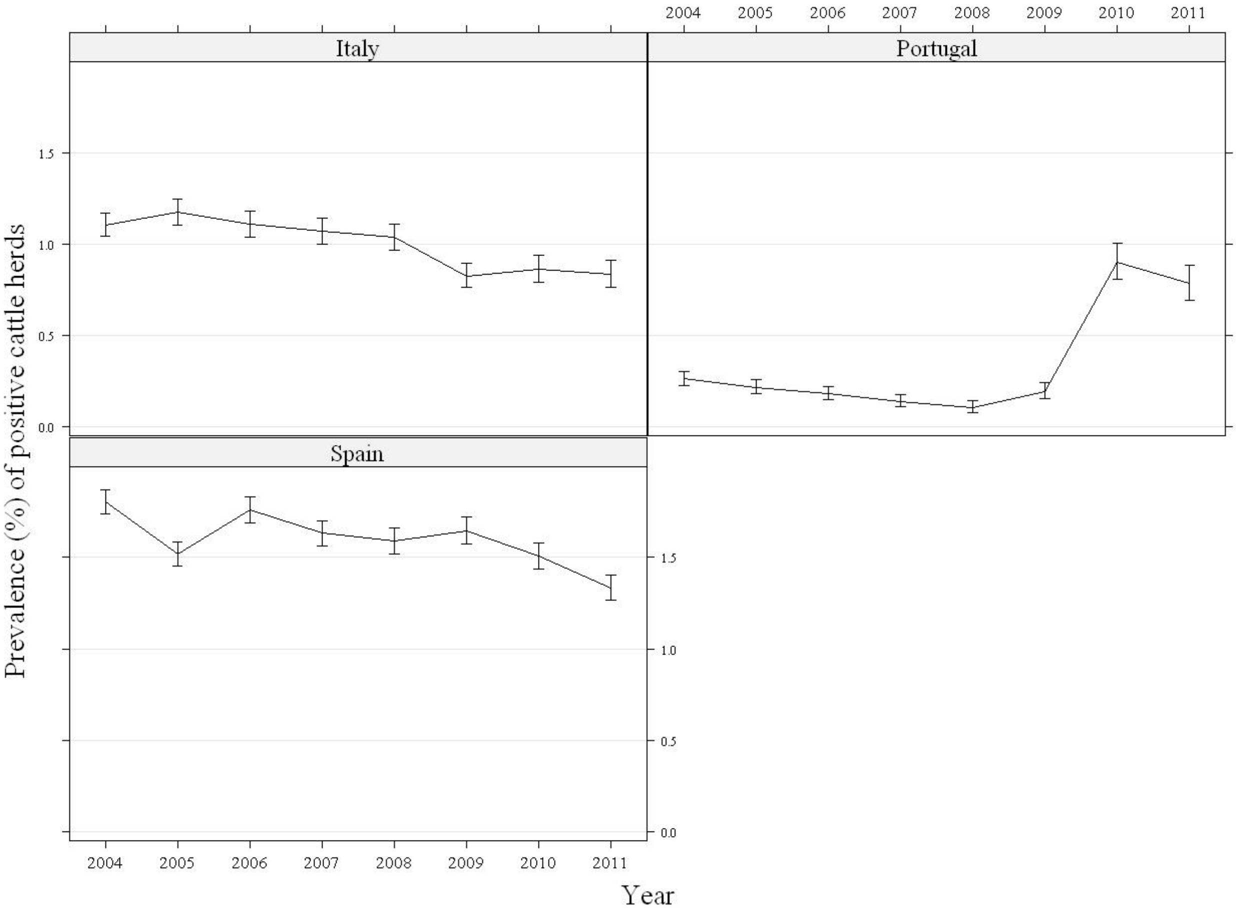
In Great Britain, Scotland is OTF and five of the 13,323 existing herds were found infected during 2011. Approximately 76,600 herds in Great Britain had a tuberculin skin test in 2011. The total number of new bovine tuberculosis breakdowns detected in 2011 (4,830) increased by 3.3 % compared with 2010 (4,678). Of these new bovine tuberculosis breakdowns in 2011, 2,965 led to withdrawal of OTF herd status (confirmed breakdowns), compared with 2,974 in 2010. Taking into account the overall number of tuberculin skin tests performed in unrestricted herds (62,464 in 2011, an increase from 61,588 in 2010), this equates to a total herd bovine tuberculosis incidence of 7.7 %, compared to 7.4 % in 2010. The estimated herd incidence of bovine tuberculosis breakdowns with OTF status withdrawn in 2011 was 4.9 %, which is identical to that of 2010.

In Northern Ireland, approximately 23,900 herds were tuberculin tested during 2011 (approximately 1.6 million cattle). The herd and animal incidence of bovine tuberculosis has increased over the last year with the current levels running at 6.01 % and 0.51 %, respectively. At the end of December 2011, 4.9 % of herds in Northern Ireland had OTF status withdrawn owing to a bovine tuberculosis incident. This is an increase compared with the 3.8 % of herds of OTF status withdrawn at the end of 2010.

Source: United Kingdom National Zoonoses Summary Report, 2011.

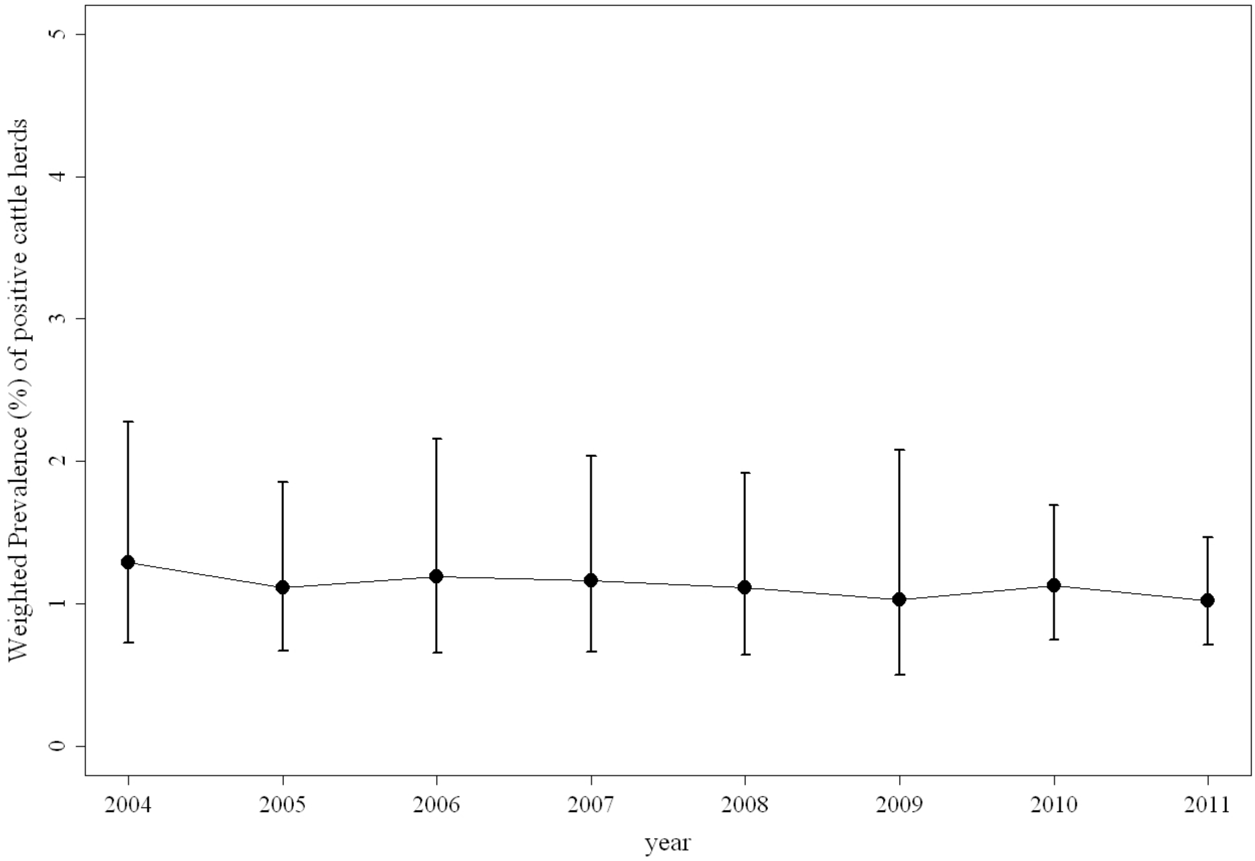
The MS-specific trends in test-positive herds in the three non-OTF MSs with continued co-financing from 2004 to 2011 are shown in Figure TB5. Over the eight years reported, the trends seem to be decreasing in Italy and Spain. For Portugal the trend is less clear but is at a lower level compared with the two other non-OTF MSs. As shown in Figure TB6 and also confirmed by logistic regression analysis, no statistically significant trend was observed from 2004 to 2011 in the weighted prevalence for the three co-financed non-OTF MSs. See Chapter 5, Materials and methods, section 5.2, for a description of the statistical methodology.

***Figure TB5. Prevalence and 95 % CI for* M. bovis *test-positive cattle herds, at MS level, in three co-financed non-OTF MSs, 2004-2011*[1]**



1. Vertical bars indicate the exact binomial 95 % confidence interval.

Figure TB6. Weighted prevalence[1] and 95 % CI for* M. bovis *test-positive cattle herds, overall for three co-financed non-OTF MSs, 2004-2011[2]



Note: Vertical bars indicate 95 % confidence intervals.

1. The MS group prevalence is estimated using weights. The MS-specific weight is the ratio between the number of existing herds and the number of tested herds, per year.
2. Data included from: Italy, Portugal and Spain.

Animal species other than cattle

Where performed, surveillance of tuberculosis due to *M. bovis* in animal species other than cattle mainly entails post-mortem meat inspection. In addition, results from clinical investigations or from other specific local studies are also reported.

In 2011, 16 MSs and two non-MSs sampled animal species other than cattle. They detected *M. bovis* in alpacas, badgers, cats, farmed and hunted wild deer (roe deer, red deer and fallow deer), foxes, goats, pigs, sheep, donkeys, vultures, wild boars, marten and bison.

All data submitted by MSs and other reporting countries are presented in the Level 3 tables.

3.6.3. Discussion

Tuberculosis due to *M. bovis* is a rare infection in humans in the EU, with 132 confirmed human cases reported in 2011. The case numbers reported over recent years are fairly constant, with no observed trend in any MSs or at the EU level. There was no clear association between a country's status as officially free from bovine tuberculosis (OTF) and notification rates in humans. This could be due to the fact that infected cattle are sometimes also detected in OTF MSs (see below) and that on average more than half of the cases in OTF MSs are persons who have immigrated to the country, thus the infection might have been acquired in their country of origin.

Fifteen MSs have OTF status and five of these reported infected cattle herds: Belgium, Germany, Poland and the Netherlands detected only very few positive herds, while France found 173 such herds. However, owing to the low numbers of infected herds compared to the numbers of officially free herds, their status as OTF countries was retained.

The proportion of infected or positive herds in the 12 non-OTF MSs slightly increased in 2011. Three of the 12 non-OTF MSs reported no infected cattle herds in 2011. Of the nine non-OTF MSs reporting herds infected with or positive to *M. bovis*, the prevalence of bovine tuberculosis remained at a level comparable to 2010 or decreased, except in the United Kingdom which reported an increase in the prevalence of bovine tuberculosis and accounted for the highest proportion of positive herds. This was the third consecutive year that the United Kingdom reported an increase in bovine tuberculosis. No statistically significant trend was observed in the grouped weighted prevalence for the three co-financed non-OTF MSs, Italy, Portugal and Spain, during 2004-2011.

In 2011, 16 MSs and two non-MSs sampled animal species other than cattle and they detected *M. bovis* in several domestic and wildlife species. These findings demonstrate that wild animals are infected and may constitute a reservoir for *M. bovis*, which is in line with a technical report submitted to EFSA in October 2009[46] on the presence of bovine tuberculosis within wildlife populations in relation to controlling the infection in cattle populations. According to the report, badgers, deer and wild boars are considered to be the wildlife species posing the greatest potential risk to cattle in 2010. *M. bovis* was also detected in non-cattle domestic animal species. This source of infection may also be considered a risk to cattle populations, although to a lesser extent than the wildlife reservoir. A few findings of *M. bovis* in other domestic animals (alpacas and cats) were also reported and *M. bovis* was also reported in farmed deer.

The occurrence of *M. bovis* in wildlife and domestic animals other than cattle thus seems to a very large extent to reflect the status of the MSs regarding freedom from bovine tuberculosis. This demonstrates the difficulties that many MSs might encounter when attempting to eradicate the disease from the cattle population when a natural reservoir of *M. bovis* is present in wildlife.

46 EFSA (European Food Safety Authority), 2009.Technical report submitted to EFSA. Scientific review on Tuberculosis in wildlife in the EU. Available on line: http://www.efsa.europa.eu/en/supporting/pub/12e.htm

3. INFORMATION ON SPECIFIC ZOONOSES AND ZOONOTIC AGENTS

3.7. *Brucella*

Brucellosis is an infectious disease caused by some bacterial species of the genus *Brucella*. There are six species known to cause human disease, and each of these has a specific animal reservoir: *Brucella melitensis* (*B. melitensis*) in goats and sheep, *B. abortus* in cattle, *B. suis* in pigs, *B. canis* in dogs and *B. ceti* and *B. pinnipedialis* in marine mammals.

In humans, brucellosis is characterised by flu-like symptoms such as fever, headache and weakness of variable duration. However, severe infections of the central nervous system or endocarditis may occur. Brucellosis can also cause long-lasting or chronic symptoms including recurrent fever, joint pain, arthritis and fatigue. Of the six species known to cause disease in humans, *B. melitensis* is the most virulent and has the largest public health impact in the EU owing to the prevalence of this *Brucella* species in small ruminant populations in many areas of the world and in certain European MSs. Humans are usually infected from direct contact with infected animals or with animal tissue contaminated with the organisms (occupational exposure). Transmission to humans also occurs through ingestion of contaminated products, such as drinking raw (unpasteurised) milk from infected animals, or eating raw milk products. In animals, the organisms are localised in the reproductive organs, causing infertility and abortions, and are shed in large numbers in urine, milk and placental fluid.

Table BR1 presents the countries reporting data for 2011.

Table BR1. Overview of countries reporting* Brucella *data, 2011

Data	Total number of reporting MSs	Countries
Human	26	**All MSs** except DK **Non-MSs:** CH, IS, NO
Food	4	**MSs:** BE, ES, IT, PT
Animal	27	**All MSs** **Non-MSs:** CH, NO

3.7.1. Brucellosis in humans

In 2011, 26 MSs provided information on brucellosis in humans. Ten MSs (Cyprus, the Czech Republic, Estonia, Finland, Hungary, Latvia, Lithuania, Malta, Poland and Slovakia) reported no human cases. In total, 352 cases of human brucellosis, of which 330 were confirmed, were reported in the EU in 2011 (EU notification rate 0.07 cases per 100,000 population) (Table BR2). This was a 7.3 % decrease in confirmed cases compared to 2010. As in previous years, MSs with the status officially free of bovine brucellosis (Officially Brucellosis Free, OBF) as well as officially free of ovine and caprine brucellosis caused by *B. melitensis* (Officially *B. melitensis* Free, ObmF) reported low numbers of human cases, whereas the non-OBF/non-ObmF MSs Greece, Portugal and Spain, accounted for 63.9 % of all confirmed cases in 2011 (Table BR2). The highest notification rates were also observed in Greece and Portugal (0.81 and 0.71 cases per 100,000 population respectively). The majority of cases reported from OBF and OBmF countries were classified as imported cases.

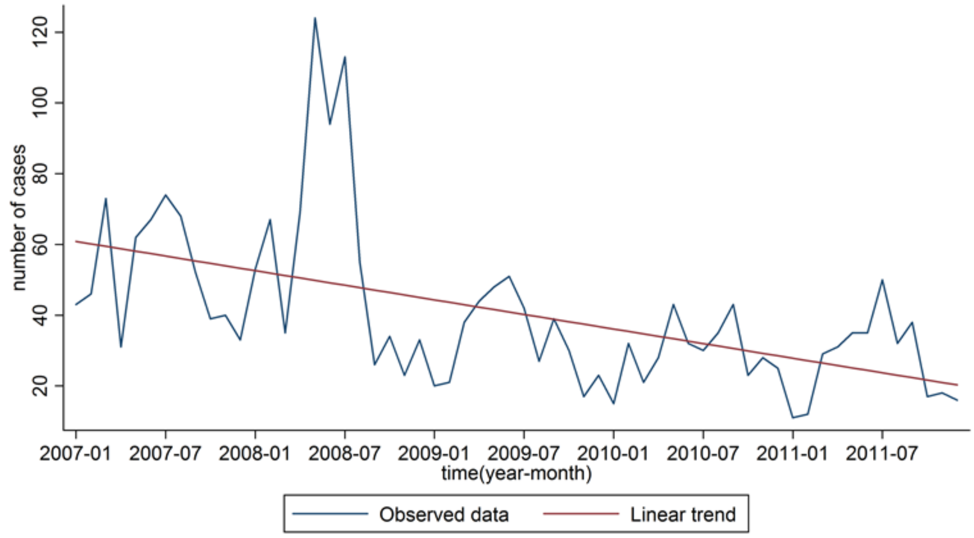
Table BR2. Reported cases of human brucellosis in 2007-2011, and notification rates for confirmed cases in 2011, OBF and ObmF status[1] is indicated

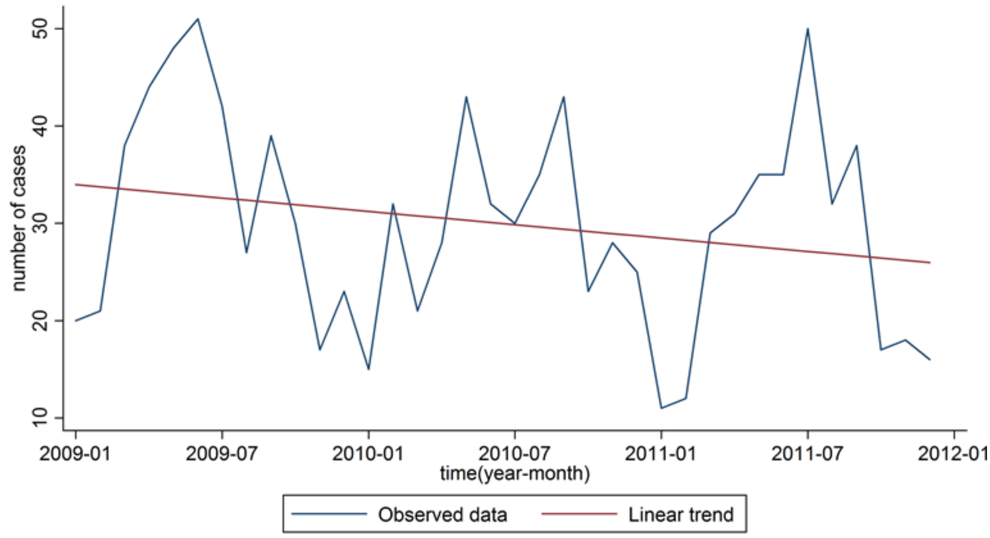
Country	2011				2010	2009	2008	2007
	Report Type[2]	Cases	Confirmed cases (Imported)	Confirmed cases/ 100,000	Confirmed cases			
Austria (OBF/ObmF)	C	5	5 (5)	0.06	3	2	5	0
Belgium (OBF/ObmF)	A	5	5 (5)	0.05	0	1	1	3
Bulgaria	A	2	2	0.03	2	3	8	9
Cyprus	U	0	0 (0)	0	0	0	0	0
Czech Republic (OBF/ObmF)	U	0	0 (0)	0	1	0	1	0
Denmark[3] (OBF/ObmF)	-	-	- -	-	-	-	-	-
Estonia (OBF/ObmF)	U	0	0 (0)	0	0	0	0	0
Finland (OBF/ObmF)	U	0	0 (0)	0	0	1	0	2
France[4](OBF)	C	21	21 (20)	0.03	20	19	21	14
Germany (OBF/ObmF)	C	24	24 (14)	0.03	22	19	24	21
Greece	C	100	92 (4)	0.81	97	106	304	101
Hungary (ObmF)	U	0	0 (0)	0	0	0	0	1
Ireland (ObmF)	C	1	1 (1)	0.02	1	0	2	7
Italy[5]	C	21	21 (0)	0.03	10	23	163	179
Latvia	U	0	0 (0)	0	0	0	0	0
Lithuania	U	0	0 (0)	0	0	1	0	0
Luxembourg (OBF/ObmF)	C	1	1 (1)	0.20	1	0	0	0
Malta	U	0	(0)	0	0	0	0	0
The Netherlands (OBF/ObmF)	C	1	1 (1)	0.01	6	3	3	2
Poland (ObmF)	U	0	0 (0)	0	0	3	1	1
Portugal[6]	C	79	76 (0)	0.71	88	80	56	74
Romania (ObmF)	C	1	1 (0)	<0.01	2	3	2	2
Slovakia (OBF/ObmF)	U	0	0 (0)	0	1	0	1	0
Slovenia (ObmF)	C	1	1	0	0	2	2	1
Spain[7]	C	54	43 (0)	0.09	78	114	120	201
Sweden (OBF/ObmF)	C	11	11 (9)	0.12	12	7	8	8
United Kingdom (OBF/ObmF)[8]	C	25	25	0.04	12	17	13	13
EU Total		**352**	**330**	**0.07**	**356**	**404**	**735**	**639**
Iceland[9]	U	0	0 (0)	0	0	0	0	0
Norway (OBF/ObmF)	C	2	2 (2)	0.04	2	0	0	0
Switzerland (OBF/ObmF)[10]	C	8	8 (8)	0.10	5	14	5	1

1. OBF/ObmF: Officially Brucellosis free/Officially *B. melitensis* free in cattle or sheep/goat population.
2. A: aggregated data report; C: case-based report; –: no report; U: unspecified.
3. No surveillance system.
4. In France, 64 departments are ObmF and no cases of brucellosis have been reported in small ruminants since 2003.
5. In Italy, ten regions and nine provinces are OBF and also 12 regions and nine provinces are ObmF.
6. In Portugal, six islands of the Azores are OBF whereas all nine Azores islands are ObmF.
7. In Spain, two provinces of the Canary Islands are OBF/ObmF and the Balearic Islands are ObmF.
8. In the United Kingdom, Great Britain and the Isle of Man are OBF and the whole of the United Kingdom is ObmF.
9. In Iceland, that has no special agreement concerning animal health (status) with the EU, brucellosis (*B. abortus*, *B. melitensis*, *B. suis*) has never been reported.
10. Switzerland provided data directly to EFSA.

There was a statistically significant (p <0.001) decreasing EU trend of confirmed brucellosis cases in 2007–2011 (Figure BR1, top). The dominant peak in 2008 could be attributed to a large outbreak in the Greek island of Thassos, in which 98 people fell ill with brucellosis. Consumption of locally produced raw cheese was identified as the most likely source of infection.[47] Trend analysis was also performed on the period 2009–2011, to remove the effect of the 2008 outbreak and then the trend was no longer significant (Figure BR1, bottom). There was a seasonal trend in brucellosis cases, however, which was clearly influenced by outbreaks. Significant decreasing trends in 2007–2011 by country were observed in two MSs: Italy and Spain. No increasing trends were observed in any country and many countries had too few cases to enable trend analysis.

Figure BR1. Trend in reported confirmed cases of human brucellosis in the EU, 2007-2011 (top) and 2009-2011 (bottom)





Source: TESSy data from 25 MSs: Austria, Belgium, Bulgaria, Czech Republic, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and United Kingdom. Cyprus, Estonia, Latvia and Malta reported zero cases throughout the period. Luxembourg data were excluded as only cases per year were reported.

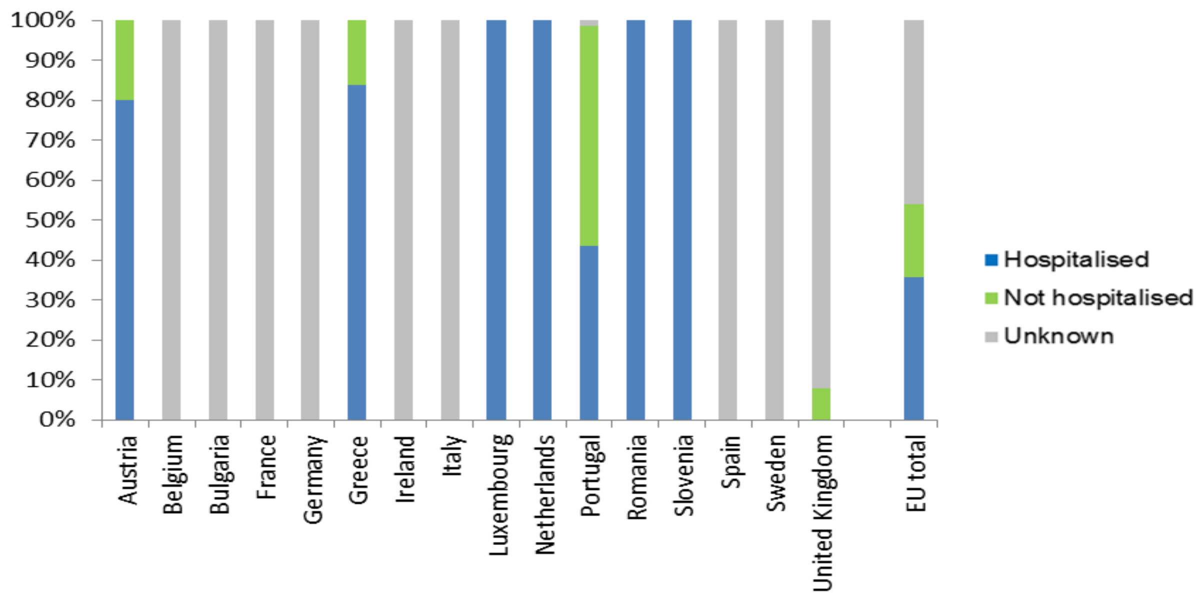
47 Karagiannis I, Mellou K, Gkolfinopoulou K, Dougas G, Theocharopoulos G, Vourvidis D, Ellinas D, Sotolidou M, Papadimitriou T and Vorou R, 2012. Outbreak investigation of brucellosis in Thassos, Greece, 2008. Euro Surveillance, 17(11):pii=20116. Available online: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=20116

Data on hospitalisation for brucellosis have been collected in the case-based reporting in TESSy for the last two years. Eight MSs provided this information for all or some of their cases (Figure BR2). On average, 66.3 % of the confirmed brucellosis cases were hospitalised, but hospitalisation status was provided for only 53.9 % of all confirmed cases. Hospitalisation rates were high in most reporting countries (80.0-100 %) except for Portugal (44.0 %) and the United Kingdom (0 %; however, information was provided for only 8 % of cases in the United Kingdom).

Eight MSs provided information on the outcome of the cases. One death due to brucellosis was reported in Portugal in 2011. This resulted in an EU case fatality rate of 0.74 % among the 136 confirmed cases for which this information was reported (42.1 % of all confirmed cases).

Species information was provided for 125 of the 330 confirmed cases. Of these 60.8 % were reported to be *B. melitensis*, 21.6 % *B. abortus* and 17.6 % other *Brucella* species. No cases of *B. suis* were reported.

Figure BR2. Proportion of reported confirmed cases of human brucellosis hospitalised in the EU, 2011



3.7.2. *Brucella* in food

In 2011, two MSs (Belgium and Portugal) provided information on *Brucella* in raw cow's milk for manufacture (with a sample size ≥25).

In Belgium, following a brucellosis outbreak in cattle at the end of 2010, all dairy herds were sampled for a serological screening by tank milk (N= 9,460) at farm. All results were negative. This raw milk from cows was intended for manufacture of heat-treated products at a processing plant. Portugal reported 35 single raw cow's milk samples taken at the farm and none of them were found to be contaminated with *Brucella*.

All data on *Brucella* in food submitted by MSs are presented in the Level 3 tables.

3.7.3. *Brucella* in animals

Cattle

The status regarding freedom from bovine brucellosis (Officially Brucellosis Free, OBF) and the occurrence of the disease in MSs and non-MSs in 2011 is presented in Figures BR3 and BR4. As regards the OBF status, Council Directive 64/432/EEC stipulates that a MS or a region of a MS may be declared OBF if no case of abortion due to *Brucella* infection and no isolation of *B. abortus* has been recorded for at least three years and at least 99.8 % of herds have achieved OBF status each year for five consecutive years. As in 2010, Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Ireland, Luxembourg, the Netherlands, Poland, Slovakia, Slovenia and Sweden, as well as Norway and Switzerland were OBF in accordance with EU legislation. Liechtenstein has the same status (OBF) as Switzerland. Moreover, in the non-MS Iceland, which has no special agreement concerning animal health (status) with the EU, brucellosis (*B. abortus, B. melitensis, B. suis*) has never been reported. In the United Kingdom, Great Britain has been classified as OBF (Decision 2003/467/EC[48]) and in addition, in 2011, the Isle of Man was also classified as OBF (Decision 2011/277/EC). In Italy, the provinces of Frosinone, Latina and Viterbo in Lazio were recognised as OBF during 2011 (Decision 2011/277/EC) so there are now 10 regions and nine provinces OBF in Italy. In Portugal, six of the nine islands of the Azores (Pico, Graciosa, Flores, Corvo, Faial and Santa Maria) are OBF (Decision 2003/467/EC and Decision 2009/600/EC[49]). In Spain, two provinces of the Canary Islands (Santa Cruz de Tenerife and Las Palmas) are OBF (Decision 2009/600/EC).

All data submitted by MSs and other reporting countries are presented in the Level 3 tables.

48 Commission Decision 2003/467/EC of 23 June 2003 establishing the official tuberculosis, brucellosis, and enzootic-bovine-leukosis-free status of certain Member States and regions of Member States as regards bovine herds, OJ L 156, 25.6.2003, pp. 74–78.

49 Commission Decision 2009/600/EC of 5 August 2009 amending Decision 2003/467/EC as regards the declaration that certain Member States and regions thereof are officially free of bovine brucellosis. OJ L 204, 6.8.2009, pp. 39–42.

Figure BR3. Status of countries regarding bovine brucellosis, 2011

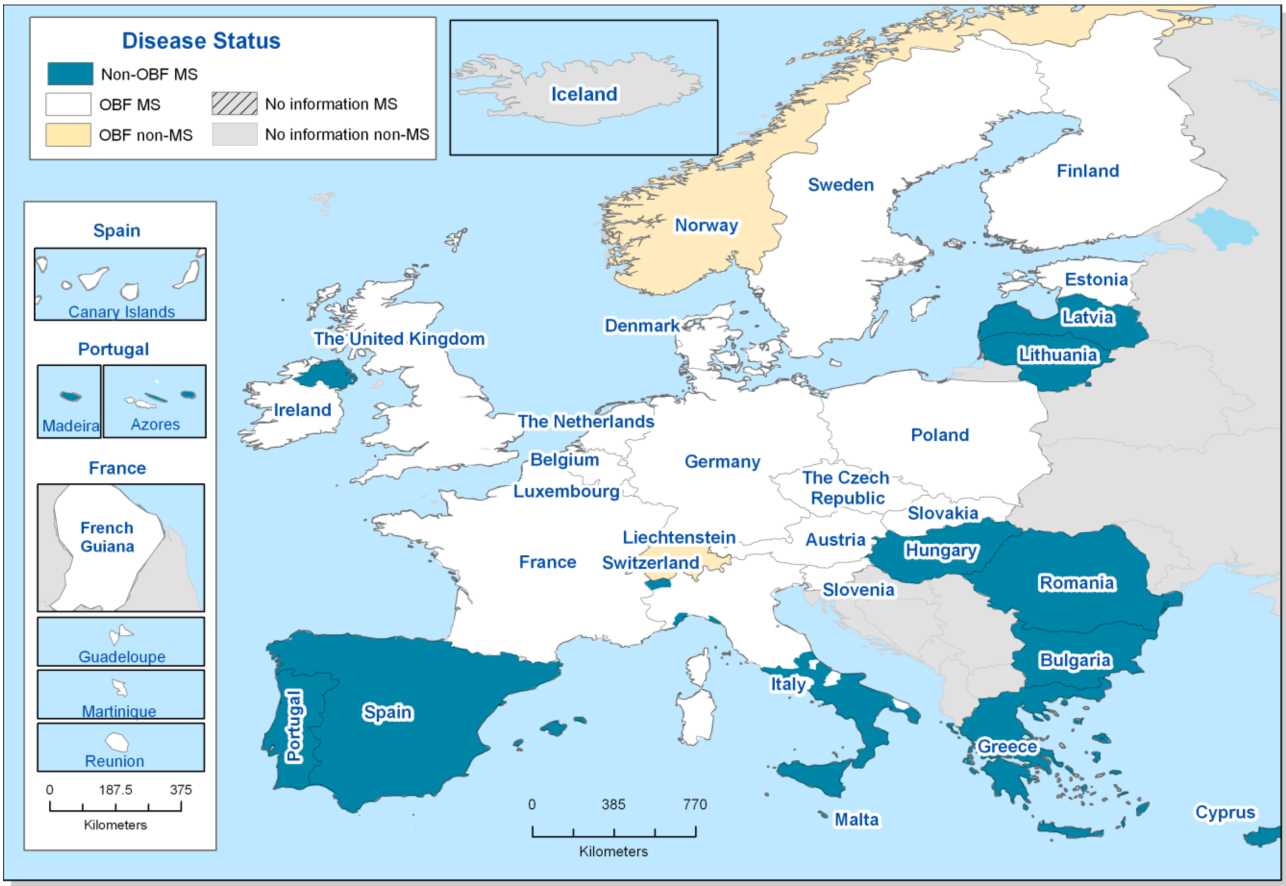


Figure BR4. Proportion of existing cattle herds infected with or positive for* Brucella*, country based-data, 2011

Trend indicators for brucellosis

To assess the annual EU trends in bovine and ovine/caprine brucellosis and to complement the MS-specific figures, two epidemiological trend indicators have been used since 2005.

The first indicator "**% existing herds infected/positive**" is "the number of infected herds" (or "the number of positive herds", respectively) divided by "the number of existing herds in the country". This indicator describes the situation in the whole country during the reporting year.

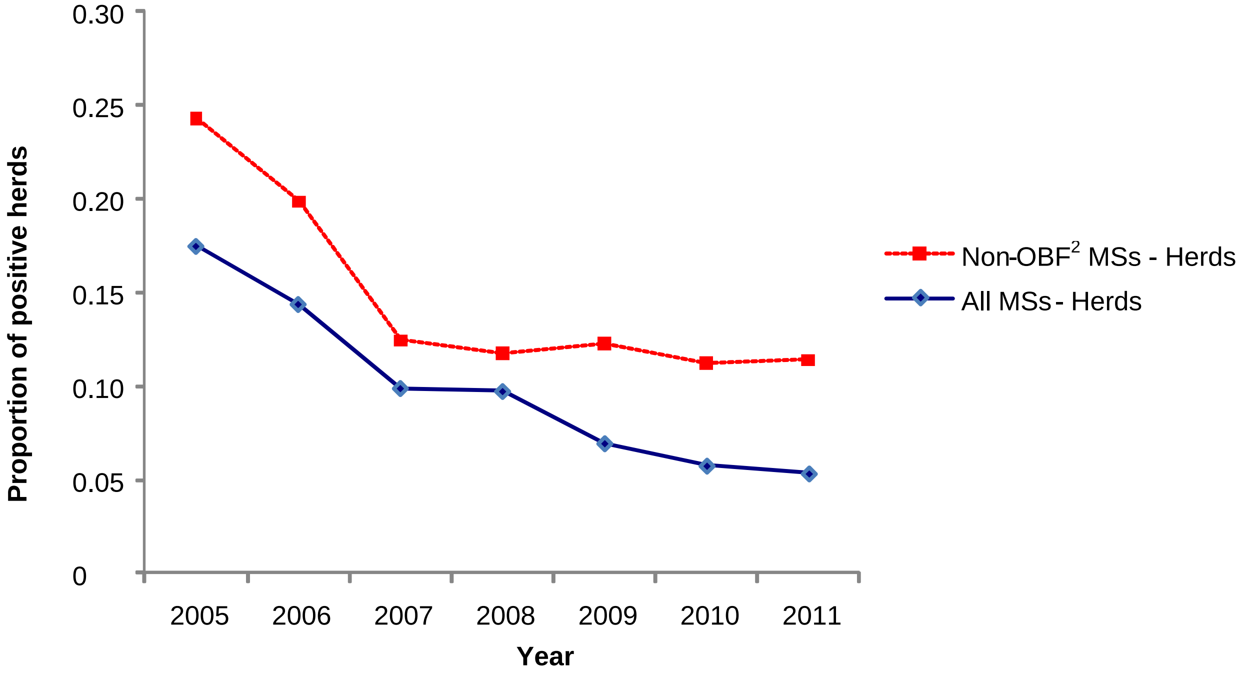
The second indicator "% **tested herds positive**" is "the number of herds test-positive" divided by "the number of tested herds". This indicator gives a more precise picture of the testing results and also estimates the herd prevalence during the whole reporting year. This information is available only from countries with EU co-financed eradication programmes.

Infected herds are all herds under control, which are not free or officially free at the end of the reporting period. This figure summarises the results of different activities (notification of clinical cases, routine testing, meat inspection, follow-up investigations and tracing). Infected herds are reported by countries and regions that do not receive EU co-financing for eradication programmes.

Positive herds are herds with at least one positive animal during the reporting year, independent of the number of times the herds have been checked. Positive herds are reported from countries and regions that receive EU co-financing for eradication programmes.

Over the years 2005–2011, the overall proportion of existing brucellosis-infected or -positive cattle herds in the EU decreased steadily to very low levels, and since 2007 bovine brucellosis has been rare, with the proportion of infected or positive herds in 2011 being 0.05 % (Figure BR5). The percentage of existing infected or positive herds in the non-OBF MSs also decreased between 2005 and 2007, after which the proportion stabilised and was 0.11 % in 2011.

***Figure BR5. Proportion of existing cattle herds infected with or positive for* Brucella*, 2005-2011*[1]**



1. Missing data from Germany (2008), Hungary (2005), Malta (2006) and Lithuania (2007). Romania included data for the first time in 2007 and Bulgaria in 2008.
2. OBF: Officially Brucellosis free.

Officially Bovine Brucellosis-free Member States and non-Member States

During 2011 brucellosis was not detected in any cattle herd in the 15 OBF MSs, or in Iceland, Norway or Switzerland.

Non-Officially Bovine Brucellosis-free Member States

In 2011, the 12 non-OBF MSs reported a total population of 1,351,383 bovine herds, of which 0.11 % were found to be infected with or positive for bovine brucellosis and this level was comparable to the level reported in 2007–2010.

Greece was the only non-OBF MS without an EU co-financed eradication programme in which positive herds (264) were detected during 2011. The percentage of positive existing cattle herds in Greece was 0.86 %, which was lower than in 2010 (250 positive herds; 1.03 %). The remaining six non-co-financed non-OBF MSs (Bulgaria, Hungary, Latvia, Lithuania, Malta and Romania) reported no infected or positive cattle herds out of 992,115 existing bovine herds in 2011.

As regards non-OBF MSs with eradication programmes co-financed by the EU, compared with 2010 there was an overall slight decrease in both indicators (the proportions of positive herds among the existing herds and among the tested herds): from 0.46 % and 0.71 %, respectively, in 2010, to 0.39 % and 0.60 % respectively, in 2011 (Table BR3). Also at the MS level, in Italy, Spain and the United Kingdom (Northern Ireland) both indicators decreased, while Portugal reported both indicators at the same level as in 2010. Cyprus was the only non-OBF MS with an EU co-financed eradication programme that reported no positive cattle herds in 2011.

For further details see the Level 3 tables.

Table BR3.* Brucella *in cattle herds in five co-financed non-OBF MSs,[1] 2011

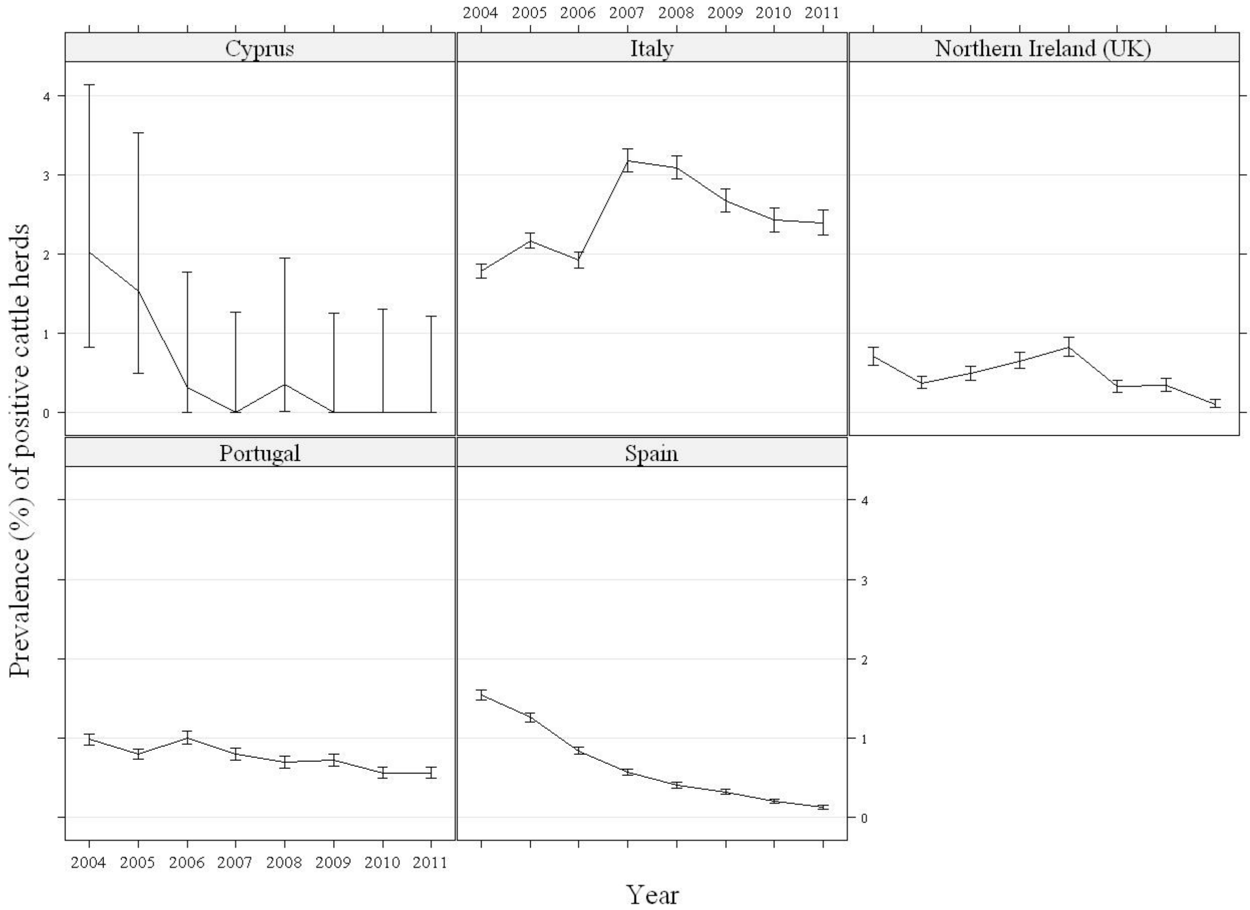
Non-officially free MSs	No of existing herds	No of tested herds	No of positive herds	% existing herds positive	% tested herds positive
Cyprus	356	302	0	0	0
Italy[2]	117,462	37,537	898	0.76	2.39
Portugal[3]	58,503	38,753	216	0.37	0.56
Spain[4]	126,435	111,367	136	0.11	0.12
United Kingdom[5]	25,677	22,978	25	0.10	0.11
Total (5 MSs in 2011)	**328,433**	**210,937**	**1,275**	**0.39**	**0.60**

1. Only tested and positive herds from regions that have co-financed eradication programmes are included. The number of existing herds includes all herds from all regions in the MS.
2. In Italy ten regions and nine provinces are OBF. In the provinces that are OBF or do not have a co-financed eradication programme, three of the 71,656 existing herds were found infected.
3. In Portugal the Azores Islands of Santa Maria, Pico, Graciosa, Faial, Flores and Corvo are OBF and none of their 2,512 existing herds were found infected. No data were available for Madeira.
4. In Spain the two provinces of the Canary Islands, Santa Cruz de Tenerife and Las Palmas, are OBF and none of their 1,064 existing herds were found infected.
5. Only Northern Ireland data are presented.

The MS-specific trends in positive tested herds in five co-financed non-OBF MSs from 2004 to 2011 are shown in Figure BR6. Since 2004, the prevalence of bovine brucellosis test-positive cattle herds (the second epidemiological indicator) appears to have decreased or remained at a low level in most of the co-financed non-OBF MSs (Cyprus, Northern Ireland, Portugal and Spain). The exception is Italy, where a considerable increase in prevalence was observed between 2006 and 2007, which has been followed by a decrease since 2008 to 2.39 % in 2011. Several Italian provinces have been declared OBF between 2004 and 2011, and in some other provinces the occurrence was so low that they did not receive co-financing for eradication programmes. Therefore, the Italian data, as they originate from non-OBF co-financed regions, reflect the results of regions having the highest prevalence instead of the situation in the whole country. Italy reported three positive herds in one of its OBF regions (Umbria).

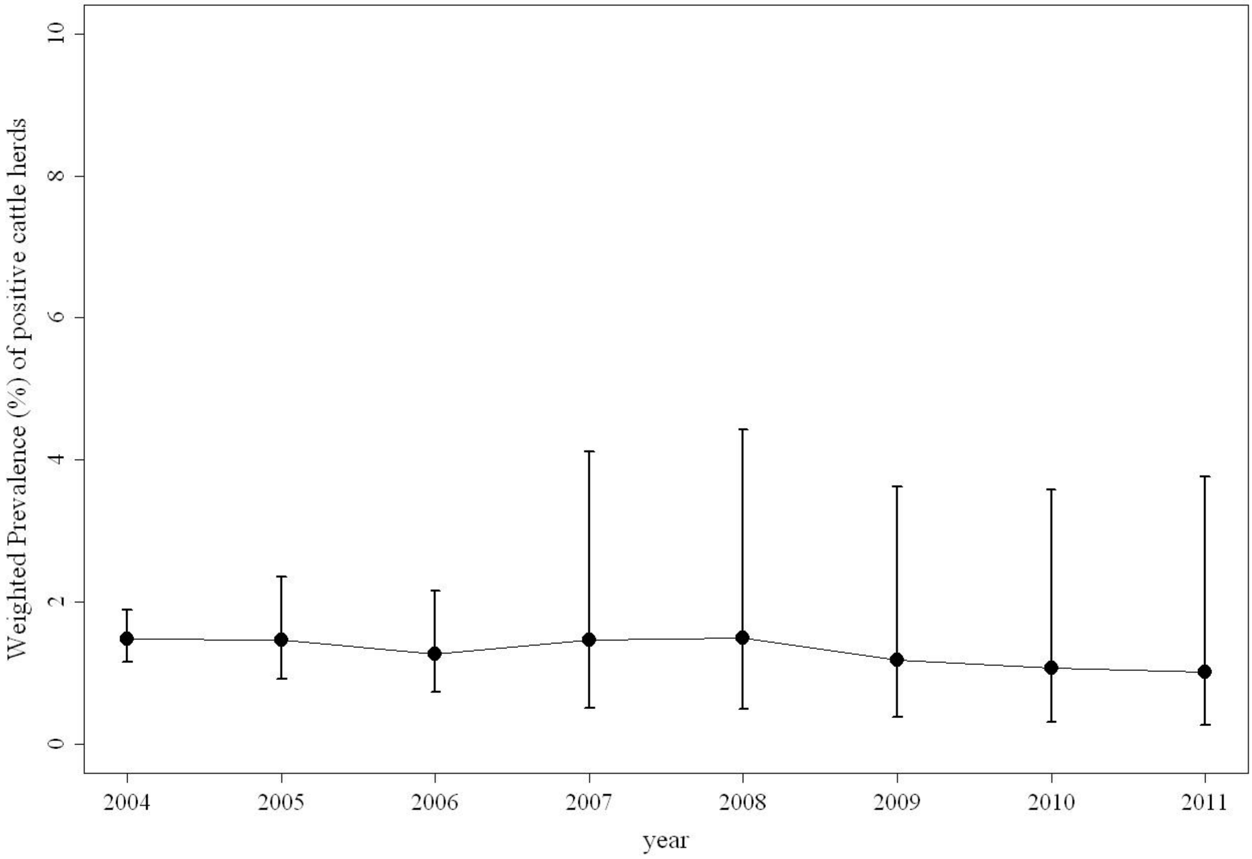
As shown in Figure BR7 and also confirmed by logistic regression analysis, no statistically significant trend was observed from 2004 to 2011 in the weighted prevalence for the five co-financed non-OBF MSs. See Chapter 5, Materials and methods, section 5.2, for a description of the statistical methodology.

Figure BR6. Prevalence and 95 % CI[1] of* Brucella *test-positive cattle herds, at MS level,[2] in five non OBF co-financed MSs, 2004–2011



1. Vertical bars indicate the exact binomial 95 % confidence interval.
2. For Italy the displayed prevalence reflects the results from non-OBF co-financed regions instead of the situation in the whole country.

Figure BR7. Weighted prevalence[1] and 95 % CI[2] of* Brucella *test-positive cattle herds, overall for five co-financed non-OBF MSs,[3] 2004–2011



1. The MS group prevalence is estimated using weights. The MS-specific weight is the ratio between the number of existing herds and the number of tested herds per MS per year.
2. Vertical bars indicate the 95 % confidence interval.
3. Includes data from Cyprus, Italy, Northern Ireland (United Kingdom), Portugal, and Spain. For Italy the prevalence data originate from non-OBF co-financed regions instead of the situation in the whole country.

Sheep and goats

The status of the countries regarding freedom from ovine and caprine brucellosis caused by *B. melitensis* (Officially *Brucella melitensis* Free, ObmF) and the occurrence of the disease in MSs and non-MSs in 2011 are presented in Figures BR8 and BR9. As regards the ObmF status, Council Directive 91/68/EEC[50] stipulates, as major conditions for qualification, that a MS or a region of a MS may be declared ObmF if at least 99,8 % of the ovine or caprine holdings are ObmF holdings, or if it fulfils the following conditions: (i) ovine or caprine brucellosis is a disease that has been compulsorily notifiable for at least five years; (ii) no case of ovine or caprine brucellosis has been officially confirmed for at least five years; and (iii) vaccination has been prohibited for at least three years. In 2011, as in 2010, Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Latvia, Lithuania, Luxembourg, the Netherlands, Poland, Romania, Slovakia, Slovenia, Sweden and the United Kingdom, as well as Norway and Switzerland, were ObmF in accordance with EU legislation. Liechtenstein has the same status (ObmF) as Switzerland. Moreover, in the non-MS Iceland, which has no special agreement concerning animal health status with the EU, brucellosis (*B. abortus, B. melitensis, B. suis*) has never been reported. Regions have previously been granted ObmF status also in France (64 departments), Portugal (the Azores Islands), and Spain (two provinces of the Canary Islands and the Balearic Islands). In addition, in Italy, the Emilia Romagna and Valle d'Aosta regions were declared ObmF in 2011 (Decision 2011/277/EU), and Italy now has 12 regions and nine provinces ObmF.

50 Council Directive 91/68/EEC of 28 January 1991 on animal health conditions governing intra-Community trade in ovine and caprine animals. OJ L 46, 19.2.1991. pp. 19-36.

All data submitted by MSs are presented in the Level 3 tables.

Figure BR8. Status of countries regarding ovine and caprine brucellosis, 2011

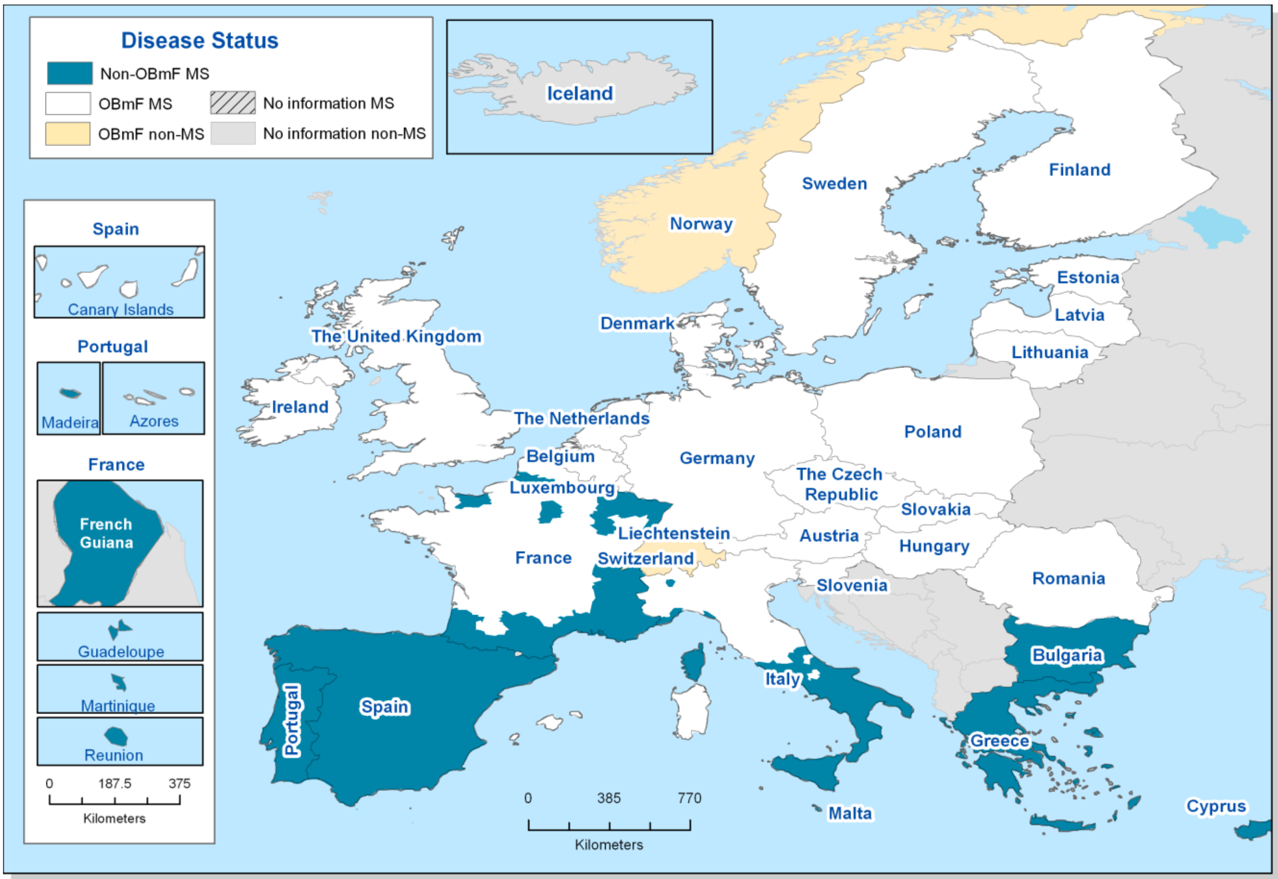
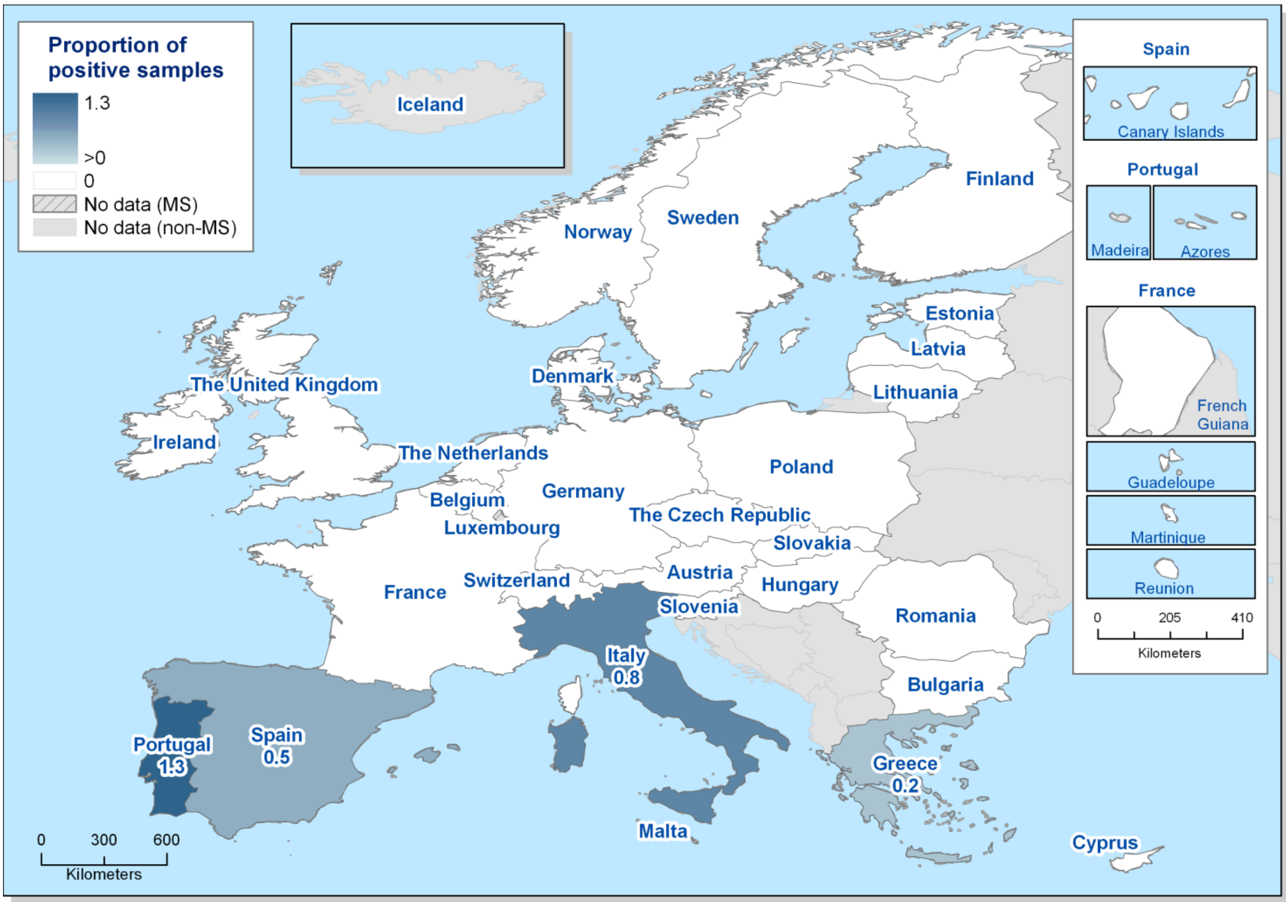
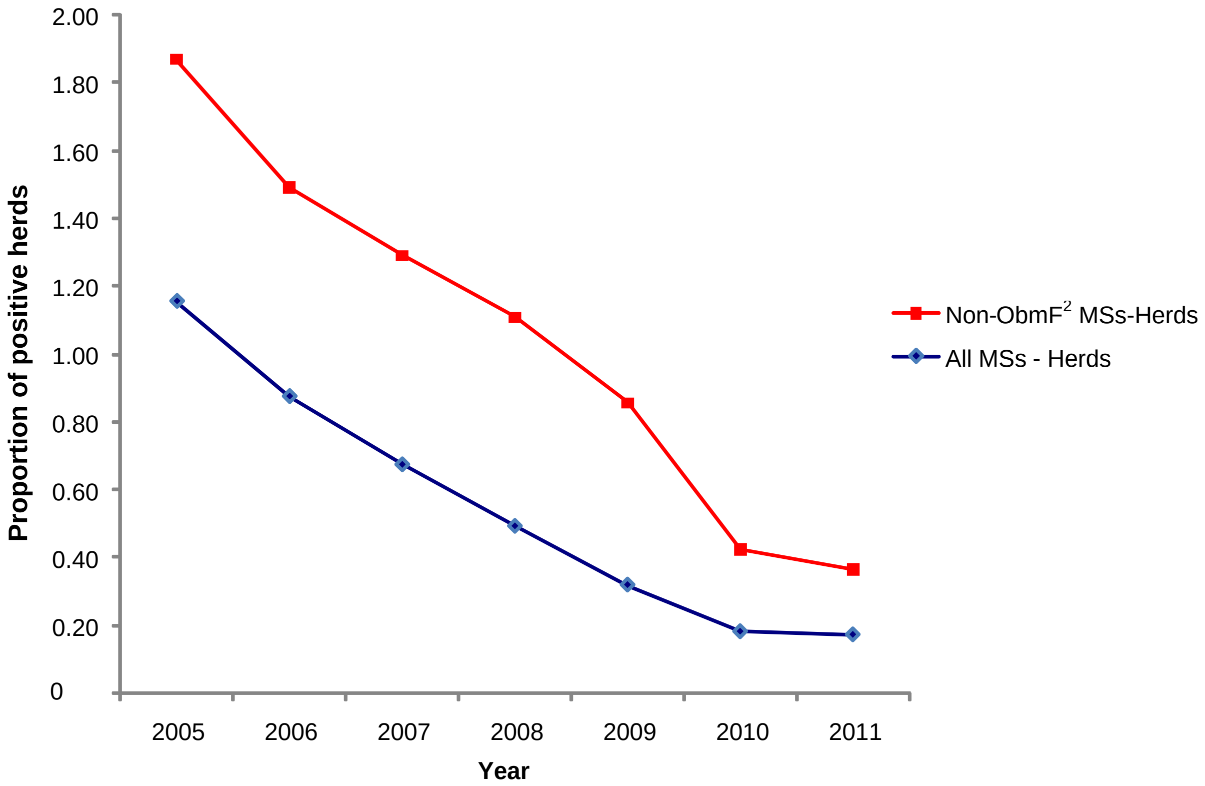


Figure BR9. Proportion of existing sheep and goat herds infected with or positive for* Brucella*, country-based data, 2011



Over the years 2005–2011, the overall proportion of existing sheep and goat herds infected with or positive for *B. melitensis* in the EU was at a very low level, decreased until 2010 and then stabilised at a level of 0.17 % in 2011. A slight decrease was observed in the proportion of existing sheep and goat herds infected with or positive to *B. melitensis* in the non-ObmF MSs from 2010 (0.42 %) to 2011 (0.36 %) (Figure BR10).

***Figure BR10. Proportion of existing sheep and goat herds infected with or positive for* Brucella*, 2005-2011*[1]**



1. Missing data from Bulgaria (2005-2007), Germany (2005-2007), Hungary (2005), Lithuania (2005, 2007, 2010), Luxembourg (2005-2006, 2008-2009, 2011), Malta (2005-2006) and Romania (2005-2006, 2008). Romania reported data at the animal level in 2008.
2. ObmF: Officially *B. melitensis* Free.

Officially *B. melitensis*-Free Member States and non-Member States

During 2011 brucellosis due to *B. melitensis* was not detected in any of the 753,501 sheep and goat herds in the 18 reporting ObmF MSs (Luxembourg did not report), or in Iceland, Norway or Switzerland.

Non-Officially *B. melitensis*-Free Member States

In 2011, the eight non-ObmF MSs reported a total of 675,458 sheep and goat herds, of which 0.36 % were found to be infected with or positive to *B. melitensis,* and this level was comparable to the level reported in 2010 (Figure BR10).

The three non-ObmF MSs without EU co-financed eradication programmes (Bulgaria, France and Malta) reported no infected or positive sheep and goat herds out of 344,600 existing ones in 2011.

As regards non-ObmF MSs with eradication programmes co-financed by the EU, compared with 2010 there was an overall slight decrease in both indicators (the proportions of positive herds among the existing herds and among the tested herds): from 0.98 % and 1.35 %, respectively, in 2010, to 0.74 % and 1.16 % respectively, in 2011 (Table BR4). Also at the MS level, in Italy and Spain both indicators decreased, whereas Portugal reported a slight increase in both indicators. In the Greek islands, where an eradication programme is implemented, Greece had a prevalence of existing *B. melitensis*-positive sheep and goat herds of 0.25 %, which was higher than in 2010 (0.20 %), whereas the proportion of positive herds among the tested herds decreased from 6.12 % in 2010 to 5.38 % in 2011. Cyprus was the only non-ObmF with an EU co-financed eradication programme that reported no positive sheep and goat herds in 2011.

Greece is divided into two zones in which different policies and measures are applied for the implementation of the brucellosis control and eradication programme for sheep and goats. The eradication policy covers the Greek islands, where the prevalence of the disease is low among sheep and goat flocks, and is based on testing and slaughtering of positive reactors. On the Greek mainland (as well as on some of the islands, including Lesvos and Leros), where the prevalence is higher, a control strategy is carried out by official mass vaccination of young and adult sheep and goats with the Rev-1 vaccine. During 2011, 912,790 sheep and goats from 23,080 flocks were vaccinated. Free-ranging (semi-wild) bovines sharing common pastures are also vaccinated with the Rev-1 vaccine in order to reduce the spread of *Brucella* infection in the field. In total 9,363 semi-wild bovines from 777 herds were vaccinated with this vaccine.

Table BR4.* Brucella *in sheep and goat herds in co-financed non-ObmF MSs,[1] 2011

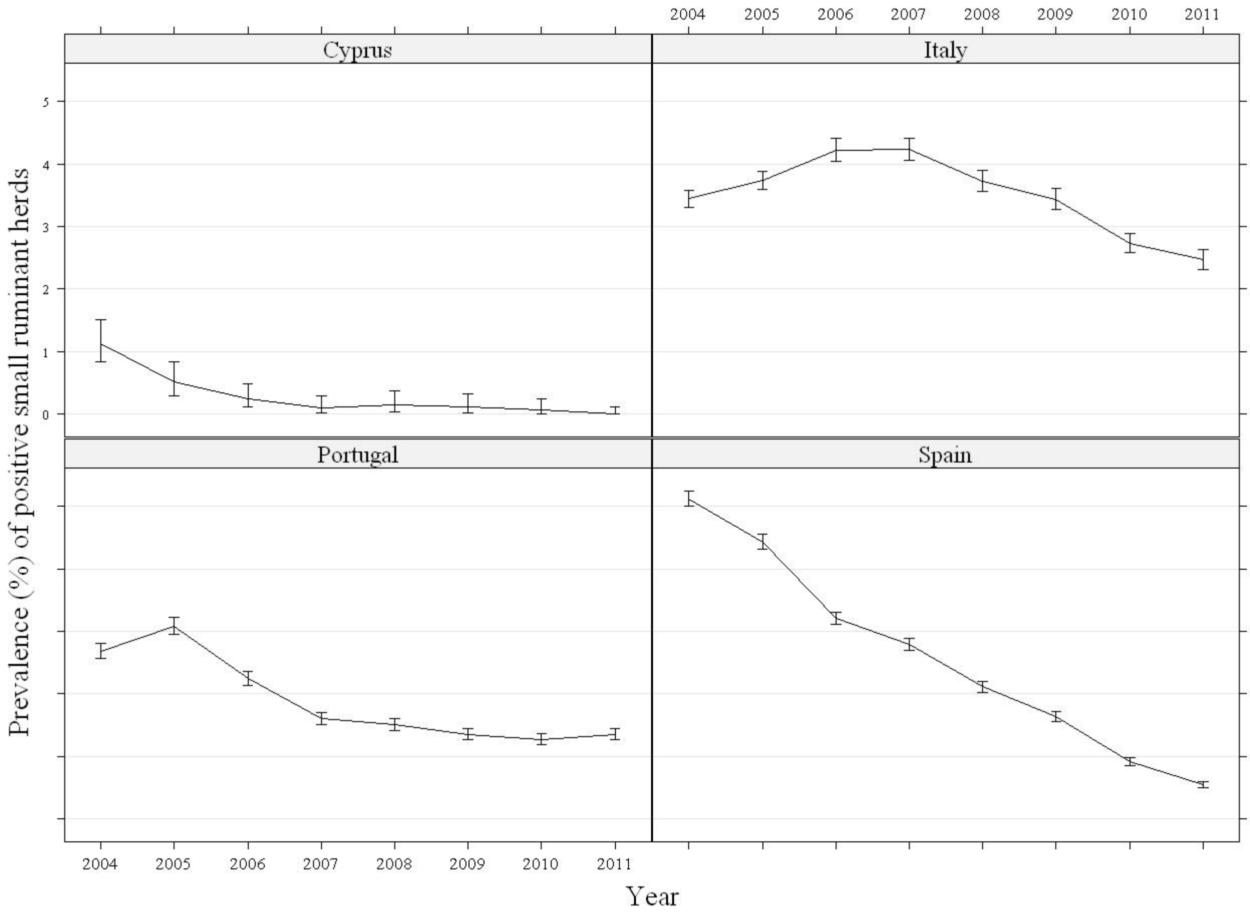
Non-officially free MSs	No of existing herds	No of tested herds	No of positive herds	% existing herds positive	% tested herds positive
Cyprus	3,362	3,036	0	0	0
Greece[2]	26,097	1,209	65	0.25	5.38
Italy[3]	116,640	38,711	956	0.90	2.47
Portugal[4]	66,941	64,059	867	1.30	1.35
Spain[5]	117,818	104,215	567	0.48	0.54
Total (5 MSs in 2011)	**330,858**	**211,230**	**2,455**	**0.74**	**1.16**

1. Only tested and positive herds from regions that have co-financed eradication programmes are included. The number of existing herds includes all herds from all regions in the MS.
2. These figures relate to the ovine and caprine *B. melitensis* eradication programme, which covers only the islands of Greece. On the Greek mainland a mass vaccination programme was carried out with co-financing by the EU, but these data are not included here.
3. In Italy 12 regions and nine other provinces are ObmF. In these areas that are ObmF or do not have a co-financed eradication programme, seven of the 72,178 existing herds were found to be infected.
4. In Portugal the Azores Islands are ObmF and none of the 890 existing sheep and goat herds were found infected.
5. In Spain the two provinces of the Canary Islands (Santa Cruz de Tenerife and Las Palmas) and the Balearic Islands are ObmF and none of their existing sheep and goat herds were found to be infected.

The MS-specific trends in tested herds positive in four co-financed non-ObmF MSs from 2004 to 2011 are shown in Figure BR11. Since 2004, the prevalence of sheep and goat herds testing positive for *B. melitensis* (the second epidemiological indicator) has decreased in Cyprus, and more markedly in Spain. Following an increase between 2004 and 2005, a decrease was observed in the proportion of positive tested herds in Portugal between 2005 and 2009. In the following years the proportion of positive tested herds stabilized. In Italy, an increase was observed from 2004 to 2006, which was followed by a continuous decrease up to, and including, 2011 (Figure BR11). This increase in positive tested herds was due to progress made in the eradication programme whereby the declared ObmF provinces and regions are no longer counted in co-financed programmes. Therefore, Italian data, as they originate from non-ObmF co-financed regions, reflect the results of regions having the highest prevalence instead of the situation in the whole country.

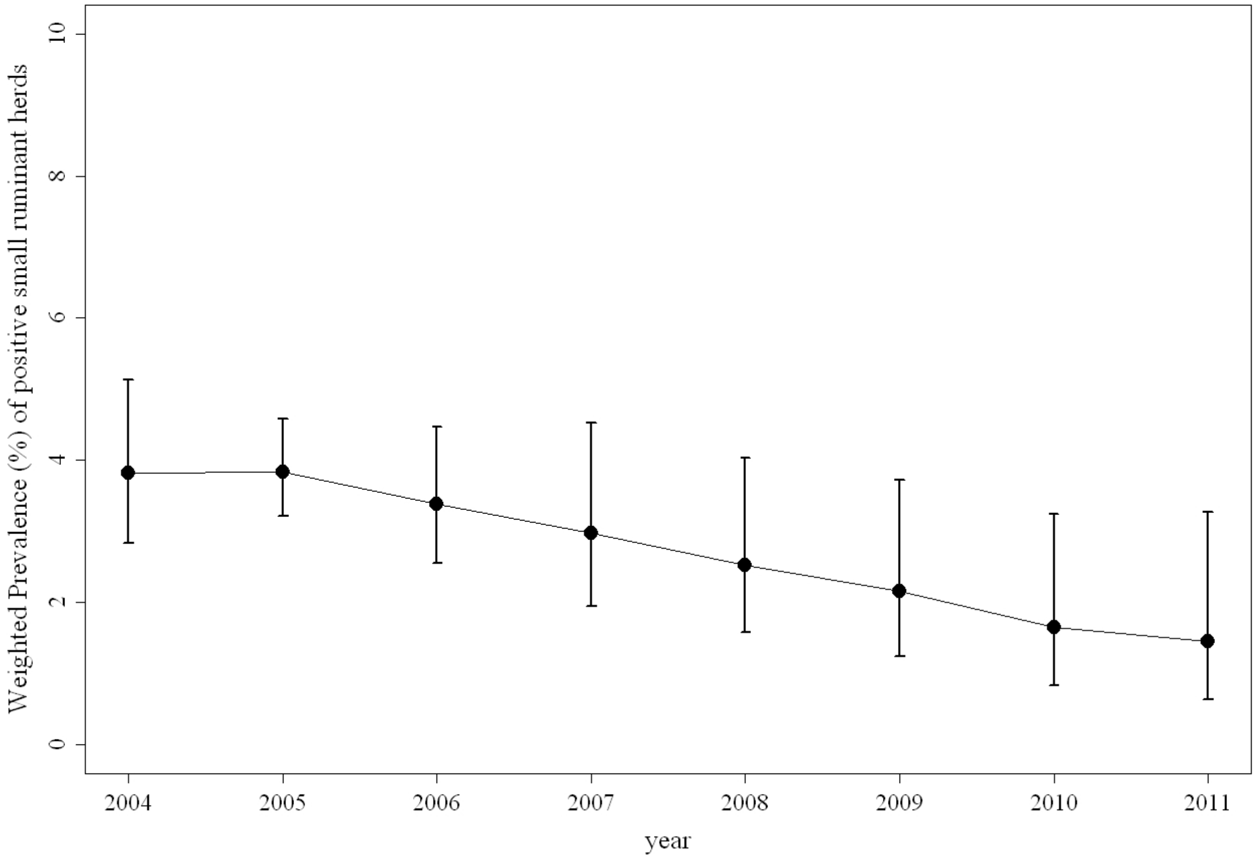
There was a statistically significant (p = 0.01) decreasing trend in the weighted prevalence of *B. melitensis* for the four co-financed non-ObmF MSs in 2004–2011 (Figure BR12). See Chapter 5, Materials and methods, section 5.2, for a description of the statistical methodology.

Figure BR11. Prevalence and 95 % CI[1] of* Brucella melitensis *test-positive sheep and goat herds, at MS level[2] in four non-ObmF co-financed MSs, 2004-2011



1. Vertical bars indicate the exact binomial 95 % confidence interval.
2. For Italy the displayed prevalence reflects the results from non-ObmF co-financed regions instead of the situation in the whole country.

Figure BR12. Weighted prevalence[1] and 95 % CI[2] of* Brucella melitensis *test-positive sheep and goat herds, overall for four co-financed non-ObmF MSs,[3] 2004-2011



1. The MS group prevalence is estimated using weights. The MS-specific weight is the ratio between the number of existing herds and the number of tested herds per MS per year.
2. Vertical bars indicate the 95 % confidence interval.
3. Includes data from Cyprus, Italy, Portugal, and Spain. For Italy the displayed prevalence reflects the results from non-ObmF co-financed regions instead of the situation in the whole country

Other animals

In 2011, 19 MSs and two non-MSs provided data on the occurrence of *Brucella* spp. in animals other than cattle, goats and sheep. The data originated from a wide range of sources including clinical investigations, surveillance, monitoring, surveys and control and eradication programmes. In addition, results from other specific local studies are reported for smaller numbers of animals.

B. abortus was detected in dogs and wild boars, *B. suis* in pigs, wild boars, Cantabrian chamois and hares, *B. canis* in dogs and *Brucella* spp. in wild fallow deer, dogs, wild boars, hares and water buffalo.

All data submitted by MSs and other reporting countries are presented in the Level 3 tables.

3.7.4. Discussion

Brucellosis is a rare infection in humans in the EU. The highest notification rates and the majority of the indigenous cases were reported from Mediterranean countries that are still not OBF in animals. At the EU level, there was a statistically significant decreasing five-year trend in confirmed brucellosis cases in humans. Significant decreasing trends by country were also observed in two MSs, Italy and Spain, which is in accordance with the findings on the animal side. On average two thirds of the human brucellosis cases, of the 53.9 % of cases for which hospitalization information was available, had been hospitalised but only one fatal case was reported in 2011.

There were no *Brucella*-positive findings in the samples of raw milk reported by two MSs. However, the two reported food-borne outbreaks for which there is weak evidence (involving four hospitalised cases) in 2011 by a non-OBF/non-ObmF MS illustrate the health risk still related to consumption of food contaminated with *Brucella*. It also illustrates that the risks of food being contaminated with *Brucella* is not negligible in MSs that are not free of animal brucellosis.

Concomitant with the significant decreasing EU trend in human brucellosis cases, the prevalence of both bovine and small ruminant brucellosis has continued to decrease within the EU, although the decline in the latter has been more substantial. Both bovine and small ruminant brucellosis-infected herds are geographically concentrated in southern European MSs. In 2011, brucellosis remained a rare event at the EU level in cattle herds (0.05 %) while the prevalence in sheep and goat herds was at very low level (0.17 %). Whereas bovine brucellosis decreased in non-OBF MSs between 2005 and 2007 and then stabilized at around 0.11% in 2011, small ruminant brucellosis further slightly decreased in 2011 to 0.36% in the non-ObmF MSs. The decrease in small ruminant brucellosis in co-financed non-ObmF MSs was statistically significant for the years 2004–2011.

Much of the overall decrease in bovine and small ruminant brucellosis at EU level, as well as within co-financed MSs, appears to have been driven by Italy and Spain, which are also the two MSs having a significant decreasing trend for *Brucella* infection in humans. The non-OBF/non-ObmF MSs Greece and Portugal, which reported stable or increasing trends in bovine and/or small ruminant brucellosis, also reported the highest notification rates of confirmed human brucellosis cases.

The lack of a more substantial decrease in the prevalence of bovine brucellosis, as opposed to small ruminant brucellosis, might reflect diminishing returns from disease surveillance and mitigation measures when prevalence is ‘rare’ (<0.1 %). At such a low prevalence it may become increasingly difficult to detect and remove infected animals before they have the opportunity to transmit the infection.

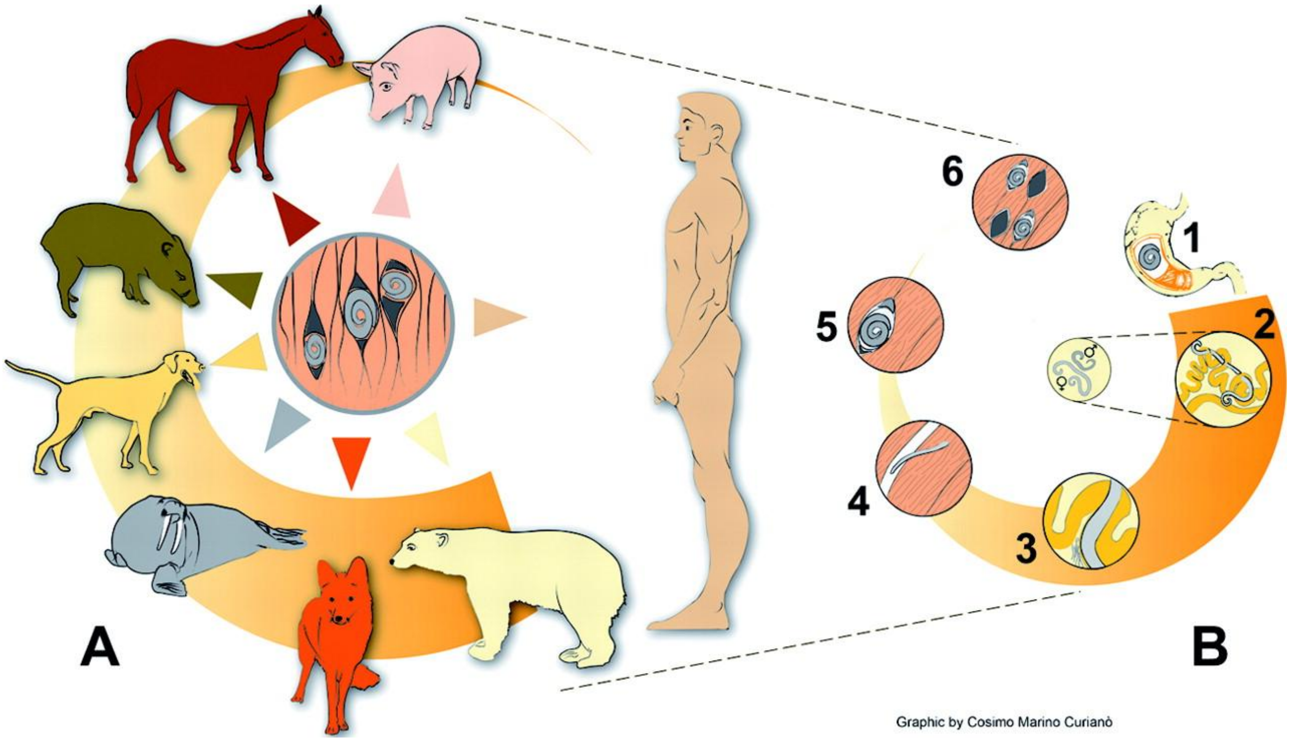
In 2011, 19 MSs and two non-MSs provided data on the occurrence of *Brucella* spp. in animals other than cattle, goats and sheep. *B. abortus* was detected in dogs and wild boars, *B. suis* in pigs, wild boars, Cantabrian chamois and hares, *B. canis* in dogs and *Brucella* spp. in wild fallow deer, dogs, wild boars, hares and water buffalos.

3. INFORMATION ON SPECIFIC ZOONOSES AND ZOONOTIC AGENTS

3.8. *Trichinella*

Trichinellosis is a zoonotic disease caused by parasitic nematodes of the genus *Trichinella*. The parasite has a wide range of host species, mostly mammals. *Trichinella* spp. undergo all stages of the life cycle, from larva to adult, in the body of a single host (Figure TR1).

***Figure TR1. Life cycle of* Trichinella**



Source: Gottstein B et al. Clinical Microbiology Reviews. 2009;22:127-145
Trichinella spp. life cycle. (A) Main sources of *Trichinella* spp. infections for humans (including pigs, horses, wild boars, dogs, walruses, foxes, and bears). (B) *Trichinella* spp. cycle in the host body. In the enteral phase, muscle tissues are digested in the stomach, and larvae are released (1); larvae penetrate the intestinal mucosa of the small intestine and reach the adult stage within 48 hours p.i., and male and female mate (2); female worm releases newborn larvae in the lymphatic vessels (from the fifth day p.i. onwards; the length of newborn production, from 1 week to several weeks, is under the influence of host immunity) (3). In the parenteral phase, the newborn larvae reach the striated muscle and actively penetrate in the muscle cell (4); the larva grow to the infective stage in the nurse cell (the former muscle cell) (5); and, after a period of time (weeks, months, or years), a calcification process occurs (6). (Modified from www.iss.it/site/Trichinella/index.asp with permission of the publisher.)

In Europe, trichinellosis has been described as an emerging and/or re-emerging disease over recent decades. Worldwide, nine species and three genotypes have been described: *Trichinella spiralis* (*T. spiralis*), *T. nativa, T. britovi, T. murelli, T. nelsoni, T. pseudospiralis, T. papuae, T. zimbabwensis* and *T. patagoniensis, Trichinella* T6, *Trichinella* T8 and *Trichinella* T9. The majority of human infections in Europe are caused by *T. spiralis,* and *T. britovi*, while a few cases caused by *T. pseudospiralis* and *T. nativa* have also been described. In a human outbreak caused by the consumption of horse meat imported from the United States of America to France in 1985, the aetiological agent was *T. murrelli*.

Humans typically acquire the infection by eating raw or inadequately cooked meat infested with infectious *Trichinella* larvae. The most common sources of human infection are pig meat, wild boars meat and other game meat. Horse, dog and many other animal meats have also transmitted the infection. Horse meat was identified as the source of infection in a number of human outbreaks recorded in the EU from the mid-1970s until 2005, including some of the largest outbreaks recorded in decades. Freezing of the meat minimises the infectivity of the parasite, although some *Trichinella* species/genotypes (*T. nativa, T. britovi* and *Trichinella* genotype T6) have demonstrated resistance to freezing in game meats.

The clinical signs of acute trichinellosis in humans are characterised by two phases. The first stage of trichinellosis symptoms may include nausea, diarrhoea, vomiting, fatigue, fever and abdominal discomfort. However, this phase is often asymptomatic. Thereafter, a second phase of symptoms including muscle pains, headaches, fever, swelling of the eyes, aching joints, chills, cough, itchy skin and diarrhoea or constipation may follow. In more severe cases, difficulties with coordinating movements as well as heart and breathing problems may occur. A small proportion of people die from *Trichinella* infection. Systematic clinical signs usually appear about 8–15 days after consumption of infested meat.

An overview of the data reported in 2011 is presented in the following tables and figures.

Table TR1. Overview of countries reporting data on* Trichinella *spp., 2011

Data	Total number of reporting MSs	Countries
Humans	26	**All MSs** except DK **Non-MS:** NO
Animals	27	**All MSs** **Non-MSs:** CH, IS, NO

3.8.1. Trichinellosis in humans

In 2011, there were 363 cases of trichinellosis reported by 26 MSs of which 268 cases (73.8 %) were reported as confirmed (Table TR2). Only 14 of the 26 MSs had observed cases, while the other 12 reported zero cases. The difference in the number of total cases versus confirmed cases may be because not all cases in an outbreak will be laboratory confirmed and the remaining cases are considered epidemiologically linked to the confirmed cases.

The number of human trichinellosis cases increased by 20.2 % in the EU in 2011 compared with 2010 but is still at a much lower level than in 2007-2009 (Table TR2). The EU notification rate was 0.05 cases per 100,000 population and the highest notification rates in 2011 were reported in Latvia (2.24 cases per 100,000) followed by Lithuania, Romania, Bulgaria and Slovakia (0.89, 0.50, 0.36 and 0.24 cases per 100,000, respectively). These five countries accounted for 84.3 % of all confirmed cases reported in 2011. There were major fluctuations in the number of cases reported by country over the years.

Data on hospitalisation for trichinellosis have been collected in the case-based reporting in TESSy for the last two years. Eight MSs provided this information for all of their cases and one MS for one case (Figure TR2). On average, 74.3 % of the confirmed trichinellosis cases were hospitalised and hospitalisation status was provided for 76.9 % of all confirmed cases.

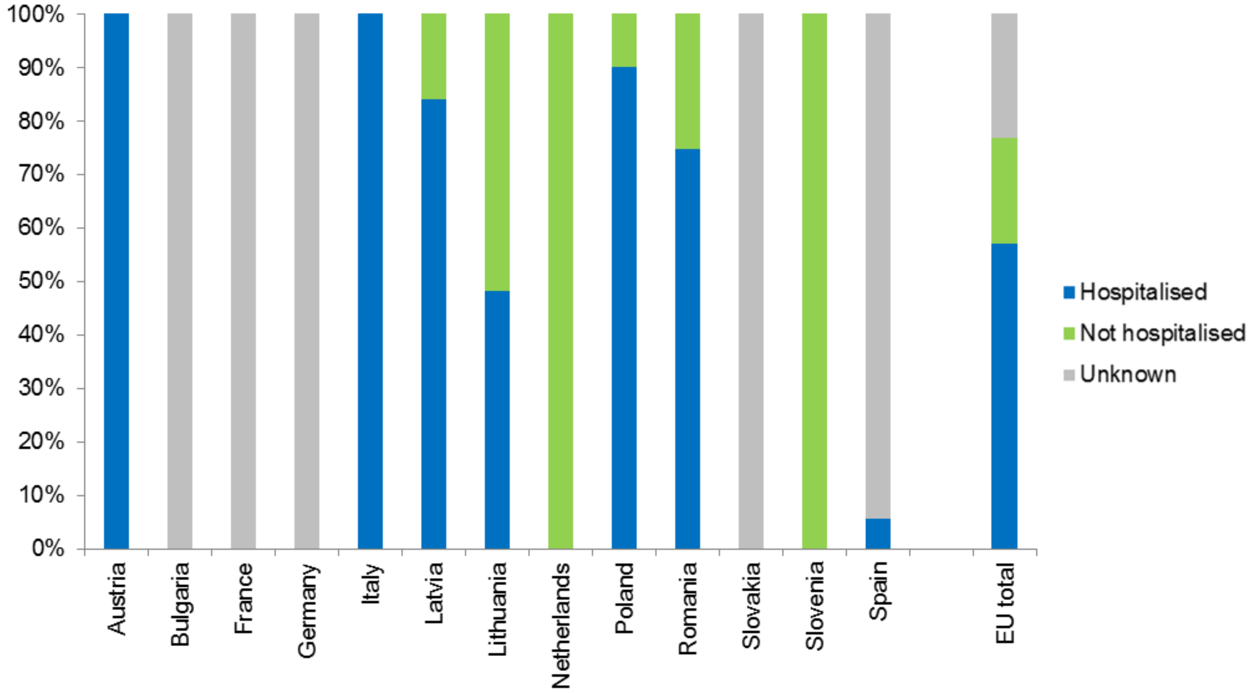
One death due to trichinellosis was reported from Spain in 2011 from the 12 MSs that provided information, which gives an EU case fatality rate of 0.49 %. The outcome of cases was provided for 76.5 % of all confirmed cases.

Table TR2. Reported cases of human trichinellosis in 2007-2011, and notification rate for confirmed cases in the EU, 2011

Country	2011				2010	2009	2008	2007
	Report Type[1]	Cases	Confirmed cases (Imported)	Confirmed cases/ 100,000	Total confirmed cases (Imported)			
Austria	C	1	1 (1)	0.01	5 (2)	0	0	0
Belgium	C	3	0	0	3	0	5	3
Bulgaria	A	27	27	0.36	14	407	67	62
Cyprus	U	0	0	0	0	0	0	0
Czech Republic	U	0	0	0	0	0	0	0
Denmark	-[2]	-	-	-	-	-	-	-
Estonia	U	0	0	0	0	0	0	0
Finland	U	0	0	0	0	0	0	0
France	A	2	2	<0.01	0	9 (9)	3	1 (1)
Germany	C	3	3 (2)	<0.01	3 (1)	1	1 (1)	10 (7)
Greece	U	0	0	0	4	2 (1)	0	0
Hungary	U	0	0	0	0	9 (1)	5 (3)	2 (2)
Ireland	U	0	0	0	0	0	0	2 (2)
Italy	C	6	6	0.01	0	1	0	1
Latvia	C	52	50	2.24	9	9	4	4
Lithuania	C	51	29	0.89	77	20	31	8
Luxembourg	U	0	0	0	0	0	0	0
Malta	U	0	0	0	0	0	0	0
Netherlands	C	1	1 (1)	0.01	0	1	1	0
Poland	C	23	10	0.03	14	18	4	217
Portugal	U	0	0	0	0	0	0	0
Romania	C	162	107	0.50	82	265	503	432
Slovakia	C	13	13	0.24	2	0	18	8
Slovenia	C	1	1	0.05	0	1 (1)	1 (1)	0
Spain	C	18	18	0.04	10	7	27	36
Sweden	U	0	0	0	0	0	0	1 (1)
United Kingdom	U	0	0	0	0	0	0	0
EU Total		**363**	**268 (4)**	**0.05**	**223 (3)**	**750 (12)**	**670 (6)**	**787 (13)**
Iceland	-[2]	-	-	-	-	-	-	-
Norway	U	0	0	0	0	0	0	0
Switzerland[3]	C	0	0	0	4	1	-	-

1. A, aggregated data report; C, case-based report; –, No report; U, Unspecified
2. No surveillance system.
3. Switzerland provided data directly to EFSA.

Figure TR2. Proportion of reported confirmed cases of human trichinellosis hospitalised in the EU, 2011



3.8.2. *Trichinella* in animals

All MSs and three non-MSs submitted data on *Trichinella* in animals for 2011 and these data are presented in Figures TR3–TR5 and Tables TR3–TR6. In the following sections, investigations with fewer than 25 units tested are included, unless stated otherwise. Results from industry programmes are also included. Moreover, results from suspect and/or selective samplings were taken into account when analysing *Trichinella* in hunted wild boars and in wildlife other than wild boars. All reported data are presented in the Level 3 tables.

The results are given for the most important animal species that serve as sources of human trichinellosis cases in MSs. According to Commission Regulation (EC) No 2075/2005,[51] carcases of domestic swine, horses, wild boars and other farmed or wild animal species susceptible to *Trichinella* infestation are systematically sampled at slaughter as part of meat inspection and tested for *Trichinella*. Thus, most of the reported data are derived from meat inspection. Animals (both domestic and wild) slaughtered for own consumption are outside the scope of the mentioned regulation but subject to national rules, which may differ between MSs. Each MS can decide how to control *Trichinella* in this specific population, e.g. carry out testing or not, or freeze the carcase or not. The results of these controls in animals slaughtered for own consumption might not be incorporated in official reports. Another source of monitoring data is the monitoring of *Trichinella* in wildlife animal species that are not intended for human consumption.

In 2011 all MSs and three non-MSs provided information regarding *Trichinella* in farm animals (pigs, farmed wild boars and solipeds). Ten MSs isolated *Trichinella* from such farm animals: Romania reported 61.2 % of all these positive findings, followed by Lithuania with 28.6 %, Bulgaria 3.5 %, Greece 3 % and the other MSs with a proportion below 1 % of the positive findings. The prevalence of *Trichinella* in farm animals in 2011 was highest in farmed wild boars (0.4 %), followed pigs (0.00017 %). None of the investigated solipeds were found positive.

Twenty-five MSs and the two non-MSs provided data regarding *Trichinella* in pigs (breeding and fattening pigs). Eight MSs reported positive findings, giving an overall EU prevalence of 0.00017 % (Table TR3), which is similar to the prevalence in 2009 (0.0002 %) and 2008 (0.0005 %) but higher than in 2010 (0.00009 %).

As in 2010, Romania accounted for the vast majority of positive findings in pigs in 2011 (86.3 % of all the *Trichinella*-positive findings). Romania also had the highest prevalence (0.006 %) in pigs of all the reporting countries; five positive pigs were raised under a controlled housing system, whereas the other positive ones were living in backyards (not raised under controlled housing conditions). Bulgaria (seven positive pigs), France (four), Greece (13) and Spain (eight) reported *Trichinella* findings from pigs not raised under controlled housing conditions. Bulgaria (eight) and Latvia (two) reported *Trichinella*-positive pigs from controlled housing conditions. Germany (two), Lithuania (10) and Spain (1) did not report the housing conditions of their *Trichinella*-positive pigs. In total 76.1 % (233) of the positive results from pigs were reported as *Trichinella* spp. In addition, there were 58 reports of *T. spiralis* and 15 reports of *T. britovi.* Italy reported 10 *Trichinella* spp.-positive feral pigs out of 13 tested, during a national survey. Poland reported five tested batches of fattening pigs and three tested batches of breeding pigs, not raised under controlled housing conditions, positive for *T. spiralis*.

Nine MSs reported data on samplings of farmed wild boars. There were in total 115 positive boars (0.4 %) and these were reported by Finland and Lithuania (Table TR4). This is a higher prevalence than in 2010 (0.07 %), which is explained by the Lithuanian data. Lithuania did not report on farmed wild boars in 2010 but in 2011 reported 114 *Trichinella*-positive boars, which was all but one of the total number of positive farmed wild boars. The prevalence in farmed wild boars is higher than the prevalence in pigs (0.00017 %) in this reporting year (Table TR3).

In 2011, 22 MSs and three non-MSs reported data on solipeds. In total, 184,212 solipeds were tested for *Trichinella* but none were found positive. Most of these data (90 %) were from horses.

51 Commission Regulation (EC) No 2075/2005 of 5 December 2005 laying down specific rules on official controls for *Trichinella* in meat. OJ L 338, 22.12.2005, p. 60-82.

Twenty-two MSs and two non-MSs provided data on hunted wild boars in 2011 (Table TR5). Thirteen MSs reported positive findings, giving an overall EU animal-level prevalence of 0.12 %. At the animal level, Poland, Spain and Romania accounted for 53.8 %, 21.2 % and 11.1 % of the positives. The highest animal-level prevalence was reported by Latvia (1.4 %), while Estonia and Romania reported a prevalence of 1.3 %. All other MSs reported an animal-level prevalence below 1 %. Bulgaria reported batch-level data and 1.31 % were positive. As in pigs, the majority (59.4 %) of results were reported as *Trichinella* spp*.* but there were also 169 reports of *T. spiralis*, 111 reports of *T. britovi*, 10 reports of *T. pseudospiralis* and four reports of *T. nativa*.

Twenty MSs and two non-MS provided data on wildlife other than wild boars in 2011 (Table TR6). Fourteen MSs reported positive findings. Overall, in 2011, Finland was responsible for 62.2 % of reported positive findings in wildlife other than wild boars. About 50 % of the positive results were from wildlife other than foxes, bears and raccoon dogs. Fifteen MSs and one non-MS reported data on *Trichinella* in foxes. Of these, 11 MSs had positive results. Lithuania reported 64.0 % positive foxes out of 25 tested. Bulgaria reported two tested foxes, both positive (100 %). Finland and Slovakia had a moderate prevalence in foxes (20.6 and 20.4 %, respectively). The majority of positive foxes were reported as *Trichinella* spp., but there were also findings of *T. britovi, T. nativa, T. pseudospiralis* and *T. spiralis*. Seven MSs and one non-MS reported data on *Trichinella* in bears in 2011, with a total prevalence within these countries of 5.4 %. Positive bears were from Estonia, Finland and Romania, where the prevalence ranged between 10.1 % and 12.3 %. *T. nativa* was most commonly reported from bears but there were also a number of reports of *T. britovi*, *T. spiralis* and *Trichinella* spp. Four MSs tested raccoon dogs for *Trichinella*, and Finland and Lithuania found respectively 34.9 % (out of 209 tested) and 100 % (out of five tested) positive animals. Fifteen MSs and two non-MSs reported data on wildlife other than wild boars, foxes, bears and raccoon dogs. Out of a total of 4,071 animals, mainly lynx and wolves, 6.4 % were found positive for *Trichinella*. Finland reported 212 positive findings with a prevalence of 50.6 %. All but 13 of these positive Finish findings originated from lynx.

Figure TR3. Findings of* Trichinella *in pigs, 2011

Note: Poland reported few tested batches of pigs, not raised under controlled housing conditions, positive for *Trichinella*. But these data were not representative for the national level.

Table TR3. Findings of Trichinella *in pigs, 2011*

Country	Species (n. of isolates)	Sample unit	N	Pos	% Pos	Additional information
Austria		Animal (fattening pigs)	5,555,567	0	0	
Bulgaria		Slaughter batch (breeding animals)	1,413	0	0	Pigs raised under controlled housing conditions
	T. spiralis (1), *T.* spp. (6)	Slaughter batch (fattening pigs)	56,545	7	0.01200	Pigs not raised under controlled housing conditions
	T. spiralis (8)	Slaughter batch (fattening pigs)	240,913	8	0.00300	Pigs raised under controlled housing conditions
Cyprus		Animal (breeding and fattening animals)	699,322	0	0	Pigs raised under controlled housing conditions
Czech Republic		Animal (fattening pigs)	3,053,433	0	0	
Denmark		Animal (breeding and fattening animals)	21,277,914	0	0	Pigs raised under controlled housing conditions
Estonia		Animal (fattening pigs)	402,422	0	0	Pigs not raised under controlled housing conditions
Finland		Animal (breeding and fattening animals)	2,576,369	0	0	
France		Animal (breeding animals)	262,816	0	0	
	T. britovi (4)	Animal (fattening pigs)	352,510	4	0.00100	Pigs not raised under controlled housing conditions; positive pigs originated from Corsica island
		Animal (fattening pigs)	74,640	0	0	Pigs raised under controlled housing conditions
Germany	*T. spiralis* (2)	Animal	55,078,995	2	0.000004	
Greece[1]		Animal	3,383	13	0.38427	Pigs not raised under controlled housing conditions
		Animal (breeding animals)	25,427	0	0	Pigs raised under controlled housing conditions
		Animal (fattening pigs)	5,474	0	0	Pigs not raised under controlled housing conditions
		Animal (fattening pigs)	1,184,217	0	0	Pigs raised under controlled housing conditions

Table continued overleaf.

Table TR3 (continued). Findings of Trichinella *in pigs, 2011*

Country	Species (n. of isolates)	Sample unit	N	Pos	% Pos	Additional information
Hungary		Animal (breeding and fattening animals)	4,329,830	0	0	
Ireland		Animal	3,700	0	0	
		Animal (breeding animals)	2,838,123	0	0	
Italy		Animal (breeding and fattening pigs)	9,161,026	0	0	
		Slaughter animal batch	498,113	0	0	
		Animal (mixed herds)	4,994	0	0	
		Slaughter batch (mixed herds)	1,860	0	0	
Latvia	*T. britovi* (2)	Animal (fattening pigs)	330,901	2	0.00100	Pigs raised under controlled housing conditions
Lithuania	*T.* spp. (10)	Animal (fattening pigs)	777,781	10	0.00100	
Luxembourg		Animal (fattening pigs)	1,963	0	0	Pigs not raised under controlled housing conditions
Malta		Single (breeding and fattening animals)	83,410	0	0	Pigs raised under controlled housing conditions
Netherlands		Animal (fattening pigs)	14,520,834	0	0	Pigs raised under controlled housing conditions
Portugal		Animal (breeding and fattening animals)	3,154,034	0	0	
		Animal (breeding animals)	15,843	0	0	Pigs not raised under controlled housing conditions
		Animal (breeding and fattening animals)	1,549,885	0	0	Pigs raised under controlled housing conditions
		Animal (fattening pigs)	22,289	0	0	

Table continued overleaf.

Table TR3 (continued). Findings of* Trichinella *in pigs, 2011

Country	Species (n. of isolates)	Sample unit	N	Pos	% Pos	Additional information
Romania		Animal (breeding animals)	3,422	0	0	Pigs raised under controlled housing conditions
	T. spp. (203), *T. britovi* (9), *T. spiralis* (47)	Animal (fattening pigs)	234,388	259	0.11100	Pigs not raised under controlled housing conditions (pigs from backyards)
		Animal (fattening pigs)	57,401	0	0	Pigs not raised under controlled housing conditions
	T. spp. (5)	Animal (fattening pigs)	3,166,507	5	0.00016	Pigs raised under controlled housing conditions
Slovakia		Animal	815,085	0	0	
		Animal	174	0	0	
Slovenia		Animal (mixed herds)	280,053	0	0	
Spain	*T.* spp. (1)	Animal (domestic slaughter for self consumption)	32,138	1	0.00300	
	T. spp. (8)	Animal (fattening pigs)	41,597,557	8	0.00002	Positive pigs not raised under controlled housing conditions
Sweden		Animal	2,845,390	0	0	
United Kingdom		Animal (breeding and fattening animals)	521,181	0	0	Pigs not raised under controlled housing conditions
		Animal (breeding animals)	2,280,845	0	0	Pigs raised under controlled housing conditions
EU Total		Animal	**179,181,243**	**304**	**0.00017**	
		Slaughter animal batch	**798,844**	**15**	**0.00188**	
Norway		Animal	1,589,000	0	0	
Switzerland		Animal	2,660,000	0	0	

Note: Data presented include only investigations with sample size ≥25.

1. In Greece an additional 2,412 fattening pigs, raised under controlled housing conditions, were monitored in an integrated system, with no positives.

Table TR4. Findings of Trichinella *in farmed wild boars, 2011*

Country	Description	Species (n. of isolates)	Sample unit	N	Pos	% Pos
Austria	Official and industry sampling, Surveillance, Census		Animal	743	0	0
Bulgaria	Official sampling, Surveillance, Unspecified		Slaughter batch	87	0	0
Denmark	Official sampling, Objective sampling, Census		Animal	1,599	0	0
Finland	Surveillance, Census	*T. pseudospiralis*	Animal	486	1	0.2
France	Official sampling, Surveillance, Objective sampling		Animal	3,553	0	0
Italy	Official sampling, Unspecified, Census		Animal	527	0	0
			Slaughter batch	3	0	0
Lithuania	Official and industry sampling, Surveillance, Objective sampling	*T.* spp.	Animal	18,208	114	0.6
Portugal	Official and industry sampling, Surveillance		Animal	28	0	0
United Kingdom	Official sampling, Surveillance, Census		Animal	852	0	0
Total (9 MSs in 2011)			**Animal**	**25,996**	**115**	**0.4**
			Slaughter batch	**90**	**0**	**0**

Figure TR4. Finding of* Trichinella *in hunted wild boars, 2011

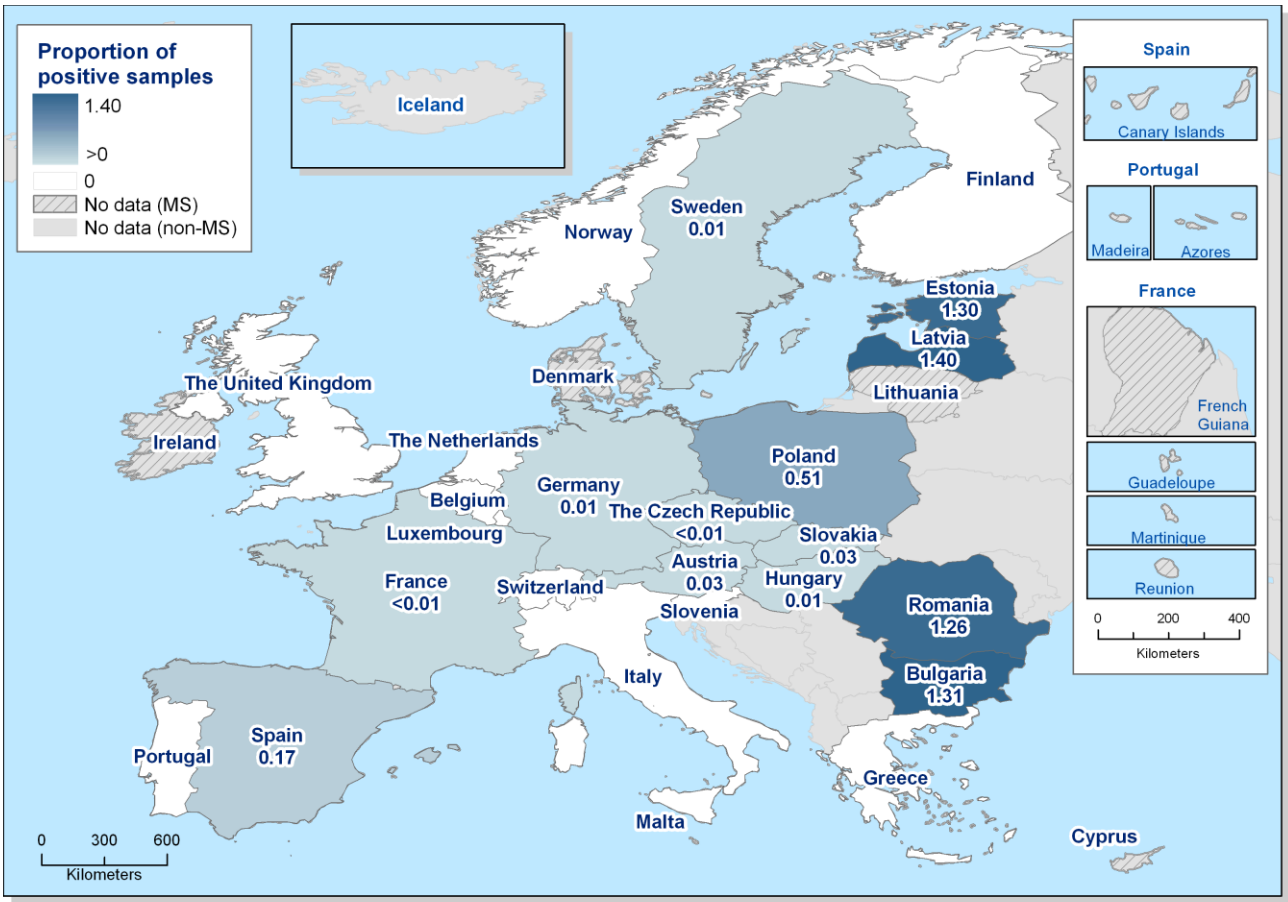


Table TR5. Findings of* Trichinella *in hunted wild boars, 2011

Country	Description	Species (n. of isolates)	Sample unit	N	Pos	% Pos
Austria	Official and industry sampling, Surveillance, Census, two positive boars were imported	*T.* spp. (7)	Animal	22,759	7	0.03
Belgium	Official sampling, Surveillance		Animal	10,169	0	0
Bulgaria	Industry sampling, Surveillance, Objective sampling	*T.* spp.(40), *T. britovi* (22), *T spiralis* (3)	Slaughter batch	4,976	65	1.31
Czech Republic	Surveillance, Objective sampling	*T. pseudospiralis* (2)	Animal	99,772	2	0.002
Estonia [1]	Official sampling, Surveillance, Census	*T.* spp. (8), *T. britovi* (25), *T. nativa* (4)	Animal	2,774	36	1.30
Finland	Unspecified		Animal	4	0	0
France	Surveillance, Selective sampling	*T. britovi* (2)	Animal	33,323	2	0.006
Germany		*T. spiralis* (13), *T. pseudospiralis* (6), *T.* spp. (4)	Animal	168,401	23	0.014
Greece	Official sampling, Surveillance, Census		Animal	12	0	0
Hungary	Official sampling, Surveillance,	*T. britovi* (5), *T. spiralis* (3)	Animal	54,039	8	0.01
Italy	Official sampling or unspecified, Census or national survey		Animal	46,960	0	0
Latvia	Official and industry sampling, Surveillance,	*T. britovi* (32)	Animal	2,282	32	1.40
Luxembourg	Official sampling, Surveillance, Census		Animal	2,235	0	0
Netherlands	Official sampling, Surveillance, Census		Animal	1,332	0	0
	Industry sampling, Surveillance, Unspecified		Animal	458	0	0
Poland	Surveillance	*T.* spp. (362), *T. spiralis* (85)	Animal	86,940	447	0.51
Portugal	Official sampling, Surveillance		Animal	594	0	0
	Official and industry sampling, Surveillance, at cutting plant		Animal	393	0	0
Romania	Official sampling, Surveillance, Objective sampling	*T.* spp. (73), *T. britovi* (10), *T. spiralis* (9)	Animal	7,308	92	1.26
Slovakia	Official sampling, Surveillance, Objective sampling	*T.* spp. (4)	Animal	15,405	4	0.03
Slovenia	Official and industry sampling, Surveillance, Census		Animal	817	0	0
Spain	Official sampling, Surveillance, Census	*T.* spp. (105), *T. britovi* (15), *T. spiralis* (56)	Animal	104,869	176	0.17
Sweden	Monitoring, Unspecified	*T. pseudospiralis* (2)	Animal	38,921	2	0.01
United Kingdom	Official sampling, Surveillance, Census		Animal	522	0	0
EU Total			**Animal**	**700,289**	**831**	**0.12**
			Batch	**4,976**	**65**	**1.31**
Switzerland	Unspecified		Animal	1,918	0	0
Norway	Suspect sampling		Animal	1	0	0

1. In one sample both *T. britovi* and *T. nativa* were found.

Table TR6. Findings of Trichinella *in wildlife other than wild boars, 2011*

Country	Foxes				Bears				Raccoon dogs				Other wildlife[1]			
	Description	N	Pos	% Pos	Description	N	Pos	% Pos	Description	N	Pos	% Pos	Description	N	Pos	% Pos
Austria		-	-	-		-	-	-		-	-	-	Surveillance	18	0	0
Belgium	Official sampling, monitoring,	507	1	0.2	Official sampling, monitoring, objective sampling	-	-	-		-	-	-	Active and passive monitoring	17	1	5.9
Bulgaria	Monitoring	2	2	100		3	0	0		-	-	-		-	-	-
Denmark	Official sampling, monitoring, objective sampling	300	0	0	Official sampling, monitoring, objective sampling	-	-	-	Official sampling, monitoring, objective sampling	5	0	0	Official sampling, monitoring, objective sampling	27	0	0
Estonia		-	-	-	Not applicable, surveillance, census	68	8	11.8		-	-	-	Unspecified	115	7	6.1
Finland	Monitoring, convenience sampling	136	28	20.6	Surveillance Unspecified	65	8	12.3	Monitoring, convenience sampling	209	73	34.9	Convenience sampling	419	212	50.6
Germany	Unspecified	2,038	7	0.3		-	-	-		-	-	-	Unspecified	27	0	0
Ireland	Official sampling, monitoring, convenience sampling	499	4	0.8		-	-	-		-	-	-		-	-	-
Italy	Official sampling, unspecified, census	2,299	12	0.5		-	-	-		-	-	-	Census	3,028	26	0.9
Latvia	Official sampling, Unspecified, Census	-	-	-		-	-	-		-	-	-		5	1	20.0
Lithuania	Monitoring, objective sampling	25	16	64.0		-	-	-	Monitoring, objective sampling	5	5	100	Monitoring, objective sampling	5	0	0
Luxembourg	Official sampling, monitoring, census	20	0	0		-	-	-		-	-	-		-	-	-
Netherlands	Industry sampling, monitoring, unspecified	260	0	0		-	-	-		-	-	-	Industry sampling, monitoring, unspecified	94	0	0

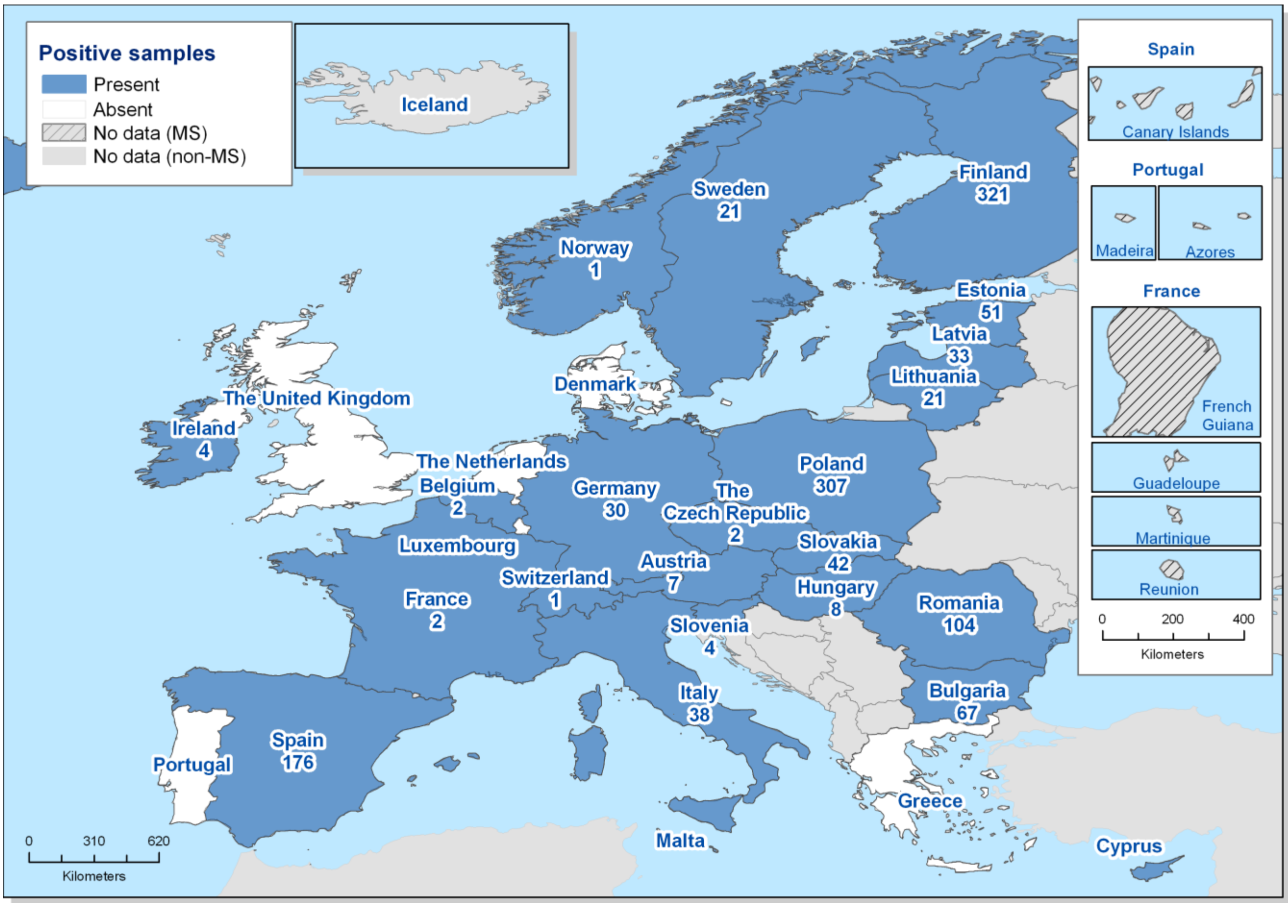
Table continued overleaf.

Table TR6 (continued). Findings of* Trichinella *in wildlife other than wild boars, 2011

Country	Foxes				Bears				Raccoon dogs				Other wildlife[1]			
	Description	N	Pos	% Pos	Description	N	Pos	% Pos	Description	N	Pos	% Pos	Description	N	Pos	% Pos
Poland	Official sampling, monitoring, objective sampling	973	32	3.3		-	-	-		-	-	-		-	-	-
Romania		-	-	-	Official sampling, surveillance, objective sampling	119	12	10.1		-	-	-		-	-	-
Slovakia	Official sampling, monitoring, selective sampling	186	38	20.4	Monitoring, objective sampling	7	0	0		-	-	-	Monitoring, selective sampling	2	0	0
Slovenia	Official and industry sampling, monitoring, unspecified	1,212	4	0.3	Official and industry sampling, surveillance, census	15	0	0		-	-	-		0	0	0
Spain		-	-	-		-	-	-		-	-	-	Official sampling	20	0	0
Sweden	Monitoring	326	5	1.5	Monitoring	242	0	0	Monitoring	48	0	0	Monitoring	199	14	7.0
United Kingdom	Official sampling, monitoring, convenience sampling	847	0	0		-	-	-		-	-	-	Official sampling monitoring convenience sampling	95	0	0
Totals (20 MSs in 2011)		**9,630**	**149**	**1.5**		**519**	**28**	**5.4**		**267**	**78**	**29.2**		**4,071**	**261**	**6.4**
Switzerland [2]		-	-	-		-	-	-		-	-	-	**-**	**-**	1	**-**
Norway	Suspect sampling	96	1	1.0	Suspect sampling	1	0	0		-	-	-	Suspect sampling	3	0	0

1. Other 'wildlife' includes badgers, beavers, birds (including falcons), coypu, deer, hedgehogs, lynx, martens, minks, otter, raccoons, rats, squirrels, wolverine, wolves and unspecified wild animals.
2. In 2011, in Switzerland, one lynx was found positive for *T. britovi*. In Switzerland there are a few wild animals tested that are not wild boars. As wildlife data are not further differentiated so far, no exact number of tested wildlife other than wild boars is available.

Figure TR5 Findings of* Trichinella *in wildlife (including wild boars), 2011



3.8.3. Discussion

The number of human trichinellosis cases increased by 20.2 % in the EU in 2011 compared with 2010 but was still at a much lower level than in 2007–2009 because of a major decrease in the number of cases reported from Bulgaria and Romania in 2010 and 2011. The majority of the confirmed cases in 2011 were reported from six MSs: Bulgaria, Latvia, Lithuania, Romania, Slovakia and Spain. The first four MSs also reported food-borne outbreaks due to *Trichinella* as well as *Trichinella*-positive pigs and hunted wild boars. Pork and wild boars meat (and products thereof) are considered to be the two main sources of human trichinellosis in the EU. On average, 74.3 % of the confirmed human trichinellosis cases were hospitalised, and one death due to trichinellosis was reported in 2011.

Trichinella is very rarely detected from pigs in the EU, and the positive findings reported by eight MSs in 2011 were mainly from pigs from non-controlled housing conditions. Also, the situation as regards *Trichinella* in pigs living in backyards and slaughtered for own consumption might not be incorporated in official reports. However, in 2011, some positive pigs were reported to have been raised under controlled housing conditions and for some the housing conditions were not reported. In pigs raised indoors, the risk of infection is mainly related to the lack of compliance with rules on the treatment of animal waste. In such farms, infection could also occur due to the breakdown of the biosecurity barriers around the farm, allowing the introduction of infected rodents.[52] The overall EU prevalence of *Trichinella*-positive pigs was 0.00017 %. Romania was responsible for the vast majority of *Trichinella* findings in pigs in 2011. None of the investigated solipeds were found positive for *Trichinella,* in 2011.

Nine MSs provided data on samplings of farmed wild boars and the proportion of positive farmed wild boars was than the prevalence in pigs. However, Lithuania accounted for all but one of the total number of positive farmed wild boars.

Trichinella is often reported in wildlife species by some Eastern and Northern European MSs in which the parasite is circulating in wildlife populations. The overall *Trichinella* prevalence in hunted wild boars in 2011 was higher than in pigs but lower than in farmed wild boars. The prevalence in wildlife, other than in wild boars, was noticeably high during 2011 in some Northern European MSs where positive findings were found in foxes, bears, raccoon dogs, lynx and other species.

Seventeen food-borne outbreaks caused by *Trichinella* were reported in 2011 by seven MSs, of which five were supported by strong evidence and were linked to the consumption of pig meat and wild boars meat, and/or products thereof. Four of these MSs reported the highest notification rates of trichinellosis in humans in 2011. Also, from the seven MSs, the ones reporting on *Trichinella* investigations in pigs or wild boars, had positive findings in those animals species.

Unlike pigs, there is no sign of a decreasing trend in *Trichinella* in wildlife; thus, it is vital to continue educating hunters so as to enable them to ensure the safety of meat from hunted game, and raise their awareness about the risks of eating undercooked bear, badger, lynx, wild boars or other carnivore or omnivore game meat.

52 EFSA (European Food Safety Authority), 2011. Scientific Report on Technical specifications on harmonised epidemiological indicators for public health hazards to be covered by meat inspection of swine. EFSA Journal, 9(9):2371, 125 pp.

3. INFORMATION ON SPECIFIC ZOONOSES AND ZOONOTIC AGENTS

3.9. *Echinococcus*

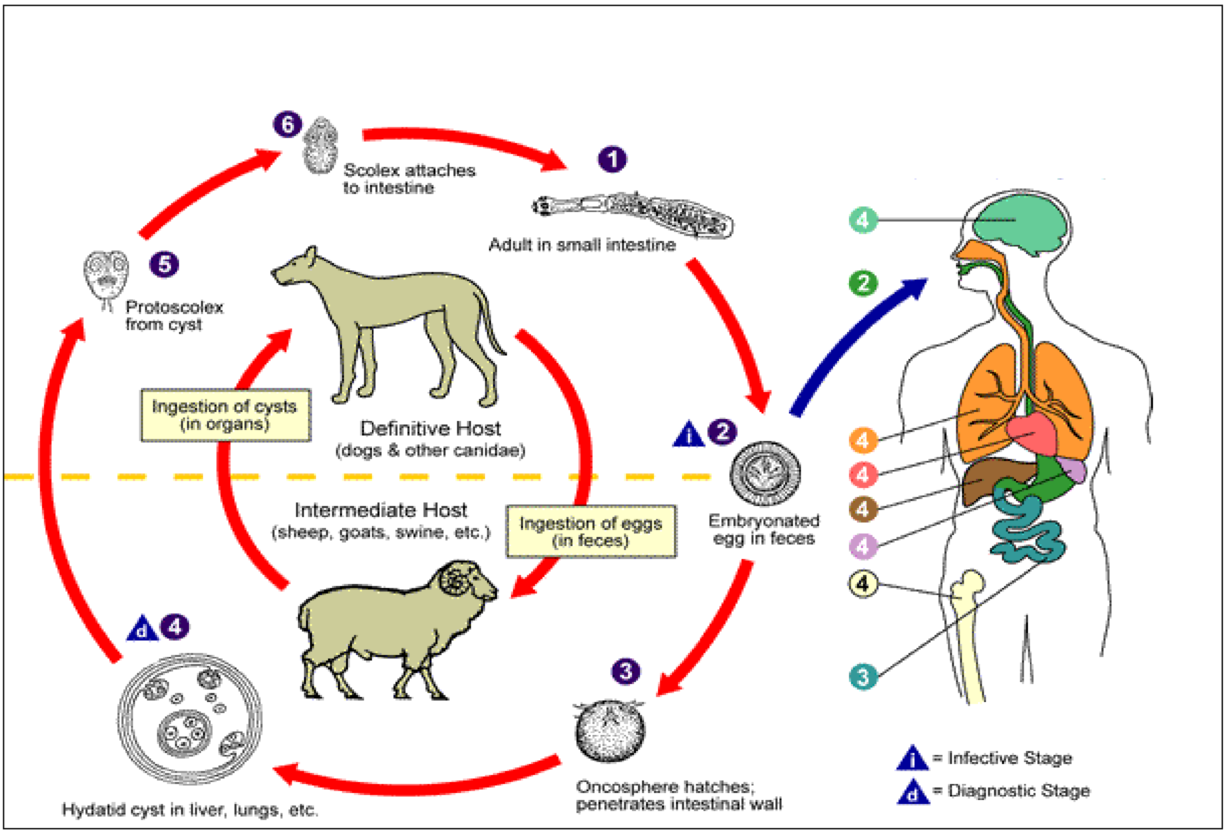
Echinococcosis, which is often referred to as hydatid disease or echinococcal disease, is a parasitic zoonosis that affects both humans and other mammals, such as sheep, dogs, rodents and horses. There are two different forms of echinococcosis found in humans in Europe, each of which is caused by the larval stages of different species of the tapeworm of genus *Echinococcus*. The *Echinococcus granulosus* (*E. granulosus*) complex causes 'cystic hydatid disease', more commonly called cystic echinococcosis (CE) whereas *E. multilocularis* causes 'alveolar hydatid disease', more commonly called alveolar echinococcosis (AE).

E. granulosus

The life cycle of *E. granulosus* is detailed in Figure EH1. The adult stage of the tapeworm *E. granulosus* lives in the small intestines of dogs and, rarely, in other canids, e.g. wolves and jackals, which are the definitive hosts. The adult parasite releases eggs that are passed in the faeces. Livestock such as sheep, goats, pigs, cattle and reindeer are the intermediate hosts in which ingested eggs hatch and release the larval stage (oncosphere) of the parasite. The larvae may enter the bloodstream and migrate into various organs, especially the liver and lungs, where they develop into hydatid cysts. The definitive hosts become infected by ingestion of the cyst-containing organs of the infected intermediate hosts.

Humans are a dead-end host and may become infected through accidental ingestion of *E. granulosus* eggs, shed in the faeces of infected dogs or other canids and subsequently contaminating the environment and the fur of dogs. In humans, the eggs also hatch in the digestive tract, releasing oncospheres, which may enter the bloodstream and migrate to the liver, lungs and other tissues to develop into hydatid cysts (Figure EH1). These cysts may develop unnoticed over many years, and may ultimately rupture. Clinical symptoms and signs of the disease, cystic echinococcosis, depend on the location of the cysts and are often similar to those induced by slow-growing tumours. Cystic echinococcosis is the most common form of echinococcosis found in humans.

***Figure EH1. Life cycle* of E. granulosus**

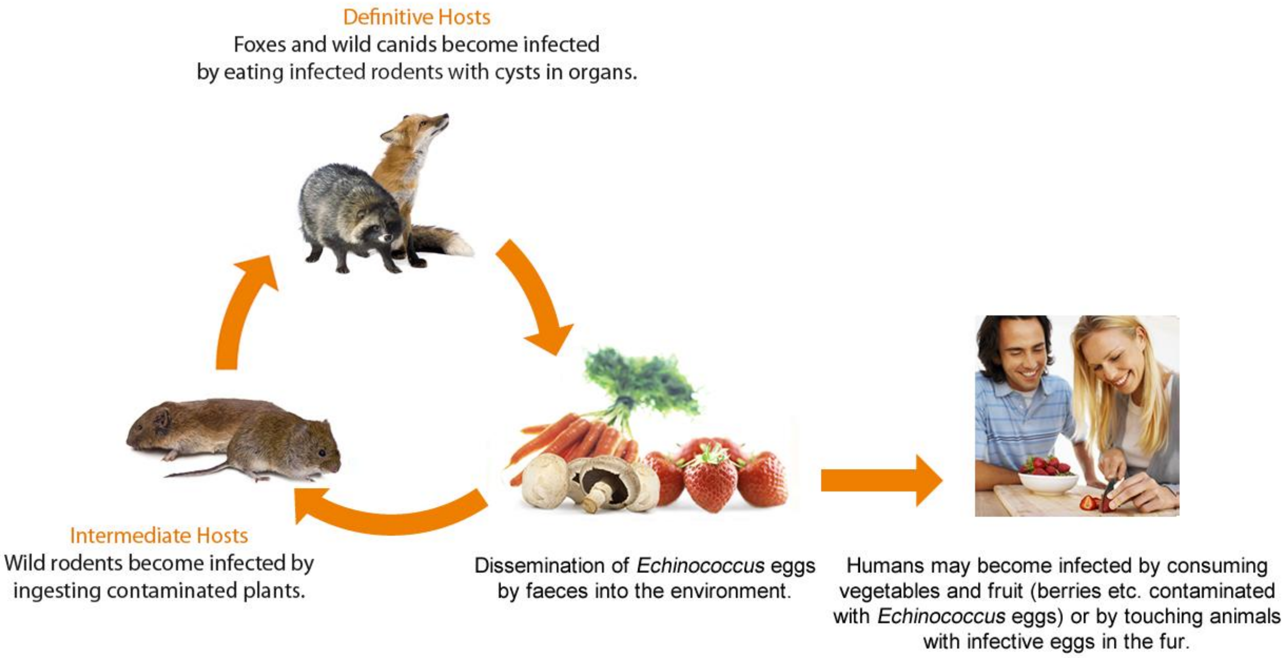


Source: http://www.dpd.cdc.gov/dpdx

E. multilocularis

The life cycle of *E. multilocularis* is presented in Figure EH2. The definitive hosts are foxes, raccoon dogs and, to a lesser extent, dogs, cats, coyotes and wolves. Wild small rodents and voles are the intermediate hosts. The larval form (metacestode) of the "small fox tapeworm" remains indefinitely in the proliferative stage in the liver, thus invading the surrounding tissues. Humans may acquire *E. multilocularis* infection by ingesting *E. multilocularis* eggs that have been shed by the definitive host and contaminated the environment. Consuming contaminated vegetables or berries or touching animals with infective *E. multilocularis* eggs in their fur could be sources of infection. *E. multilocularis* is the causative agent of the highly pathogenic alveolar echinococcosis in man. Although a rare human disease, alveolar echinococcosis is a chronic disease with infiltrative growth and is of considerable public health importance as it is fatal in a large number of untreated patients and because it has the potential to become an emerging disease in many countries.

***Figure EH2. Life cycle of* E. multilocularis**



An overview of the data reported in 2011 is presented in the following Tables and Figures. Additional information on data provided by MSs on *Echinococcus* spp. in 2011 is presented in the Level 3 Tables.

Table EH1. Overview of countries reporting data for* Echinococcus *spp., 2011

Data	Total number of reporting MSs	Countries
Human	25	**All MSs except**: DK, IT **Non-MS:** NO
Animal	24	**All MSs** except BE, BG, MT **Non-MSs:** CH, NO

3.9.1. Echinococcosis in humans

Cases of both infections, caused by *E. granulosus and E. multilocularis,* are reported jointly to ECDC as echinococcosis as the EU case definition does not differentiate between the two clinical forms of the disease. The numbers of reported human cases of echinococcosis (including both cystic and alveolar echinococcosis) are presented in Table EH2. In 2011, a total of 781 confirmed cases of echinococcosis were reported in the EU which was an increase of 3.3 % compared with 2010. The EU notification rate was 0.18 cases per 100,000 population. The highest notification rate was reported by Bulgaria with 4.09 cases per 100,000 followed by Lithuania with 0.74 cases per 100,000.

The two forms of the disease in the data reported to ECDC can be differentiated by the reported species. Species information was provided from 13 MSs for 623 or 79.8 % of the confirmed cases (Table EH3). Six MSs only reported cases of *E. granulosus*, two MSs only reported cases of *E. multilocularis* and five MSs reported both parasites in humans. Of known species, *E. granulosus* accounted for 530 cases (85.1 %) and *E. multilocularis* 93 cases (14.9 %). Over the last five years, there was an increasing number of cases infected with *E. multilocularis* (alveolar echinococcosis) reported from the eight MSs reporting this species throughout the five-year period (Figure EH3). In contrast, there was a decreasing number of cases infected with *E. granulosus* (cystic echinococcosis) reported from the seven MSs reporting this species throughout the period (Figure EH3).

Data on hospitalisation for echinococcosis have been collected in the case-based reporting in TESSy for the last two years. Ten MSs provided this information for all or the majority of their cases and, on average, 67.6 % of the cases were hospitalised (Figure EH4). Hospitalisation status was, however, only provided for 18.2 % of all reported echinococcosis cases in 2011. In half of the countries, the hospitalisation rate was high (>80 %), while in the other half, it was low (<13 %). This observation did not seem to be related to the species of *Echinococcus* as 15 out of 22 (68.2 %) cases with *E. granulosus* and 7 out of 13 (53.8 %) cases of *E. multilocularis* were hospitalised.

Twelve MSs provided information on the outcome of the cases. Two deaths due to echinococcosis of unknown species were reported in 2011, both from Romania. This gives an EU case fatality rate of 0.9 % among the 222 confirmed cases for which this information was reported (28.4 % of all confirmed cases).

Table EH2. Reported cases of human echinococcosis in 2007-2011, and notification rate for confirmed cases in the EU, 2011

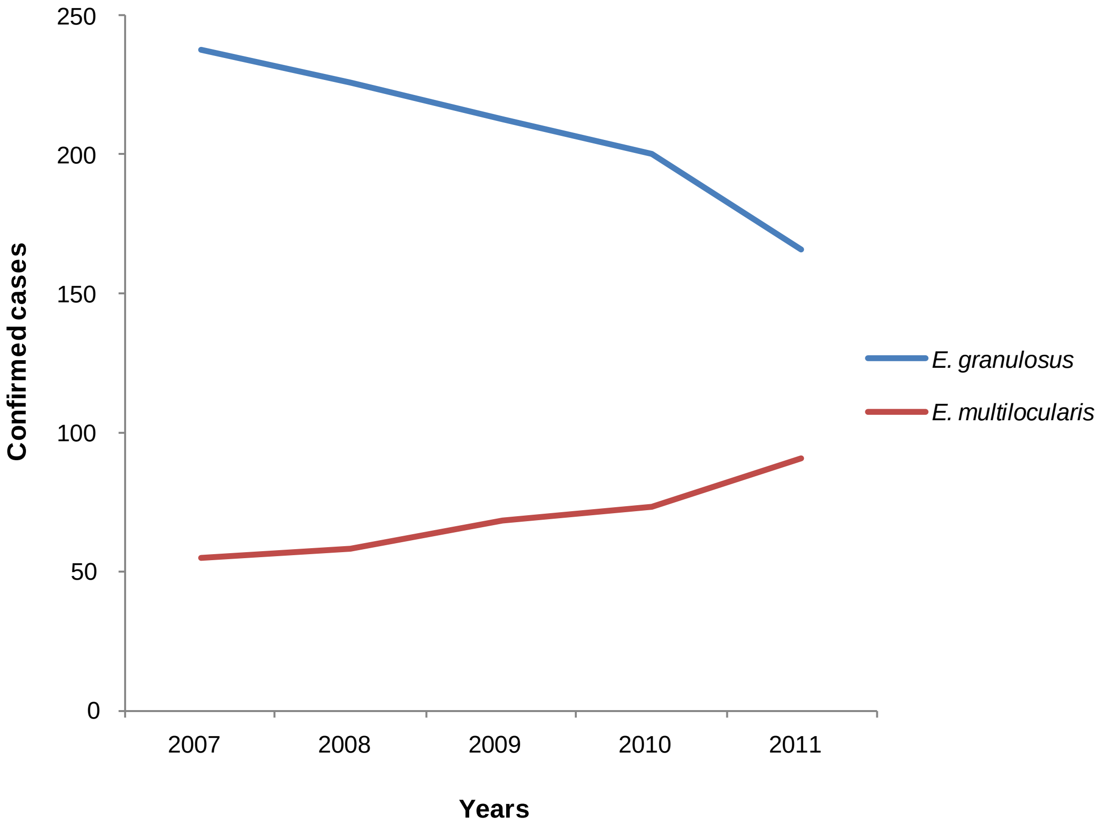
Country	2011				2010	2009	2008	2007
	Report Type[1]	Cases	Confirmed Cases	Confirmed cases/ 100,000	Confirmed Cases			
Austria	C	7	7	0.08	21	20	6	16
Belgium	A	1	1	0.01	1	0	0	1
Bulgaria	A	307	307	4.09	291	323	386	461
Cyprus	C	2	2	0.25	0	1	1	4
Czech Republic	U	0	0	0	5	1	2	3
Denmark[2]	-	-	-	-	-	-	-	-
Estonia	U	0	0	0	0	0	1	2
Finland	C	1	1	0.02	1	1	1	1
France	C	46	45	0.07	33	27	14	25
Germany	C	142	142	0.17	117	106	102	89
Greece	C	17	17	0.15	11	22	28	10
Hungary	C	11	11	0.11	9	8	7	8
Ireland	U	0	0	0	1	1	2	0
Italy[2]	-	-	-	-	-	-	-	-
Latvia	C	10	10	0.45	14	15	21	12
Lithuania	C	25	24	0.74	23	36	32	12
Luxembourg	C	1	1	0.20	1	0	0	0
Malta	U	0	0	0	0	0	0	0
Netherlands	A	49	49	0.29	-	25	12	12
Poland	C	19	19	0.05	34	25	28	40
Portugal	C	1	1	0.01	3	4	4	10
Romania	C	53	53	0.25	55	42	119	99
Slovakia	C	2	2	0.04	9	4	5	4
Slovenia	C	8	8	0.39	8	9	7	1
Spain	C	53	53	0.11	82	86	109	131
Sweden	C	19	19	0.20	30	12	13	24
United Kingdom	C	9	9	0.01	7	7	9	7
EU Totals		**783**	**781**	**0.18**	**756**	**775**	**909**	**972**
Iceland	-	-	-	-	-	-	-	-
Norway	C	3	3	0.06	1	4	3	2

1. A: aggregated data report; C: case-based report; –-: no report; U: unspecified.
2. No surveillance system.

Table EH3. Species distribution of reported confirmed echinococcosis cases in humans, 2011

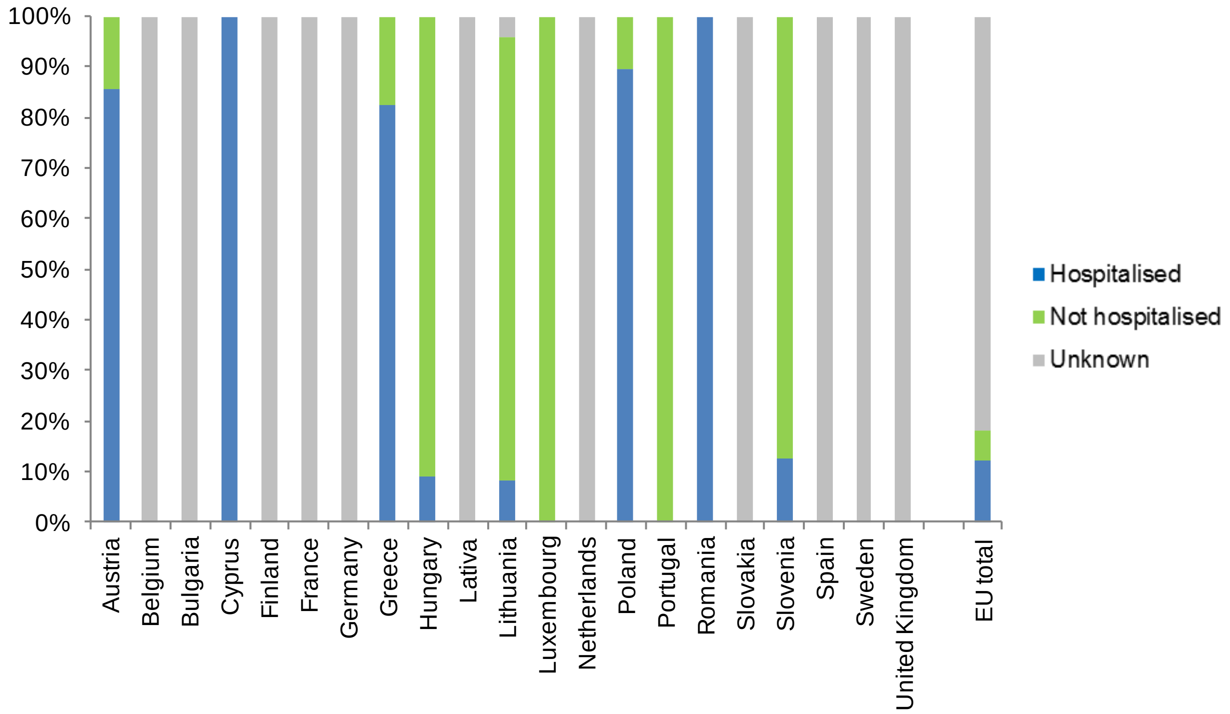
Country	*E. granulosus*	*E. multilocularis*	*E.* spp unknown	Total
Austria	4	3	-	7
Belgium	-	1	-	1
Bulgaria	307	-	-	307
Cyprus	-	-	2	2
Finland	-	-	1	1
France	-	45	-	45
Greece	-	-	17	17
Germany	88	32	22	142
Hungary	-	-	11	11
Latvia	4	-	6	10
Lithuania	7	7	10	24
Luxembourg	-	-	1	1
Netherlands	47	2	-	49
Poland	9	3	7	19
Portugal	1	-	-	1
Romania	-	-	53	53
Slovakia	1	-	1	2
Slovenia	-	-	8	8
Spain	53	-	-	53
Sweden	-	-	19	19
United Kingdom	9	-	-	9
EU total (%)	**530 (67.9 %)**	**93 (11.9 %)**	**158 (20.2 %)**	**781 (100 %)**

Figure EH3. Reported confirmed cases by species in selected MSs, 2007-2011



Source: TESSy data from countries reporting species, for part of or all confirmed cases, throughout the period (2007-2011). *E. granulosus* data from seven MSs (Austria, Germany, Latvia, Lithuania, Poland, Slovakia and Spain). *E. multilocularis* data from eight MSs (Austria, Belgium, France, Germany, Latvia, Lithuania, Poland and Slovakia).

Figure EH4. Proportion of hospitalisation of reported confirmed cases of human echinococcosis in the EU, 2011



3.9.2. *Echinococcus* in animals

As noted earlier, *E. granulosus* and *E. multilocularis* infections have different epidemiology in animals and different manifestations in humans. For *E. granulosus* the definitive hosts are dogs and, albeit rarely, other canids, while the intermediate hosts are mainly livestock. For *E. multilocularis* the intermediate hosts are wild small rodents and voles, while the definitive hosts in Europe are foxes, raccoon dogs and, to a lesser extent, dogs, cats and wolves. As stated above, over the last five years, there was an increasing number of human cases infected with *E. multilocularis* reported from the eight MSs reporting this species throughout the five-year period and a decreasing number of cases infected with *E. granulosus* reported from the seven MSs reporting this species throughout the period (Figure EH3). Therefore, it is of particular importance to assess the occurrence and distribution of *E. multilocularis* in Europe. In the presentation of *Echinococcus* investigations and findings in animals also data from investigations with less than 25 units tested are included as well as results from industry sampling, suspect and/or selective samplings, convenience sampling and clinical investigations.

E. multilocularis in animals

In 2011, 11 MSs and Norway reported data on *Echinococcus* in foxes and seven MSs reported positive findings (Table EH4). All the MSs reporting positive findings in foxes in 2011 reported *E. multilocularis*, with Germany reporting, additionally, 183 samples positive for *Echinococcus* spp. As it is highly probable that these latter findings were also *E. multilocularis*, all subsequent presentations are based on this assumption. The overall proportion of samples positive for *E. multilocularis* in foxes in the 11 reporting MSs was 17.2 %, with a large variability in the proportion of positive results between the reporting MSs (Table EH4). Switzerland reported 13 wild animals of unspecified species positive for *Echinococcus* spp. out of 28 animals tested in the framework of clinical investigations, indicating however, that wild animals tested are mainly foxes. Regional data for *E. multilocularis* in foxes were reported by France and Sweden. The distribution of *E. multilocularis* in the sampled regions and/or countries is shown in Figure EH5.

As regards the sampling context, eight MSs (and Norway) reported data from monitoring in foxes. In addition, the United Kingdom specified that there is an annual, continuous monitoring programme in wild definitive hosts to demonstrate disease freedom and as part of this program faecal samples are collected from red foxes and tested for the presence of *E. multilocularis* and *E. granulosus* (see text box), while data from Sweden originated from a surveillance programme in hunted foxes. Five MSs (the Czech Republic, France, the Netherlands, Poland and the United Kingdom) reported using objective sampling. It has to be noted, however, that the infection rate by *E. multilocularis* in foxes is currently assessed in some French regions but not at national level, while the reported sampling in the Netherlands was done in a region bordering Germany.

Seven MSs have reported data on *E. multilocularis* in foxes for a minimum of four years, from 2005 to 2011 (Figure EH6). In this period, the Nordic countries (Finland and Sweden) reported no or very few positive findings in foxes. In the Czech Republic the reported prevalence of *E. multilocularis* in foxes has continued to increase since 2005, except for 2010 when a decrease was observed followed again by an increase in 2011. Findings from France, Germany and Luxembourg, have continued to fluctuate, with an increase in the prevalence reported by Germany in 2011. It is important to note that the distribution of *E. multilocularis* in the EU may be increasing, while foxes may also be found in closer proximity to human populations, at least in some areas.

In mainland **Norway**, *E. multilocularis* has never been detected in any animal species. The main host of *E. multilocularis*, the red fox, has been investigated by examining a total of 2,166 foxes killed during hunting from 2002 to 2011. All foxes have been negative. Thus, there are so far no indications that this parasite has established in Norway. In 1999, as part of a research project on echinococcosis in the archipelago of Svalbard, *E. multilocularis* was detected in 16.0 % of 172 sibling voles tested. In a follow-up study, the parasite was diagnosed in samples from polar foxes and one dog. Of the voles tested in 2000-2006, between 19.0 % and 96.0% were positive each year.

The surveillance programme for red foxes was intensified, especially in areas close to the Swedish border, after the findings in Sweden in 2011. The findings of *E. multilocularis* in the archipelago of Svalbard in 1999 resulted in follow-up studies, requirements regarding anti-helmintic treatment of dogs and cats in regard to export, and an information campaign directed at the inhabitants of Svalbard.

E. multilocularis has not been found in the indigenous **United Kingdom** animal population. As part of an annual, continuous monitoring programme in wild definitive hosts to demonstrate disease freedom in the United Kingdom, faecal samples are collected from red foxes (*Vulpes vulpes*) and tested for the presence of *E. multilocularis* and *E. granulosus*. In 2011, a total of 355 faecal samples was collected in Great Britain and a further 150 were collected and tested in Northern Ireland. Of the total 505 foxes tested in the United Kingdom in 2011, all tested negative for *E. multilocularis* and *E. granulosus*. These results are supported by previous surveys and give 99.5 % confidence that *E. multilocularis* is not present in the United Kingdom red fox population at a prevalence of 1.0 % or greater.

Findings of *E. multilocularis* were reported also from pigs in Poland. Moreover, France reported five coypu positive for *E. multilocularis* (out of 154 examined).

Before 2010, *E. multilocularis* had never been reported in **Sweden**. However, in 2010 the first positive case, an *E. multilocularis* infected fox, was found. Extended investigations during 2011 have shown that the parasite is spread in the country and control or eradication is not considered feasible. The intermediate host(s) involved in the life cycle has/have not been identified. Although it is not known how *E. multilocularis* was introduced into Sweden, infected dogs introduced to the country without proper deworming is the most probable route. This is in line with results of the Swedish risk assessment conducted in 2006.

Since 2001, 300-400 foxes have been annually shot, sampled and investigated within the framework of a screening programme for *E. multilocularis*. This programme also detects *E. granulosus*. Carcases of wildlife e.g. wolves and raccoon dogs, are sampled sporadically at necropsy. During spring 2011, an extended surveillance was implemented and 2,985 hunter shot foxes from different parts of the country were examined. In addition, 119 faecal samples from hunting dogs, collected in the region of the first positive finding, were analysed. In the same area 236 rodents were trapped and autopsied. Of the 2,985 foxes collected during 2011, three were found positive, while all dogs and rodents were negative for *E. multilocularis*.

Other *Echinococcus* findings in animals

In 2011, 18 MSs and two non-MSs reported data on *Echinococcus* in farm animals, mainly from meat inspection at slaughterhouse. Most of these countries (except Cyprus, Germany, the Netherlands, Portugal and Switzerland) reported *Echinococcus* data from large numbers of animals inspected (data are presented in the Level 3 Tables). Among the MSs that reported data on *Echinococcus* in farm animals, the majority reported no findings or very low levels of *Echinococcus*. Among countries that reported the species of *Echinococcus* in farm animals, most reported findings of *E. granulosus* and/or unspecified *Echinococcus* spp. while Poland reported also findings of *E. multilocularis*.

Romania and Switzerland reported positive findings of *Echinococcus* spp. in dogs in 2011. Cyprus, France, Germany, Slovakia, Sweden and Norway also reported sampling from dogs, but without positive findings. Information on reported samples from other animal species and the respective results can be found in the Level 3 Tables.

Overall, among the reporting countries, Denmark, Estonia, Ireland, Latvia, Luxembourg and Norway did not report any positive findings in any animal species for which data were reported.

For additional information on *Echinococcus* in animals, see the Level 3 Tables.

Table EH4. E. multilocularis *in foxes, 2011*

Country	Description	*Echinococcus* species	Sample unit	N	Pos	% Pos
Czech Republic	Monitoring, official sampling, objective sampling	*E. multilocularis*	animal	1,484	500	33.7
Finland	Monitoring, convenience sampling		animal	128	0	0
France[1]	Wild, from hunting, monitoring, objective sampling[2]	*E. multilocularis*	animal	254	10	3.9
	Wild, from hunting, objective sampling[3]			170	58	34.1
	Wild, from hunting, objective sampling[4]			9	2	22.2
	Monitoring, objective sampling[5]			232	37	15.9
Germany	Official sampling	*E. multilocularis*	animal	3,548	926	26.1
		Echinococcus spp.			183	5.2
Ireland	Monitoring, official sampling, convenience sampling		animal	326	0	0
Luxembourg	Monitoring, official sampling, census[5]		animal	20	0	0
Netherlands	From hunting, monitoring, objective sampling[6]	*E. multilocularis*	animal	165	1	0.6
Poland	Monitoring, from hunting, objective sampling[7]	*E. multilocularis*	animal	250	10	4.0
Slovakia	Monitoring, official sampling, selective sampling[7]	*E. multilocularis*	animal	186	31	16.7
Sweden	Wild, from hunting, surveillance, selective sampling[5]	*E. multilocularis*	animal	2,985	3	0.1
United Kingdom	Wild, survey - national survey, official sampling, objective sampling[5, 8]		animal	505	0	0
Total (11 MSs)				**10,262**	**1,761**	**17.2**
Norway	Monitoring, selective sampling		animal	533	0	0
Switzerland	Clinical investigations[9, 10]	*Echinococcus* spp.	animal	28	13	46.4

Note: In all investigations, sample type is 'animal sample', except wherever explicitly mentioned otherwise.

1. The infection rate by *E. multilocularis* is currently assessed in some French regions, not at national level.
2. Animal sample: organ/tissue – sample type: intestine.
3. Regional program in Meurthe-et-Moselle region; Animal sample: organ/tissue – sample type: intestine.
4. National program: environmental sample: foxes worms collected from the environment.
5. Animal sample: faeces.
6. Survey in regions bordering with Germany.
7. Animal sample: organ/tissue – small intestines.
8. As part of an annual, continuous monitoring programme in wild definitive hosts to demonstrate disease freedom in the United Kingdom, red fox (*Vulpes vulpes*) carcasses are collected and faeces samples taken from these carcasses are tested for the presence of *E. multilocularis* and *E. granulosus*. In total in 2011, 355 foxes were tested in Great Britain by the Food and Environment Research Agency (FERA) and a further 150 were tested by the Agri-food and Biosciences Institute (AFBI) in Northern Ireland.
9. All data categorised as “clinical investigations” are summaries of data from the ILD (Informationssystem Labordiagnostik = information system of laboratory data). ILD is run by the FVO and all labs, which are approved for the diagnosis of certain diseases have to report their results in this system. Only tests on antigen detection are selected for the zoonoses reporting in the context of "clinical investigations".
10. Up to date there is no further differentiation in the ILD among wild animals possible. However, wild animals tested here are mainly foxes.

Figure EH5. Findings of* E. multilocularis *in foxes, 2011

Note: All regional data from France are presented together in the map, with the understanding that they sometimes originate from different types of programmes, with different sampling plans and methodologies and with different sample types. For more details, see Table EH4 '*Echinococcus multilocularis* in foxes, 2011'. The infection rate by *E. multilocularis* is currently assessed in some French regions, but not at national level.

Data from the Netherlands are mapped on the entire country, even though they originated from a survey in regions bordering with Germany.

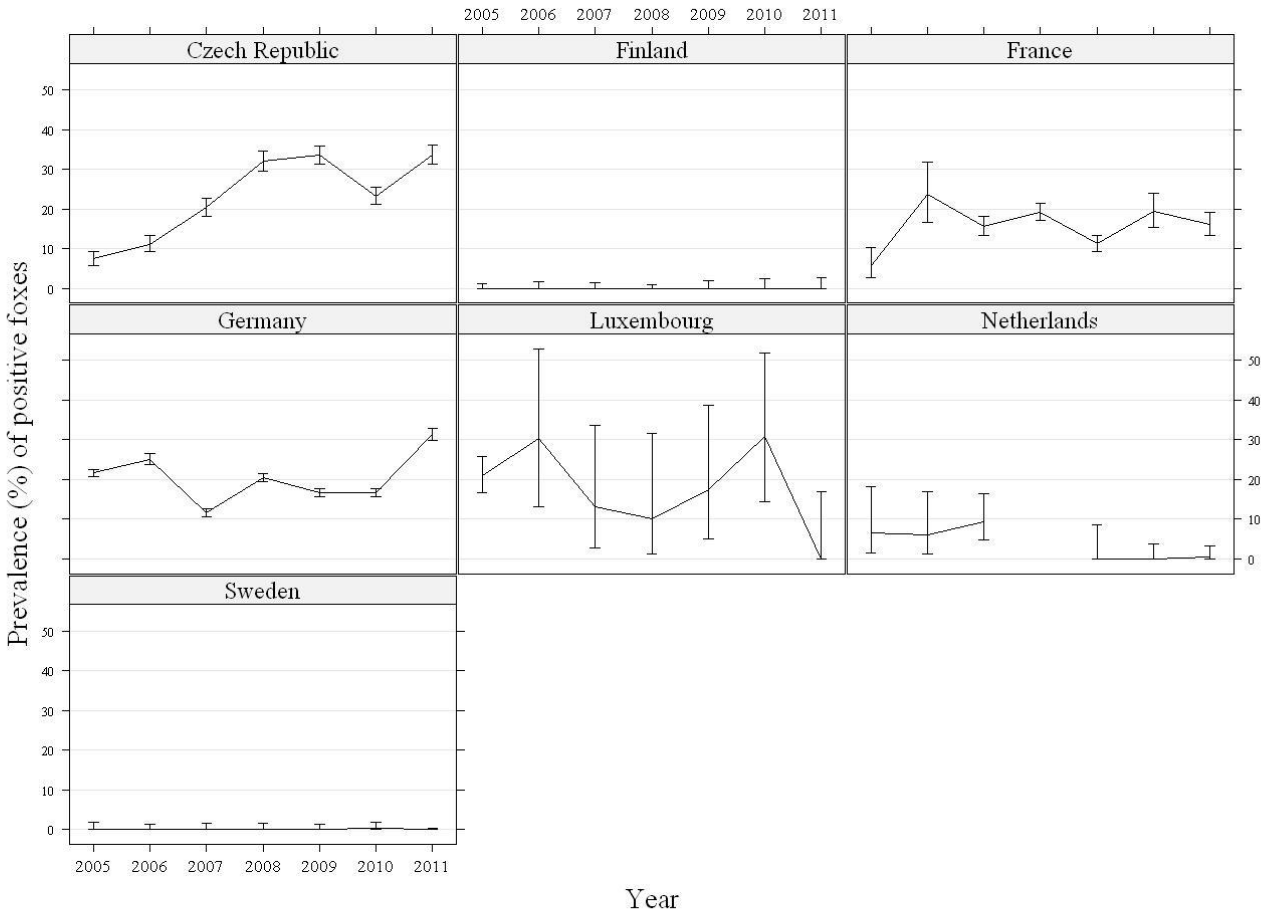
The proportion of positive samples plotted for Germany includes the samples reported both as *E. multilocularis* and as *Echinococcus* spp.

Regarding the Swedish data, all foxes were not georeferenced, therefore total units reported as tested regionally (2,956) do not sum up to the reported total number of tested foxes of 2,985 (Table EH4). The map includes information from the testing of 2,956 foxes. Among the remaining 29 foxes that were not included in the map, there were no animals testing positive.

For countries reporting regional data for *E. multilocularis* in foxes (France and Sweden) the displayed proportion of positive results has been calculated using all reported samples.

The proportion of positive samples plotted for Switzerland concerns 13 wild animals of unspecified species positive for *Echinococcus* spp. out of 28 animals tested in the framework of clinical investigations. Switzerland indicated, that wild animals tested are mainly foxes (see also footnotes 10 and 11 in table EH4).

Figure EH6. Findings of **E. multilocularis** ***in foxes in MS[1] providing data for at least four years, 2005-2011***



Note: The vertical bars indicate the exact binomial 95 % confidence interval.

1. French data for 2011 were summarized from several samplings, concerning sometimes different regions and types of sample (see Table EH4 '*E. multilocularis* in foxes, 2011'). The infection rate by *E. multilocularis* is currently assessed in some French regions, but not at national level.
   Data from Germany for 2011 also include 183 samples that were reported as *Echinococcus* spp.
   The Netherlands data for 2011 originate from a survey in a region bordering with Germany. No data were reported from the Netherlands in 2008, therefore no line was drawn from 2007 to 2009 in the trend Figure for this MS.

3.9.3. Discussion

In humans, the number of confirmed echinococcosis cases in 2011 increased by 3.3 % compared with 2010. Among the cases for which species had been determined, *E. granulosus* accounted for 85.1 % of the cases and *E. multilocularis* for 14.9 %. Six MSs only reported cases of *E. granulosus*, two MSs only reported cases of *E. multilocularis* and five MSs reported both parasites in humans. The highest population-based risk was noted in Bulgaria (which only reported *E. granulosus*), where the notification rate was 23 times higher than the rate at the EU level. No data from sampling in animals was however reported by Bulgaria in 2011.

Over the last five years, there was an increasing number of cases infected with *E. multilocularis* (alveolar echinococcosis) reported from the eight MSs reporting this species throughout the five-year period. In contrast, there was a decreasing number of cases infected with *E. granulosus* (cystic echinococcosis) reported from the seven MSs reporting this species throughout the period. The increase in alveolar echinococcosis is worrisome as untreated disease is often fatal. On average, one third of the confirmed echinococcosis cases were hospitalised. In half of the countries, hospitalisation was high (>80 %), while in the other half, it was low (<13 %). This observation did not seem to be related to the species of *Echinococcus*. Two deaths due to echinococcosis (unknown species) were reported in 2011, resulting in an EU case fatality rate of 0.9 %.

Surveillance of *E. multilocularis* in foxes is important in order to assess the prevalence of this parasite in Europe, particularly as there is evidence that the distribution of *E. multilocularis* is increasing in Europe.[53,54,55,56] Proposals for harmonised schemes for the monitoring and reporting of *Echinococcus* in animals and foodstuffs can be found in an External Scientific Report submitted to EFSA, which is available on the EFSA website.[57] Several MSs have had monitoring/surveillance programmes running for some years, and based on data reported the parasite has been commonly found in foxes in many central European countries. The occurrence in examined foxes in 2011 is roughly similar to that in 2009 and 2010. In 2011, among the MSs that reported data on *Echinococcus* in slaughtered farm animals, the majority reported no findings or very low levels of *Echinococcus*.

The quality of the data reported on *Echinococcus* in animals has improved in recent years, with more information being provided about the sampling context and more data reported at species level. The data on parasite speciation are very important for risk management efforts as *E. granulosus* and *E. multilocularis* have different epidemiology and pose different health risks to humans.

Regional data on *Echinococcus* in farm animals, and *E. multilocularis* in foxes were reported by three and two MSs, respectively. Even though this is slightly lower than the level of reporting in 2010, this is still a very welcome development because more regional data will enable determination of the geographical patterns of spread of the parasite.

53 Combes B, Comte S, Raton V, Raoul F, Boué F, Umhang G, Favier S, Dunoyer C, Woronoff N and Giraudoux P, 2012. Westward Spread of *Echinococcus multilocularis* in Foxes, France, 2005-2010. Emerging Infectious Diseases 18, 2059-2062.

54 Takumi K, de Vies A, Chu m L, Mulder J, Teunis P and van der Giessen J, 2008. Evidence for an increasing presence of *Echinococcus multilocularis* in foxes in the Netherlands. International Journal for Parasitology 38, 571-578.

55 Berke O, Roming T and von Keyserlingk M, 2008. Emergence of *Echinococcus multilocularis* among red foxes in northern Germany 1991-2005. Veterinary Parasitology 155, 319-322.

56 Vervaeke M, van der Giessen J, Brochier B, Losson B, Jordaens, Verhagen R, de Lezenne Coulander C and Teunis P, 2006. Spatial spreading of *Echinococcus multilocularis* in red foxes across nation borders in Western Europe. Preventive Veterinary Medicine 76, 137-150.

57 EFSA (European Food Safety Authority), 2010. Scientific report submitted to EFSA Development of harmonised schemes for the monitoring and reporting of *Echinococcus* in animals and foodstuffs in the European Union. Available on line: http://www.efsa.europa.eu/en/supporting/pub/36e.htm

3. INFORMATION ON SPECIFIC ZOONOSES AND ZOONOTIC AGENTS

3.10. Rabies

Rabies is a disease caused by a Rhabdovirus of the genus *Lyssavirus*. This virus can infect all warm-blooded animals and is transmitted through contact with saliva from infected animals, typically from foxes and stray dogs, for example, via bites. The disease causes swelling in the central nervous system of the host and is normally fatal.

The majority of rabies cases are caused by the classic rabies virus (RABV, genotype 1). In addition, four species of rabies virus are detected in bats in Europe: BBLV (Bokeloh Bat *Lyssavirus*), WCB (West Caucasian Bat virus), EBLV-1 (European Bat *Lyssavirus*) and EBLV-2, of which only the two latter were reported in 2011. Although rare in Europe, bats can transmit rabies to other mammals, including humans.

Symptoms in humans include a sense of apprehension, headache and fever, leading to death. Human cases are extremely rare in industrialised countries. However, those working with bats and other wildlife are encouraged to seek advice on preventive immunisation (vaccination) against rabies.

In animals, the pathogenicity and infectivity of the virus vary greatly among different species. Infected animals may exhibit a wide range of symptoms, including drooling, difficulty in swallowing, irritability, strange behaviour, alternating rage and apathy and increasing paralysis of the lower jaw and hind parts. Animals may excrete the virus during the incubation period, up to 14 days prior to the onset of clinical symptoms.

Table RA1 presents countries reporting data in 2011.

Table RA1. Overview of countries reporting data on* Lyssavirus*, 2011

Data	Total number of reporting MSs	Countries
Humans	27	**All MSs** **Non-MSs:** CH, IS, NO
Animals	24	**All MSs except** CY, IE, MT **Non-MSs:** CH, NO

3.10.1. Rabies in humans

Generally, very few cases of rabies in humans are reported in the EU, and most MSs have not had any indigenous cases for decades. In 2011, one travel-associated case of rabies was reported in the EU, from Portugal (Table RA2). The patient was a woman, resident in Portugal who visited her country of birth, Guinea-Bissau, where she was bitten by a dog. The woman visited the local health centre but no rabies vaccine was available in the country. Two and a half months after the bite, the woman consulted a hospital after returning to Portugal, complaining of back pain but not relating it to exposure to the dog bite. Five days later, she returned to the emergency department with clinical symptoms of rabies.[58]

58 Santos A, Calé E, Dacheux L, Bourhy H, Gouveia J and Vasconcelos P, 2012. Fatal case of imported human rabies in Amadora, Portugal, August 2011. Euro Surveillance. 17(12):pii=20130.

Table RA2. Human rabies cases, 2007-2011

Year	Country	Case
2007	Finland	1 case from the Philippines who was bitten by a dog in his home country, fell ill with rabies when working on a ship in the Baltic Sea and was hospitalised in Finland and died there
	Germany	1 case imported from Morocco
	Lithuania	1 case imported from India after contact with dog
2008	France	1 case (French Guyana)
	Netherlands	1 case imported from Kenya (fatal)
	Romania	1 case (fatal)
	United Kingdom	1 imported case
2009	Romania	1 fatal case, 69- year- old female from a rural area bitten by a fox. The patient did not visit a hospital either reported it to the veterinary authorities
2010	Romania	2 fatal cases, 10 and 11 year old girls from rural areas. Possible transmission by cat bite and unknown
2011	Portugal	1 fatal case imported from Guinea-Bissau. Case was a 41 year old woman bitten by a dog. No vaccine was available in the country at the time of the bite. The person visited the hospital in Portugal two and a half months after the bite

3.10.2. Rabies in animals

Rabies is a notifiable disease in all MSs. In 2011, 12 MSs had their annual or multiannual plan of rabies eradication co-financed by the EC (Decision 2010/712/EU).[59] Eradication plans comprise oral vaccination of wild animals, sampling of wild and domestic animals (suspect for rabies and those found dead) for rabies surveillance and sampling of wild animals for monitoring for testing vaccine efficacy.

The vaccination programmes can be conducted nation-wide or only in at-risk areas, and they may vary in frequency as ordinary vaccination campaigns (twice a year) or extraordinary campaigns (as many campaigns as required depending on the epidemiological situation).

The majority of samples from wild and domestic animals that are analysed for rabies, are taken based on suspicion of rabies infection. In addition, countries carrying out oral vaccination programmes of wildlife monitor the efficiency of the vaccinations. This involves the sampling of hunted healthy (rabies unsuspected) foxes and raccoon dogs randomly and homogeneously in the vaccination areas. These hunted animals are tested for vaccine intake and for specific immunity, as well as for rabies virus.

With the exception of Cyprus, Ireland and Malta, all MSs and the two non-MSs (Norway and Switzerland) provided information on rabies in animals. Six MSs and one non-MS (Norway) reported rabid infected wild animals other than bats (Table RA3 and Table RA4), and three of these MSs reported rabies also in domestic animals; one MS reported rabies only in a domestic animal. Six MSs reported rabies-infected bats (Table RA5).

In 2011, 512 animals other than bats were found infected with classic rabies or unspecified *Lyssavirus* in seven EU MSs and one non-MS (Norway). Reported cases reduced compared with 2010 when 883 cases where detected in animals other than bats, thus continuing the overall decreasing trend registered since 2006 (Figure RA1).

Seven MSs reported their findings at regional level, three of them covering rabies surveillance of the entire national area (Figure RA2).

Lyssavirus was speciated for only 39 % of the 544 rabies positive animals (including bats) reported, and 334 of these cases were reported as unspecified *Lyssavirus*.

Domestic animals

In 2011, 19 MSs and two non-MSs (Norway and Switzerland) reported data on rabies testing in domestic animals.

Overall 127 domestic animals were found infected with classic virus or unspecified *Lyssavirus* in three MSs. These cases were reported by Latvia (one case in a domestic soliped), Poland (33 cases) and Romania (93 cases). Poland and Romania also reported rabies in wildlife.

Poland recorded 33 cases in domestic animals, 15 occurred in farm animals, 10 and eight in cats and dogs, respectively. Polish cases in domestic animals increased compared with 2010 when 21 cases were reported. Romania reported 93 domestic animal cases infected with classic rabies virus or unspecified *Lyssavirus*. Thirty-five cases occurred in farm animals, 19 in cats and 39 in dogs. This was fewer than in 2010 when 121 rabies cases were reported in domestic animals.

In addition, France reported one rabies case in a dog imported from Morocco. This case is not included in the above number because the animal was not infected within the EU, but still it represents a risk for rabies related to the importation of animals from countries or regions where rabies has not been eliminated.

59 Commission Decision 2010/712/EU of 23 November 2010 approving annual and multiannual programmes and the financial contribution from the Union for the eradication, control and monitoring of certain animal diseases and zoonoses presented by the Member States for 2011 and following years. OJ L 309, 25.11.2010, p. 18.

Wildlife

In 2011, 21 MSs and two non-MS (Norway and Switzerland) reported data on wild animals other than bats.

Overall 385 wild animals (excluding bats) were found positive for the classic virus or unspecified *Lyssavirus* and these data were reported by Bulgaria, Estonia, Italy, Lithuania, Poland, Romania and Norway. Most of the cases were reported by Poland and Romania.

There was a decrease in cases in wildlife compared with 2010 when 725 cases were reported by MSs and non MSs. Nineteen MSs and two non-MSs (Norway and Switzerland) reported data on foxes, and overall 336 foxes were found infected in 2011. Fox cases decreased compared with 2010 when 643 foxes were reported to be infected with classic rabies virus or unspecified *Lyssavirus*. Seven MSs and one non-MS (Switzerland) reported data in raccoon dogs. Eleven raccoon dogs were found positive for rabies and this figure is lower than that reported in 2010 when 15 rabid raccoon dogs were reported. Thirty-eight cases occurred in other wildlife species, among them nine in martens.

Since 2008, **Italy** has had a rabies epidemic in its north-eastern regions. In 2011, Italy reported only one rabid fox in the affected area (Figure RA2). This was the last case of a declining trend that started in 2010 when overall 209 cases occurred mostly during the first half of the year. Italy has a multiannual EU approved and co-financed plan for rabies eradication. In Slovenia no cases of rabies were reported in 2011.

In 2011, **Poland** reported, at national level, 155 rabid animals other than bats. This was a slight increase in cases over 2010 when the epidemic started and 145 rabid animals other than bats were reported. This slight increase was mostly due to the higher number of cases in domestic animals, whereas cases in wildlife remained stable with 122 in 2011 and 124 cases reported in 2010. Out of these wildlife cases, 103 foxes were found rabid, a slight decrease compared to 2010 when 117 rabid foxes were reported. In 2011, as in previous years, Poland implemented the EU-approved and co-financed rabies eradication plan. At regional level it are the south-eastern regions of Poland that have been experiencing an epidemic with several outbreaks since 2010. In 2011 the north-eastern border regions of Poland also registered some cases in wildlife (Figure RA2). Poland borders non-EU countries where rabies epidemics are ongoing; most likely some wildlife cases occurring along the border are cross-boundary cases.

Romania reported 324 cases in animals other than bats and 231 cases of these were in wild animals. Most cases involved foxes (222), which is an important reduction compared with 2010 when 303 rabid foxes were recorded. However Romania is still the MS reporting the most fox cases in the EU. Also, one rabid raccoon dog and eight other wild rabid animals were reported. Rabid cases in wildlife were evenly distributed across the Romanian territory (Figure RA2) with some counties reporting no cases in wildlife. In 2011, Romania implemented the first annual rabies eradication plan and it was approved and co-financed by the EU. The plan was implemented by two oral vaccination campaigns in wildlife, with distribution of vaccine by airplane in 16 counties of its 42 counties, which, together with other control and prevention measures, contributed to the important reduction in cases reported in domestic animals and wildlife in 2011.

In 2011, Lithuania reported 14 cases occurring in wildlife with an overall reduction compared with 2010 when 31 cases were registered. Raccoon dogs represent an important reservoir for rabies in Lithuania and seven animals were found to be rabid together with four foxes and three other wild animals.

Latvia reported no rabies cases occurring in wildlife in 2011, although 16 cases were reported in 2010.

Norway reported rabies in five arctic foxes and 10 reindeer; all these cases occurred in the Svalbard Island.

Bats

In 2011, 17 MSs and one non-MS (Switzerland) reported data on rabies in bats. Bats infected with rabies virus were found in six MSs (France, Germany, Hungary, the Netherlands, Poland and Spain) (Figure RA3). These countries also reported positive findings in bats in 2010.

In France, six bats originating from four different departments across the country were reported to be infected with EBLV-1. Germany reported 11 bats infected with EBLV.

The United Kingdom performed an annual monitoring for rabies in bats, but in 2011, as in 2010, no cases were detected.

For additional information on rabies in animals, refer to the level 3 Tables.

Table RA3. Number of tested animals and positive cases of domestic animals, 2011

Country	Description of sampling strategy[1]	Classical rabies virus (RABV) or unspecified *Lyssavirus* (u. *L.*)[2]											
		Farm animals[3]				Cats (pets)				Dogs (pets)			
		N	RABV[2]	u. *L.*[2]	all *L.*[2]	N	RABV[2]	u. *L.*[2]	all *L.*[2]	N	RABV[2]	u. *L.*[2]	all *L.*[2]
			Pos	Pos	Total Pos		Pos	Pos	Total Pos		Pos	Pos	Total Pos
Austria	Clinical investigations	8	0	0	0	40	0	0	0	61	0	0	0
Belgium	Clinical investigations	465	0	0	0								
Bulgaria	Clinical investigationsMonitoring	4	0	0	0					12	0	0	0
Czech Republic	Unspecified	3	0	0	0	176	0	0	0	119	0	0	0
Denmark	Clinical investigations	2	0	0	0	2	0	0	0	1	0	0	0
Estonia	Clinical investigationsControl and eradication programmes	7	0	0	0	28	0	0	0	10	0	0	0
Finland	Monitoring	2	0	0	0	16	0	0	0	16	0	0	0
France		19	0	0	0	576	0	0	0	640	0	0	0
Hungary		46	0	0	0								
Italy	Clinical investigations	23	0	0	0	398	0	0	0	431	0	0	0
Latvia	Clinical investigationsMonitoring	18	1	0	1	22	0	0	0	22	0	0	0
Lithuania	Control and eradication programmes	31	0	0	0								
Luxembourg		5	0	0	0								
Netherlands	Clinical investigations	868	0	0	0	6	0	0	0	9	0	0	0
Poland		62	14	1	15	1,008	5	5	10	531	3	5	8
Romania	Unspecified	194	10	25	35	91	0	19	19	272	0	39	39
Slovakia	Clinical investigationsMonitoring	14	0	0	0	108	0	0	0	171	0	0	0
Slovenia	MonitoringSurveillance	31	0	0	0	56	0	0	0	35	0	0	0
Sweden		1	0	0	0	4	0	0	0	3	0	0	0
United Kingdom	Monitoring					18	0	0	0	11	0	0	0
EU Total		**1,803**	**25**	**26**	**51**	**2,549**	**5**	**24**	**29**	**2,344**	**3**	**44**	**47**
Norway										5	0	0	0
Switzerland		7	0	0	0	9	0	0	0	33	0	0	0

Note: All records reported are included in the table, no exclusion was made on the record size.
In 2011, France reported one rabies infected dog imported from Morrocco. This case is not reported in table RA3.

1. Sampling strategy refers to farm animals, cats (pets) and dogs (pets).
2. RABV: Rabies Virus; u.: unspecified; *L.*: *Lyssavirus.*
3. Data include: cattle (bovine animals), goats, pigs, unspecified poultry, unspecified, sheep, goats, domestic solipeds.

Table RA4. Number of tested animals and positive cases of rabies in wild animals other than bats, 2011

Country	Description of sampling strategy [1]	Classical rabies virus (RABV) or unspecified *Lyssavirus* (u. *L.*)[2]											
		Foxes				Raccoon dogs				Other wild[3]			
		N	RABV[2] Pos	u. *L* [2] Pos	all *L.* [2] Total Pos	N	RABV[2] Pos	u. *L.*[2] Pos	all *L* [2] Total Pos	N	RABV[2] Pos	u. *L.*[2] Pos	all *L*[2] Total Pos
Austria	Clinical investigation, monitoring, surveillance	2,349	0	0	0					179	0	0	
Belgium	Clinical investigation, monitoring	40	0	0	0					23	0	0	0
Bulgaria	Clinical investigation and monitoring	457	0	1	1					6	0	0	0
Czech Republic	Monitoring, unspecified	3,416	0	0	0	4	0	0	0	106	0	0	0
Estonia	Clinical investigation, control and eradication programmes	52	0	0	0	103	1	0	1	9	0	0	0
Finland	Monitoring	133	0	0	0	208	0	0	0	120	0	0	0
France	Monitoring	104	0	0	0					55	0	0	0
Greece										8	0	0	0
Hungary	Monitoring	4,575	0	0	0					681	0	0	0
Italy	Clinical investigation and unspecified	4,494	1	0	1					1,253	0	0	0
Latvia	Clinical investigation, monitoring	221	0	0	0	115	0	0	0	87	0	0	0
Lithuania	Clinical investigation, monitoring	340	4	0	4	239	7	0	7	260	3	0	3
Luxembourg	Monitoring	20	0	0	0					5	0	0	0
Netherlands	Clinical investigation, monitoring	6	0	0	0					6	0	0	0
Poland	Monitoring	23,589	101	2	103	91	2	0	2	531	11	6	17
Portugal										6	0	0	0
Romania	Control and eradication programmes	2,091	0	222	222	1	0	1	1	28	0	8	8
Slovakia	Clinical investigations, control and eradication programmes	3,270	0	0	0					76	0	0	0
Slovenia	Monitoring, surveillance	2,001	0	0	0					103	0	0	0
Spain	Monitoring	4	0	0	0					104	0	0	0
Sweden	Monitoring, surveillance	1	0	0	0					1	0	0	0
EU Total		**47,163**	**106**	**225**	**331**	**761**	**10**	**1**	**11**	**3,647**	**14**	**14**	**28**
Norway[4]		141	5	0	5					24	10	0	10
Switzerland		22	0	0	0	1	0	0	0	5	0	0	0

Note: Zoo animals and unspecified species are not included in the table. Three zoo animals were tested for rabies in 2011 (one in Romania and two in France) but with no positive findings.
Lithuania reported five other animals - unspecified with no positive findings; Poland reported testing for rabies 243 other animals and reported no positive findings; the United kingdom reported testing two other animals with no positive findings; all these data are not presented in the table.

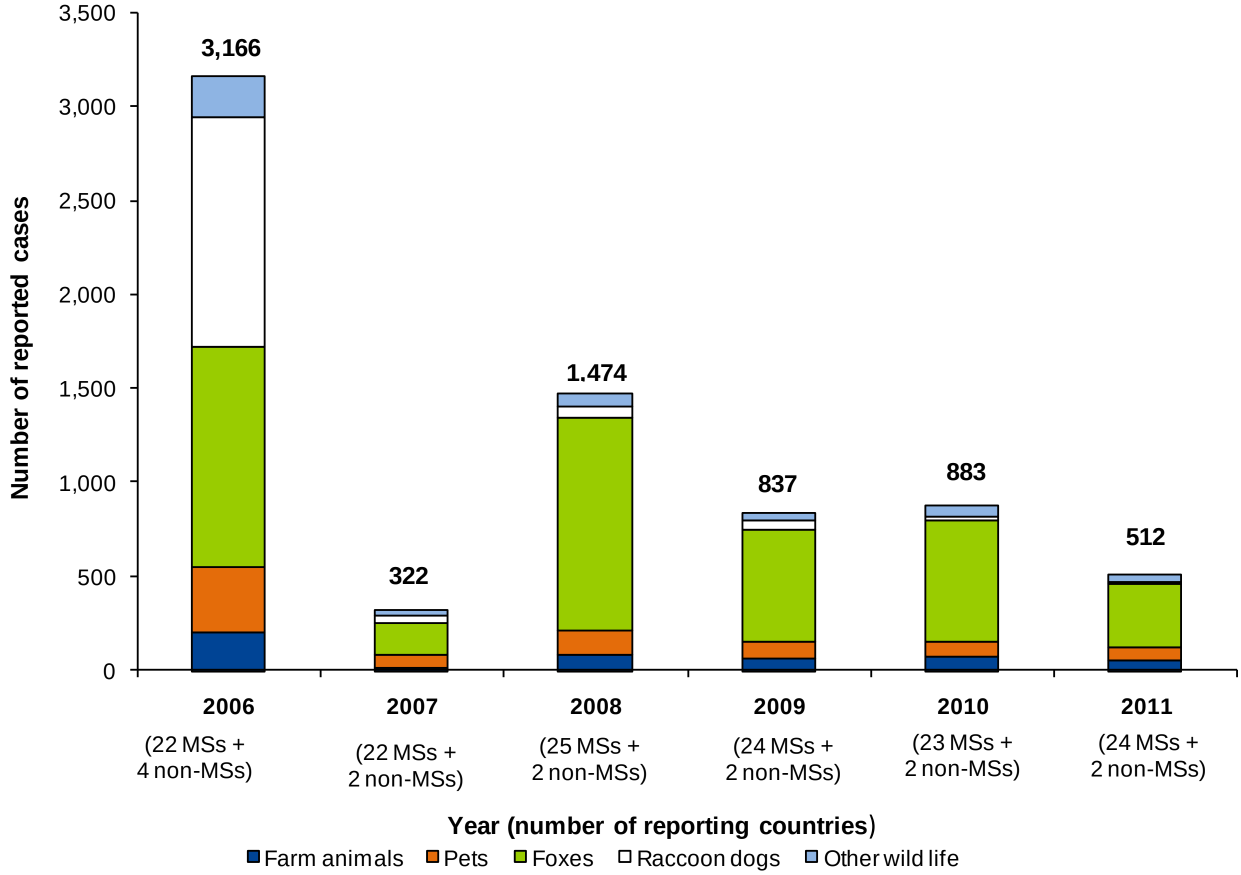
1. Sampling strategy refers to foxes, raccoon dogs and other wildlife.
2. RABV: Rabies Virus; u. *L.*: unspecified *Lyssavirus.*
3. Data include alpine chamois, budgerigars, badgers, beavers, chinchillas, chipmunks, deer, dormice, ermine, elks, ferrets, guinea pigs, hares, hamster, hedgehogs, jackals, lynxes, martens, mice, mink, monkeys, moose, moles, mouflons, muskrats, unspecified mustelides, otter, other wild carnivores, other mustelides, bears, polar bear, polecats, rabbits, rats, raccoons, reindeers, rodents, seals, squirrels, stray cats, stray dogs, voles, weasel, wild boars, wild cats (*Felis silvestris*), wolverines, wolves and other wild animals. Pets, other then dog and cat pets, are also included here.
4. From the Svalbard area, one seal (*Erignathus barbatus),* four polar bears (*Ursus maritimus*), 19 reindeers and 140 arctic foxes (*Vulpes lagopus)* were investigated. Ten reindeers and five arctic foxes were found positive.

Table RA5. Number of tested animals and positive cases of rabies in bats

Country[2]	European Bat *Lyssavirus* (EBLV-1 and EBLV-2) or unspecified *Lyssavirus* (u. *L)*[1]	
	N	EBLV-1 or EBLV-2[1] Pos
Austria	105	0
Belgium	16	0
Bulgaria	6	0
Czech Republic	19	0
Finland	13	0
France	317	6
Germany	11	11
Hungary	18	2
Italy	211	0
Netherlands	164	7
Poland	153	4
Romania	3	0
Slovakia	2	0
Slovenia	158	0
Spain	54	2
Sweden	217	0
United Kingdom	552	0
EU Total	**2,019**	**32**
Switzerland	28	0

1. EBLV-1 and EBLV-2: European Bat *Lyssavirus* 1 or 2; u*. L.*: unspecified *Lyssavirus.*
2. Latvia, France, Sweden (since 1998), the Netherlands and the United Kingdom (since 1987) have a passive surveillance programme for EBLV in bats.

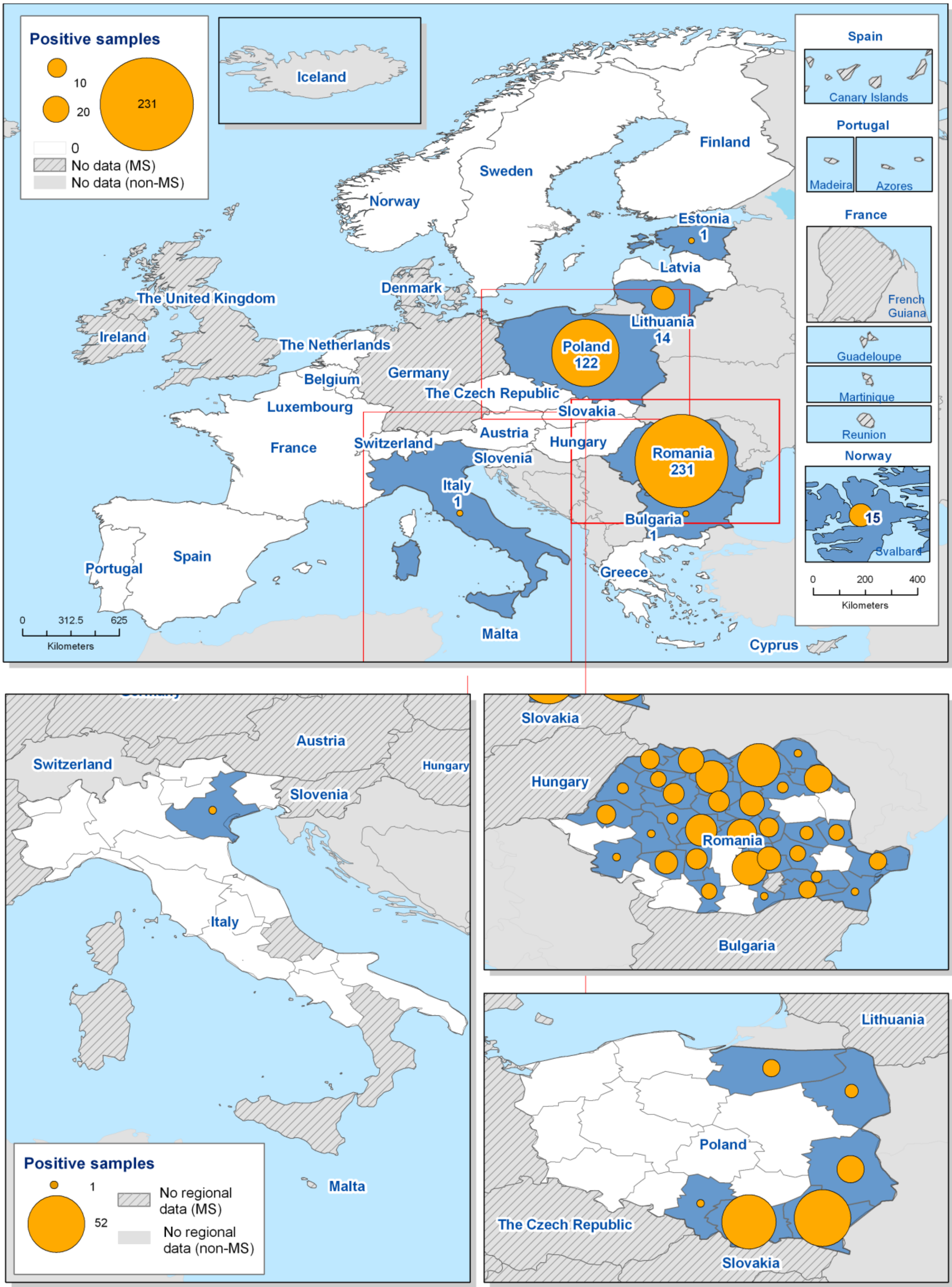
Figure RA1. Reported cases[1] of classical rabies or unspecified* Lyssavirus *in animals other than bats, in the Member States and other reporting countries, 2006-2011



Note: The number of reporting MSs and non-MSs is indicated at the bottom of each bar. The total number of rabid cases is reported at the top of the bar.

1. Imported cases are not included.

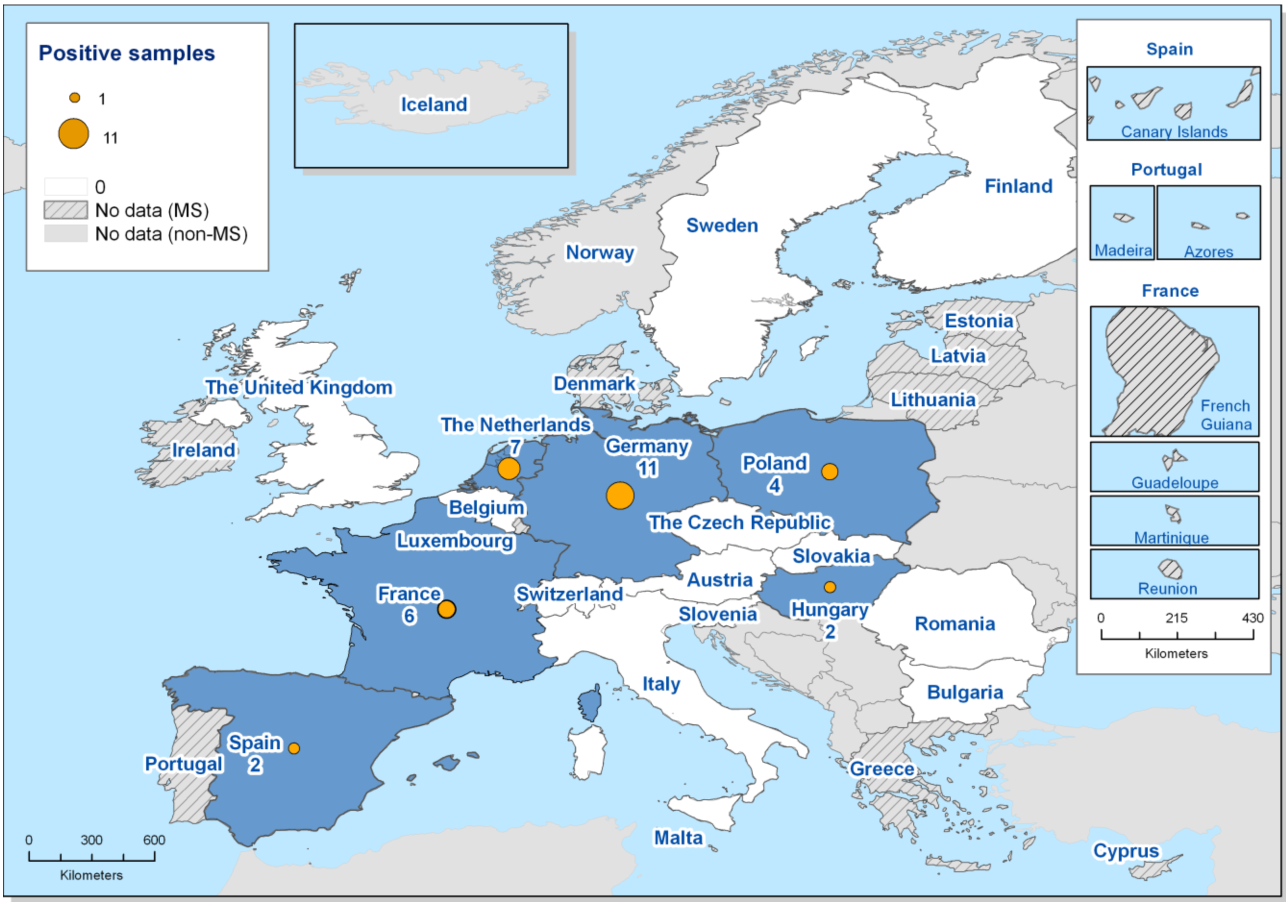
Figure RA2. Classical rabies or unspecified* Lyssavirus *cases in wild animals other than bats, 2011



Note: From the Svalbard area (Norway), one seal *(Erignathus barbatus),* four polar bears *(Ursus maritimus),* 19 reindeers and 140 arctic foxes *(Vulpes lagopus)* were investigated. Ten reindeers and five arctic foxes were found positive.

The blue highlighted areas indicate MSs, non-MSs or regions reporting rabies cases in wild animals other than bats.

Figure RA3. **European Bat Lyssavirus *(EBLV) or unspecified* Lyssavirus *cases in bats, 2011***



Note: The blue highlighted areas indicate MSs, non-MSs or regions reporting rabies cases in bats.

3.10.3. Discussion

Human rabies is a rare and vaccine-preventable zoonosis in Europe but the disease is invariably fatal in infected unvaccinated humans. Every year, there are still one or two human cases reported in European citizens, either travel related or indigenous. In 2011, a case of rabies was reported of a patient who travelled to a country endemic for rabies. The person did not receive any post exposure treatment and also did not seek medical attention on returning to Europe until very late. This highlights the importance of public information and education about the risk of contracting rabies while travelling to rabies endemic countries or in MSs that have not eradicated the disease in their animal population.

In 2011, classic rabies was not reported in animals of Central and Western MSs, but this disease still occurs in wildlife and, although less frequently, in domestic animals of the Baltic MSs and some Eastern and Southern MSs. Most of the latter MSs are now executing rabies eradication plans which are co-financed by the EU (Decision 2010/712/EU). In some of these MSs, cases occurred mostly in regions bordering eastern Europe non-EU MSs affected by rabies epidemics. The general decreasing trend in the total number of rabies cases in animals observed in previous years continued in 2011, when an important further reduction of reported cases was observed. Presumably this is the result of an advanced eradication of rabies in Italy and Slovenia, but also because of reduced rabid cases in domestic animals and wildlife in Romania, after this country initiated in 2011 the distribution of vaccine by airplane in 16 of its 42 counties, as well as manually distributing baits of oral vaccine in wildlife.

The declining trend in animal cases observed in Romania is remarkable as this trend includes domestic animals, which represent the most important source of exposure of humans to the rabies virus. However, rabies outbreaks in domestic animals and wildlife are still occurring in the whole Romanian territory, as well as in the south-eastern regions of Poland where the number of infected domestic animals increased.

Seven MSs reported their findings at regional level. Three MSs submitted regional data on rabies surveillance, covering the entire national area. Reporting of surveillance data, including negative findings, at regional level, is important in evaluating rabies trends over time.

In 2011, six MSs reported rabies findings from bats.

4. FOOD-BORNE OUTBREAKS

4.1. General overview

The reporting of investigated food-borne outbreaks has been mandatory for EU MSs since 2005. Starting in 2007, harmonised specifications on the reporting of food-borne outbreaks at EU level have been applied.[60] In 2011, as in 2010, revised reporting specifications for food-borne outbreaks were implemented,[61] and the distinction between 'verified' and 'possible' food-borne outbreaks was abandoned; instead, outbreaks were categorised as having 'strong evidence' or 'weak evidence' based on the strength of evidence implicating a suspected food vehicle. In the former case, i.e. where the evidence implicating a particular food vehicle was strong, based on an assessment of all available evidence, a detailed dataset was reported for outbreaks. In the latter case, i.e. where no particular food vehicle was suspected or for food-borne outbreaks where the evidence implicating a particular food vehicle was weak, only a limited dataset was reported. This minimal dataset included the number of outbreaks per causative agent and the number of human cases, hospitalisations and deaths. In this chapter the term 'weak evidence outbreak' also covers outbreaks for which no particular food vehicle was suspected. It is important to note that the food-borne outbreak investigation systems at national level are not harmonised among MSs. Therefore, the differences in the number and type of reported outbreaks, as well as in the causative agents may not necessarily reflect the level of food safety among MSs; rather they may indicate differences in the sensitivity of the national systems in identifying and investigating food-borne outbreaks.

Data from 2011 provide information on the total number of reported food-borne outbreaks attributed to different causative agents, including food-borne outbreaks for which the causative agent was unknown.

In this general overview, all reported food-borne outbreaks, including waterborne outbreaks, are included in the tables and figures. In subsequent sections, outbreaks are presented in more detail and categorised by the causative agent, but excluding waterborne outbreaks where the evidence was strong. All waterborne outbreaks with strong evidence are addressed separately in section 4.13.

In 2011, 25 MSs and two non-MSs provided data on food-borne outbreaks; this is one country more than in 2010. No outbreak data were reported by Cyprus and Luxembourg for 2011. An overview of countries reporting data on food-borne outbreaks is provided in Table OUT1.

60 EFSA (European Food Safety Authority), 2007. Report of the Task Force on Zoonoses Data Collection on harmonising the reporting of food-borne outbreaks through the Community reporting system in accordance with Directive 2003/99/EC. EFSA Journal,123, 1-16.

61 EFSA (European Food Safety Authority), 2011. Updated technical specifications for harmonised reporting of food-borne outbreaks through the European Union reporting system in accordance with Directive 2003/99/EC. EFSA Journal, 9(4):2101, 24 pp.

Table OUT1. Overview of countries reporting data on food-borne outbreaks, 2011

Causative agent	Total number of reporting MSs	Countries
Salmonella	24	**All MSs except:** CY, LU, PT **Non-MSs:** CH, NO
Campylobacter	17	**MSs:** AT, BE, DE, DK, EE, ES, FI, FR, HU, IT, LT, MT, NL, PL, SE, SK, UK **Non-MS**: NO
Pathogenic *E. coli*	12	**MSs:** AT, BE, DE, DK, ES, FR, HU, IE, NL, RO, SE, UK
Other bacterial agents[1]	15	**MSs:** AT, BE, DE, DK, EE, ES, FI, FR, HU, IT, LT, MT, PL, SK, UK **Non-MSs**: NO, CH
Bacterial toxins[2]	19	**MSs:** AT,BE, BG, DE, DK, ES, FI, FR, HU, IT, LT, NL, PL, PT, RO, SE, SK, SI, UK **Non-MS:** NO
Viruses	19	**MSs:** AT, BE, DE, DK, EE, ES, FI, FR, HU, IT, LT, LV, MT, NL, PL, SE, SK, SI, UK **Non-MSs:** CH, NO
Parasites	11	**MSs:** BG, DE, ES, FR, IE, LT, LV, PL, RO, SE, SK
Other causative agents[3]	10	**MSs:** BE, DE, DK, ES, FR, HU, MT, PL, SE, UK **Non-MSs:** CH, NO
Unknown	19	**MSs:** BE, BG, DE, DK, ES, FI, FR, GR, HU, IE, IT, LT, LV, MT, NL, PL, SE, SK, UK **Non-MSs:** CH, NO

1. Includes *Listeria, Shigella*, *Yersinia*, *Brucella* and other bacterial agents.
2. Includes *Bacillus*, *Clostridium* and staphylococcal enterotoxins.
3. Includes histamine, mushroom toxins, marine biotoxins, mycotoxins, escolar fish (wax esters) and other agents.

Number of outbreaks

In 2011, a total of 5,648 food-borne outbreaks, including both weak and strong evidence outbreaks, were reported by the 25 reporting MSs. This represents an increase of 7.1 % compared with 2010, when 5,276 outbreaks (including the 14 strong evidence waterborne outbreaks) were reported in total by 24 MSs.

The overall reporting rate in 2011 at EU level was 1.12 outbreaks per 100,000 population (Table OUT2), similar to that observed in 2010 (1.1). Malta had the highest reporting rate (14.37 outbreaks per 100,000 population), followed by Slovakia (9.82 outbreaks per 100,000 population). These high rates could be due to sensitive food-borne outbreak investigation and identification systems in these countries.

In 2011, France accounted for 20.4 % of all reported outbreaks (Table OUT2) and was also the MS reporting the largest number of outbreaks in the previous years (1,039 in 2010 and 1,256 in 2009). France has a sensitive food-borne outbreaks investigation and reporting system, which is the likely reason for consistently reporting a high number of outbreaks. The MS reporting the second highest number of outbreaks was Italy, with 908 outbreaks reported (16.1 % of the total). Slovakia, Poland, Germany and Spain reported 534, 493, 424 and 424 outbreaks, respectively, and these countries together with France and Italy accounted for 69.7 % of all outbreaks within the EU. However, the reporting rate per 100,000 population in these countries was quite low (between 1.77 and 0.52), with the exception of Slovakia, which reported a rate of 9.82 (Table OUT2 and Figure OUT1).

A total of 701 strong evidence outbreaks were reported by 18 MSs, representing 12.4 % of the total number of food-borne outbreaks recorded in 2011 (Table OUT2). This was similar to the number of strong evidence outbreaks reported in 2010 (712 including the strong evidence waterborne outbreaks).

Spain, Poland and France accounted for 53.6 % of the total number of reported strong evidence outbreaks (Table OUT2). These were the same countries reporting the highest number of strong evidence outbreaks in 2010.

In the non-MSs, Norway and Switzerland, 58 outbreaks were reported in total, out of which seven were reported with strong evidence.

Strong and weak evidence outbreaks

The classification of outbreaks as either strong or weak evidence was based on an assessment of all available evidence, and more than one type of evidence is often reported in one outbreak.

There were large differences between MSs in the proportions of strong and weak evidence outbreaks reported in 2011 (Figure OUT2). This may be due to differences between the MSs' specific outbreak investigation and reporting systems, and consequently the type of information available for each outbreak.

Seventeen MSs and two non-MSs reported both strong and weak evidence outbreaks, whereas Bulgaria, the Czech Republic, Greece, Italy, Latvia, Malta and Slovenia reported only weak evidence outbreaks, providing no detailed information on implicated food vehicles, settings or contributing factors. Portugal reported only strong evidence outbreaks.

The MSs reporting the highest proportions of strong evidence outbreaks out of the total outbreaks reported in the country were Denmark, Portugal, Romania and the United Kingdom, where the proportions of these outbreaks were 88.4 %, 100 %, 83.3 % and 74.7 %, respectively (Table OUT2 and Figure OUT2).

Human cases

In the EU, the reported 5,648 outbreaks caused 69,553 human cases, 7,125 hospitalisations (10.2 %) and 93 deaths (case fatalities) (0.13 % out of the reported cases). The 58 outbreaks reported in total by the non-MSs comprised 994 human cases with 43 hospitalisations and no fatalities (Table OUT2).

With regard to the 701 strong evidence outbreaks reported by MSs, a total of 35,869 human cases were involved; of these cases, 3,748 people (10.4 %) were admitted to hospital and 67 people died (0.19 %) (Table OUT2). However, these high numbers of hospitalisations and deaths were influenced by the large enterohaemorrhagic *Escherichia coli* (EHEC) outbreaks occurring in Europe in spring and summer 2011 and affecting 3,793 humans in Germany, with 2,353 hospitalisations and 53 fatalities.

In the non-MSs, Norway and Switzerland, seven strong evidence outbreaks were reported involving 128 human cases with 15 hospitalisations but no fatalities (Table OUT2).

Of the 67 fatalities related to strong evidence outbreaks, 54 were associated with pathogenic *Escherichia coli* (*E. coli*), six with *Salmonella*, four with *Listeria monocytogenes* (*L. monocytogenes*), one with *Campylobacter*, one with *Clostridium botulinum* (*C. botulinum)* toxins and one with mushroom toxins (Table OUT4).

Among the 26 deaths related to the reported weak evidence food-borne outbreaks, 11 were linked to *Clostridium* spp. (three to *C. perfringens* and the remaining to *Clostridia* unspecified), seven to *Salmonella*, four to norovirus, and one each with staphylococcal toxins, *Bacillus* toxins and *L. monocytogenes*, whereas one death was not associated with any particular causative agent.

Table OUT2. Number of all food-borne outbreaks and human cases in the EU, 2011

Country	Total outbreaks	Reporting rate per 100,000	Strong evidence outbreaks				Weak evidence outbreaks			
			N	Human cases			N	Human cases		
				Cases	Hospitalised	Deaths		Cases	Hospitalised	Deaths
Austria	232	2.76	7	166	32	0	225	623	147	0
Belgium	281	2.57	16	393	18	4	265	1,146	39	0
Bulgaria	13	0.17	-	-	-	-	13	100	7	0
Czech Republic	4	0.04	-	-	-	-	4	168	4	0
Denmark	86	1.55	76	1,917	44	0	10	218	1	0
Estonia	13	0.97	2	131	40	0	11	24	14	0
Finland	52	0.97	26	854	8	1	26	298	7	0
France	1,153	1.77	102	916	122	1	1,051	8,758	546	6
Germany	424	0.52	50	4,861	2,476	53	374	1,236	231	1
Greece	8	0.07	-	-	-	-	8	371	33	0
Hungary	174	1.74	20	492	55	1	154	1,139	187	0
Ireland	18	0.40	4	35	9	0	14	85	4	0
Italy	908	1.50	-	-	-	-	908	3,887	-	-
Latvia	51	2.29	-	-	-	-	51	665	193	0
Lithuania	176	5.42	3	70	41	0	173	609	368	0
Malta	60	14.37	-	-	-	-	60	249	16	0
Netherlands	213	1.28	16	112	21	0	197	867	14	0
Poland	493	1.29	109	1,186	392	1	384	5,092	973	12
Portugal	8	0.08	8	101	1	0	-	-	-	-
Romania	6	0.03	5	53	53	0	1	5	5	0
Slovakia	534	9.82	5	123	31	0	529	2,226	424	0
Slovenia	8	0.39	-	-	-	-	8	95	13	4
Spain	424	0.92	165	1,930	182	3	259	3,947	129	3
Sweden	222	2.36	22	20,632	47	0	200	1,549	17	0
United Kingdom	87	0.14	65	1,897	176	3	22	327	5	0
EU Total	**5,648**	**1.12**	**701**	**35,869**	**3,748**	**67**	**4,947**	**33,684**	**3,377**	**26**
Norway	51	1.04	5	116	15	0	46	736	9	0
Switzerland	7	0.09	2	12	0	0	5	130	19	0

Figure OUT1. Reporting rate per 100,000 population in Member States and non-Member States, 2011

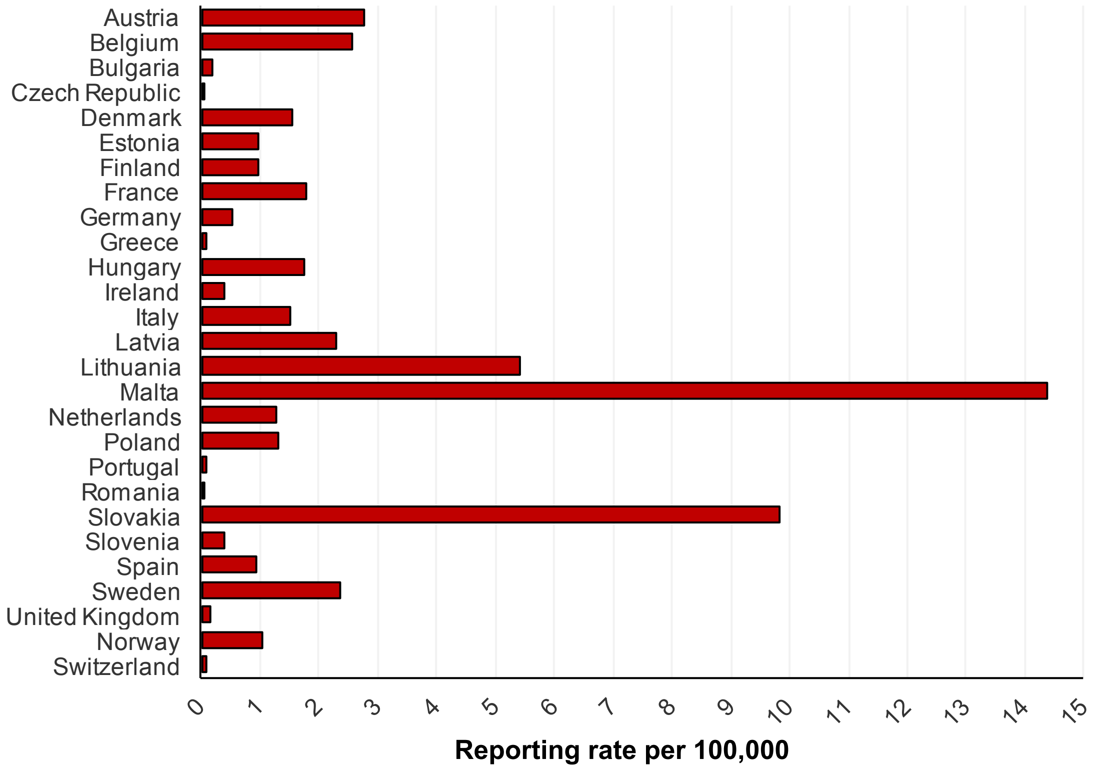
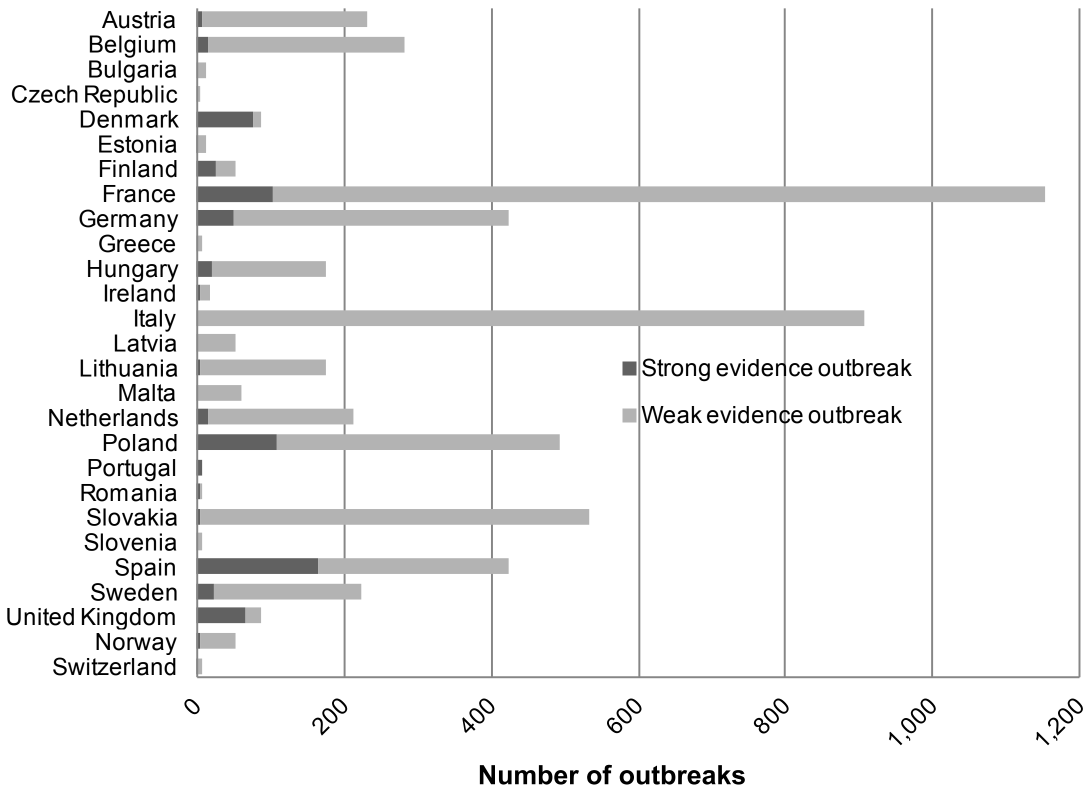


Figure OUT2. Distribution of food-borne outbreaks in Member States and non-Member States, 2011



Causative agents

Within the EU, the causative agent was known in 64.2 % of the total number of outbreaks reported (Table OUT3 and Figure OUT3). *Salmonella* remained the most frequently detected causative agent in the food-borne outbreaks reported (26.6 % of outbreaks), followed by bacterial toxins, *Campylobacter* and viruses, which accounted for 12.9 %, 10.6 % and 9.3 % of the outbreaks, respectively. Other agents each constituted 2.0 % or less of the number of food-borne outbreaks.

The decline in the number of *Salmonella* outbreaks within the EU continued, from 1,888 outbreaks in 2008 to 1,501 outbreaks in 2011. A decrease was also observed since 2009 in the numbers of outbreaks caused by viruses, reducing from 1,043 outbreaks in 2009 to 525 outbreaks in 2011. In contrast, an increase was observed in the number of outbreaks caused by bacterial toxins (from 461 in 2010 to 730 in 2011) and by *Campylobacter* (from 470 in 2010 to 598 in 2011). The number of outbreaks in which the causative agent was unknown continued to increase from 1,380 in 2008 to 2,023 in 2011, representing an increase of 27.8 % compared with 2010 (1,583 outbreaks) (Figure OUT4).

Within the EU, the causative agent of the strong evidence outbreaks was known in 93.2 % of the reported outbreaks (Table OUT4). *Salmonella* was the most frequent causative agent (40.4 % of outbreaks), followed by bacterial toxins, viruses and other causative agents, responsible for 17.0 %, 13.1 % and 12.7 % of outbreaks, respectively. Other agents were each reported in less than 6.0 % of food-borne outbreaks.

Considering each causative agent, the highest proportion of strong evidence outbreaks, out of the total outbreaks, was reported for the group of other causative agents[62] (78.8 %) followed by *E. coli* (27.0 %) and parasites (22.6 %) (Table OUT3 and Figure OUT3).

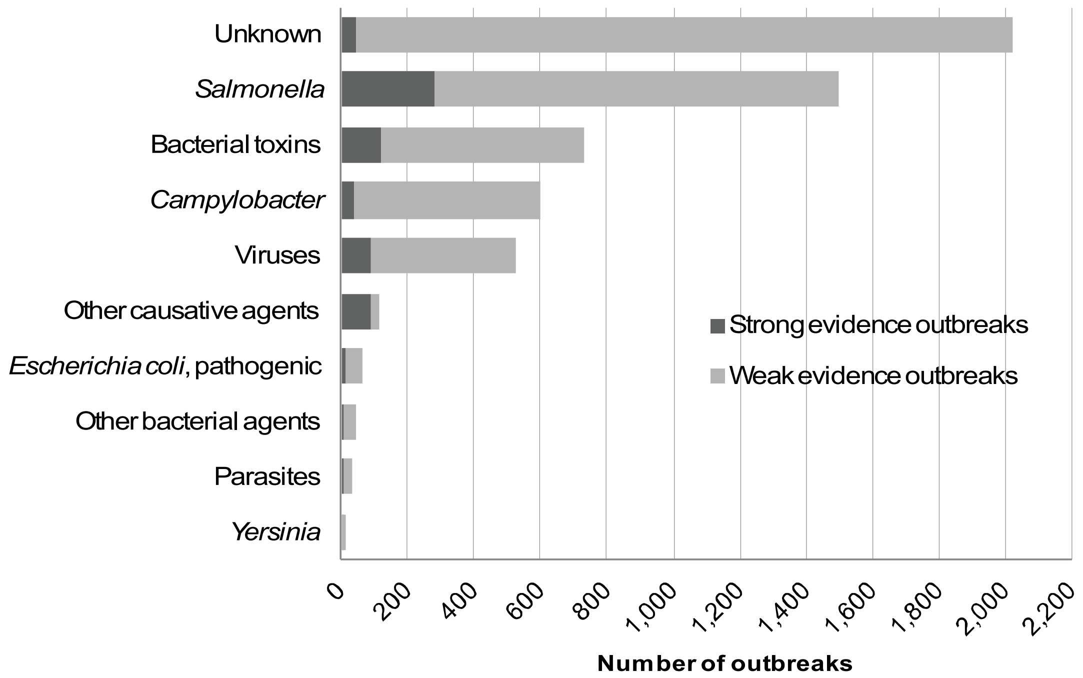
Table OUT3. Causative agents in all food-borne outbreaks in the EU, 2011

Causative agent	Outbreaks			
	N	%	Strong evidence outbreaks (n)	Weak evidence outbreaks (n)
Salmonella	1,501	26.6	283	1,218
Bacterial toxins	730	12.9	119	611
Campylobacter	598	10.6	39	559
Viruses	525	9.3	92	433
Other causative agents	113	2.0	89	24
Escherichia coli, pathogenic	63	1.1	17	46
Other bacterial agents	47	0.8	6	41
Parasites	31	0.5	7	24
Yersinia	17	0.3	1	16
Unknown	2,023	35.8	48	1,975
EU Total	**5,648**	**100**	**701**	**4,947**

Note: Food-borne viruses include calicivirus, hepatitis A virus and other unspecified food-borne viruses. Bacterial toxins include toxins produced by *Bacillus*, *Clostridium* and *Staphylococcus.* Other causative agents include mushroom toxins, marine biotoxins, histamine, mycotoxins, escolar fish (wax esters) and other unspecified agents. Parasites include primarily *Trichinella*, but also *Giardia*, *Cryptosporidium* and *Anisakis.* Other bacterial agents include *Listeria*, *Shigella* and *Brucella.*

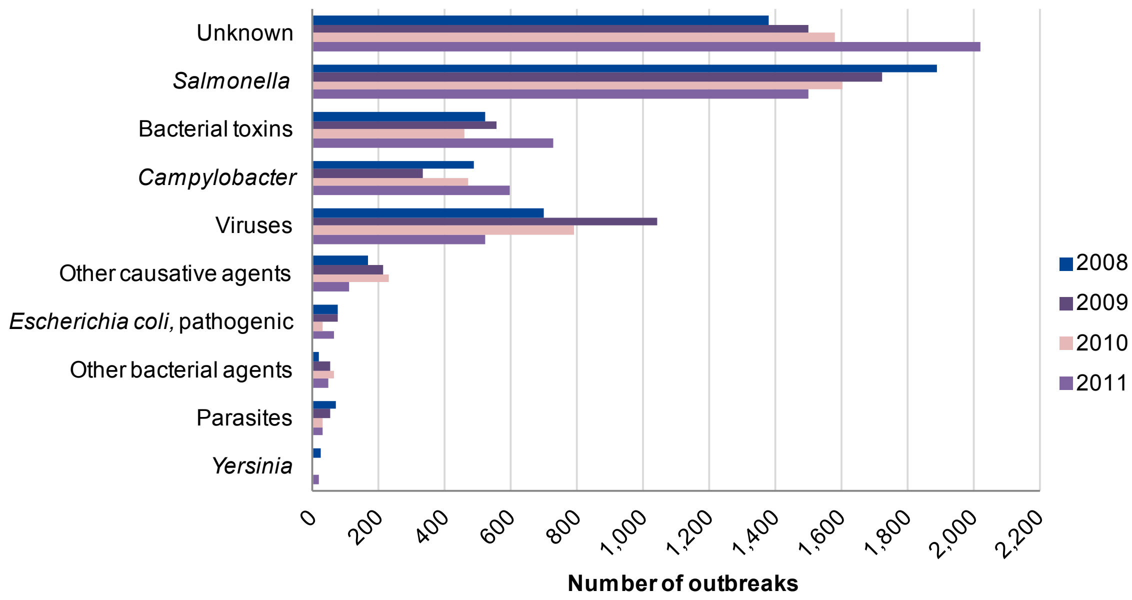
62 Other causative agents include mushroom toxins, marine biotoxins, histamine, mycotoxins, escolar fish (wax esters) and other unspecified agents.

Figure OUT3. Distribution of all food-borne outbreaks per causative agent in the EU, 2011



Note: Food-borne viruses include calicivirus, hepatitis A virus and other unspecified food-borne viruses. Bacterial toxins include toxins produced by *Bacillus*, *Clostridium* and *Staphylococcus.* Other causative agents include mushroom toxins, marine biotoxins, histamine, mycotoxins, escolar fish (wax esters) and other unspecified agents. Parasites include primarily *Trichinella*, but also *Giardia*, *Cryptosporidium* and *Anisakis.* Other bacterial agents include *Listeria*, *Shigella* and *Brucella.*

Figure OUT4. Distribution of all food-borne outbreaks per causative agent in the EU, 2008-2011



Note: Food-borne viruses include calicivirus, hepatitis A virus and other unspecified food-borne viruses. Bacterial toxins include toxins produced by *Bacillus*, *Clostridium* and *Staphylococcus.* Other causative agents include mushroom toxins, marine biotoxins, histamine, mycotoxins, escolar fish (wax esters) and other unspecified agents. Parasites include primarily *Trichinella*, but also *Giardia*, *Cryptosporidium* and *Anisakis.* Other bacterial agents include *Listeria*, *Shigella* and *Brucella.*

Strong evidence outbreaks

In strong evidence outbreaks, outbreaks caused by parasites were responsible for the highest number of human cases, accounting for 55.9 % of the reported cases in all strong evidence outbreaks. However, it should be noted that this is because of one waterborne outbreak caused by *Cryptosporidium*, which involved 20,000 human cases. A substantial number of human cases (more than 4,000) were also reported for *Salmonella* and pathogenic *E. coli* outbreaks. In addition, *E. coli* outbreaks accounted for the majority of hospitalisations (66.8 % of all hospitalised cases) and deaths (80.6 % of all deaths) related to strong evidence outbreaks (Table OUT4).

The highest proportion of hospitalisations, out of the cases caused by each causative agent, was reported in pathogenic *E. coli* outbreaks (58.5 % of the human cases reported in *E. coli* outbreaks), followed by the outbreaks due to other bacterial agents, *Salmonella* and other causative agents (23.6 %, 17.5 % and 17.0 %, respectively). Low proportions of hospitalisations were reported for outbreaks due to viruses, *Campylobacter*, parasites and *Yersinia* (Table OUT4).

Table OUT4. Number of outbreaks and human cases per causative agent in strong evidence food-borne outbreaks (including strong evidence waterborne outbreaks) in the EU, 2011

Causative agent	Strong evidence outbreaks				
	N	%	Human cases		
			Cases	Hospitalised	Deaths
Salmonella	283	40.4	4,662	815	6
Bacterial toxins	119	17.0	2,102	165	1
Viruses	92	13.1	2,536	37	0
Other causative agents	89	12.7	448	76	1
Campylobacter	39	5.6	720	17	1
Escherichia coli, pathogenic	17	2.4	4,275	2,502	54
Other bacterial agents	6	0.9	123	29	4
Parasites	7	1.0	20,037	74	0
Yersinia	1	0.1	7	0	0
Unknown	48	6.8	959	33	0
EU total	**701**	**100**	**35,869**	**3,748**	**67**

Note: Data from 701 outbreaks are included: Austria (7), Belgium (16), Denmark (76), Estonia (2), Finland (26), France (102), Germany (50), Hungary (20), Ireland (4), Lithuania (3), Netherlands (16), Poland (109), Portugal (8), Romania (5), Slovakia (5), Spain (165), Sweden (22) and United Kingdom (65).

Food-borne viruses include calicivirus and hepatitis A virus. Bacterial toxins include toxins produced by *Bacillus*, *Clostridium* and *Staphylococcus.* Other causative agents include mushroom toxins, marine biotoxins, histamine, mycotoxins and escolar fish (wax esters). Parasites include primarily *Trichinella*, but also *Cryptosporidium* and *Anisakis.* Other bacterial agents include *Listeria* and *Shigella*.

According to the reporting specifications, an outbreak is defined as either a household outbreak, in which only members of a single household are affected, or as a general outbreak, in which members of more than one household are affected. Of the 701 strong evidence outbreaks in 2011, 59.6 % were general outbreaks, 25.2 % were household outbreaks and in 15.1 % of outbreaks this information was unknown. The reporting and investigation systems in some MSs do not cover household outbreaks at all.

Types of evidence supporting the outbreaks

Types of evidence supporting the strong evidence outbreaks are summarised here below.

Epidemiological evidence
- Descriptive epidemiological evidence
- Analytical epidemiological evidence

Microbiological evidence
- Detection in food vehicle or its component and Detection of indistinguishable causative agent in humans
- Detection in food chain or its environment and Detection of indistinguishable causative agent in humans
- Detection in food vehicle or its component and Symptoms and onset of illness pathognomonic of the causative agent found in food vehicle or its component or in food chain or its environment
- Detection in food chain or its environment and Symptoms and onset of illness pathognomonic of the causative agent found in food vehicle or its component or in food chain or its environment

The types of evidence reported for the strong evidence outbreaks, including strong evidence waterborne outbreaks, are presented in Table OUT5.

The causative agent was detected both from the food vehicle or food chain and from the human cases in 27.0 % of strong evidence outbreaks. The agent was detected in the food vehicle or food chain in combination with observed symptoms pathognomonic of the causative agent in 23.3 % of outbreaks. Analytical epidemiological evidence supported the link between human cases and food vehicles in 37.4 % of strong evidence outbreaks and convincing descriptive epidemiological evidence was reported in 39.7 % of strong evidence outbreaks.

In 197 strong evidence outbreaks (28.1 % of all strong evidence outbreaks) reported by MSs, descriptive epidemiological evidence was the only supporting evidence, including 59 outbreaks in which the causative agent was *Salmonella*, 43 outbreaks in which the causative agents were viruses, 33 outbreaks due to histamine, 16 outbreaks due to *Campylobacter* and four outbreaks due to pathogenic *E. coli*. Fifty-one strong evidence outbreaks were supported only by detection of the causative agent in the food chain or its environment in combination with detection in humans or pathognomonic symptoms in human cases and in one outbreak by a combination of descriptive epidemiological evidence, detection of the causative agent in the food chain or its environment and pathognomonic symptoms.

The detection of the causative agent in the food chain or its environment and descriptive epidemiological evidence could be used for the first time in 2010 to support the designation of outbreaks for which more detailed data should be reported. These evidence categories were used alone in approximately one-third (35.4 %) of the strong evidence outbreaks, as was the case in 2010. Interestingly, some MSs used these new evidence categories (alone) more than others to support the outbreak reports (Table OUT5).

Food vehicle

In 2011, the majority of the strong evidence outbreaks were associated with foodstuffs of animal origin (Figure OUT5). As in previous years, the most common single foodstuff category reported as food vehicle was eggs and egg products, responsible for 150 (21.4 %) outbreaks. Mixed foods were the next most common single category (13.7 %), followed by fish and fish products (10.1 %), crustaceans, shellfish, molluscs and products thereof (6.0 %), and vegetables, juices and products thereof (5.3 %). It should be noted that the food category ‘Mixed food’ was previously used combined with the category ‘Buffet meals’ in the unique category ‘Mixed and buffet meals’; the separation into two different categories was made for the 2011 data reporting. The proportion of the two categories counted together increased from 13.9 % in 2010 to 17.8 % in 2011. An increase was also observed in the number of outbreaks associated with fish and fish products and sweets and chocolate. In contrast, decreasing numbers of outbreaks linked to vegetables, crustaceans, shellfish, molluscs and products thereof, and bakery products were reported.

The food vehicle was reported in all 701 strong evidence outbreaks, even though in 28 outbreaks (4.0 %) it was reported as 'Other food' and no additional information was provided. Nonetheless this confirms an improvement in the detail of the data submitted using the new reporting specifications.

Setting

The setting of the outbreak was provided in 97.6 % of strong evidence outbreaks (Figure OUT6). The setting 'restaurant, café, pub, bar, hotel' increased from 30.8 % in 2010 to 34.4 % in 2011, replacing 'household/domestic kitchen' (32.7 %) as the most commonly reported setting. Apart from restaurants and households, the most common settings in strong evidence outbreaks were canteen or workplace catering (5.7 %) and school, kindergarten (4.4 %). Disseminated cases were reported in only 2.7 % of outbreaks, but accounted for the majority of human cases (68.2 %). However, it is important to note that this group comprises the two biggest strong evidence outbreaks: the *Cryptosporidium* waterborne outbreak involving 20,000 cases (55.8 % of the total cases), and the German pathogenic *E. coli* outbreak with 3,793 cases (10.6 %).

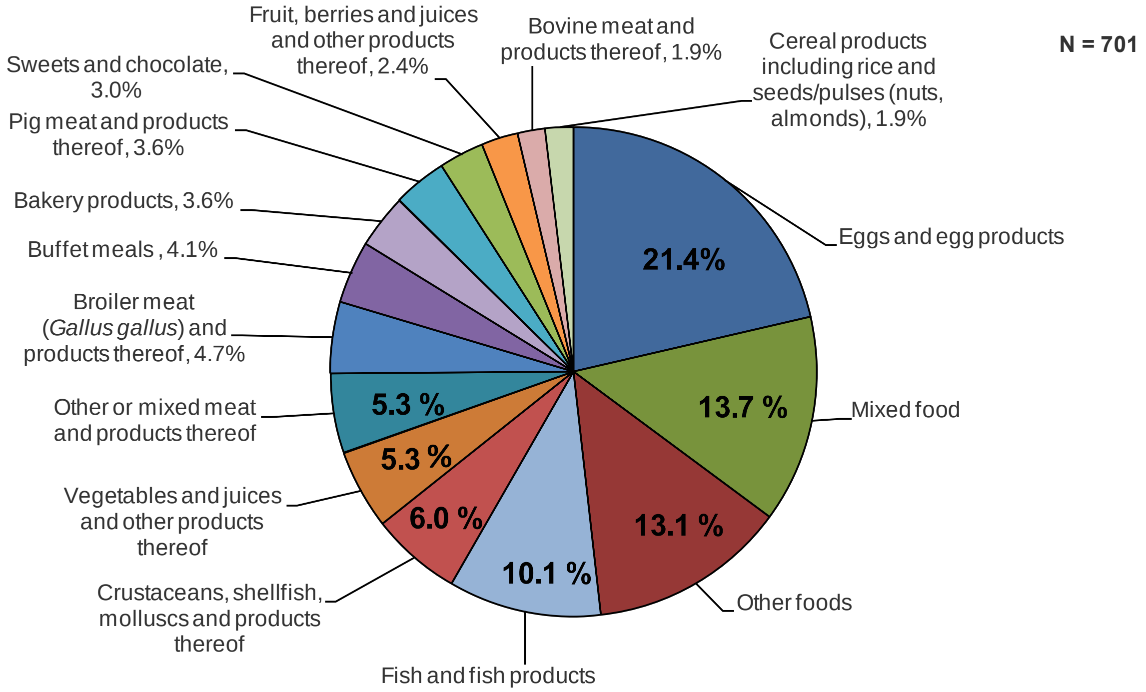
Table OUT5. Evidence in strong evidence food-borne outbreaks (including strong evidence waterborne outbreaks) in the EU, 2011

Country	N	Analytical epidemiological evidence	Descriptive epidemiological evidence (this evidence alone)	Detection of causative agent in food vehicle or its component - Detection of indistinguishable causative agent in humans	Detection of causative agent in food chain or its environment - Detection of indistinguishable causative agent in humans (this evidence alone)	Detection of causative agent in food vehicle or its component - Symptoms and onset of illness pathognomonic of causative agent	Detection of causative agent in food chain or its environment - Symptoms and onset of illness pathognomonic of causative agent (this evidence alone)
Austria	7	2	-	6	-	-	-
Belgium	16	-	2 (2)	1	2 (2)	11	-
Denmark	76	23	57 (36)	21	-	-	-
Estonia	2	-	2 (2)	-	-	-	-
Finland	26	8	26 (6)	8	-	7	-
France	102	-	48 (48)	9	38 (38)	7	-
Germany	50	4	16 (16)	11	9 (6)	12	2 (2)
Hungary	20	7	1 (1)	4	1 (1)	6	1 (1)
Ireland	4	1	4	3	-	-	-
Lithuania	3	3	3	-	-	-	-
Netherlands	16	2	1 (1)	3	-	10	-
Poland	109	36	61 (35)	53	1	55	2
Portugal	8	-	1 (1)	-	-	7	-
Romania	5	-	-	2	-	3	-
Slovakia	5	1	-	4	-	-	-
Spain	165	153	-	-	-	33	-
Sweden	22	-	13 (13)	3	1 (1)	5	-
United Kingdom	65	22	43 (36)	9	-	1	1
EU Total	**701**	**262**	**278 (197)**	**137**	**52 (48)**	**157**	**6 (3)**
Norway	5	3	-	-	-	2	-
Switzerland	2	-	1 (1)	-	1	-	-

Note: The evidence types 'Detection of causative agent in food chain or its environment - Detection of indistinguishable causative agent in humans' and 'Descriptive epidemiological evidence' were not reported together.

More than one type of evidence can be reported per outbreak.

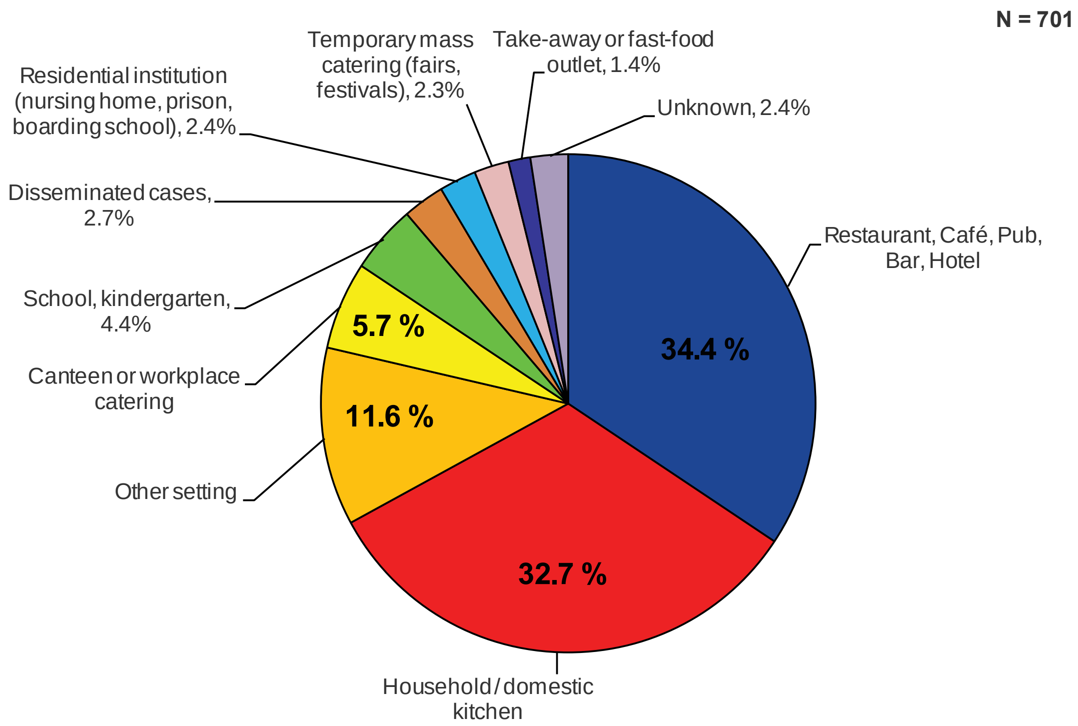
Figure OUT5. Distribution of strong evidence outbreaks by food vehicle in the EU, 2011



Note: Data from 701 outbreaks are included: Austria (7), Belgium (16), Denmark (76), Estonia (2), Finland (26), France (102), Germany (50), Hungary (20), Ireland (4), Lithuania (3), Netherlands (16), Poland (109), Portugal (8), Romania (5), Slovakia (5), Spain (165), Sweden (22) and United Kingdom (65).

Other foods (N = 92) include: canned food products (1), cheese (8), dairy products (other than cheeses) (12), drinks (1), herbs and spices (4), milk (6), tap water (11) and other foods (49).

Figure OUT6. Distribution of strong evidence outbreaks by settings in the EU, 2011



Note: Data from 701 outbreaks are included: Austria (7), Belgium (16), Denmark (76), Estonia (2), Finland (26), France (102), Germany (50), Hungary (20), Ireland (4), Lithuania (3), Netherlands (16), Poland (109), Portugal (8), Romania (5), Slovakia (5), Spain (165), Sweden (22) and United Kingdom (65).

Other settings (N = 81) include: aircraft, ship, train (4), camp, picnic (4), mobile retailer, market/street vendor (5), hospital/medical care facility (7), at hospital or care home (6), farm (primary production) (3) and other settings (52).

Detailed information on causative agents in selected food vehicles

The following section provides a more detailed view of different food vehicles identified in the outbreaks and shows the distribution of the causative agents related to strong evidence outbreaks caused by eggs and egg products (Figure OUT7); mixed foods (Figure OUT8); fish and fish products (Figure OUT9); crustaceans, shellfish, molluscs and products thereof (Figure OUT10); food of non-animal origin (Figure OUT11); and vegetables (Figure OUT12).

Egg and egg products were implicated in 150 outbreaks, of which 95.3 % were caused by *Salmonella* spp. (Figure OUT7). The majority of these outbreaks were associated with *S*. Enteritidis (72.0 %), as in previous years. Three outbreaks were caused by bacterial toxins (two by *Bacillus* and one by staphylococcal toxins). In addition, one calicivirus outbreak was attributed to eggs and egg products.

Mixed foods were implicated in 96 outbreaks. *Salmonella* and calicivirus were the most frequently detected causative agents in these outbreaks (21.9 % and 18.8 %, respectively), followed by the bacterial toxins of *C. perfringens* (14.6 %), *Staphylococcus* (14.6 %) and *Bacillus* (12.5 %) (Figure OUT8). In 7.3 % of cases the causative agent was unknown.

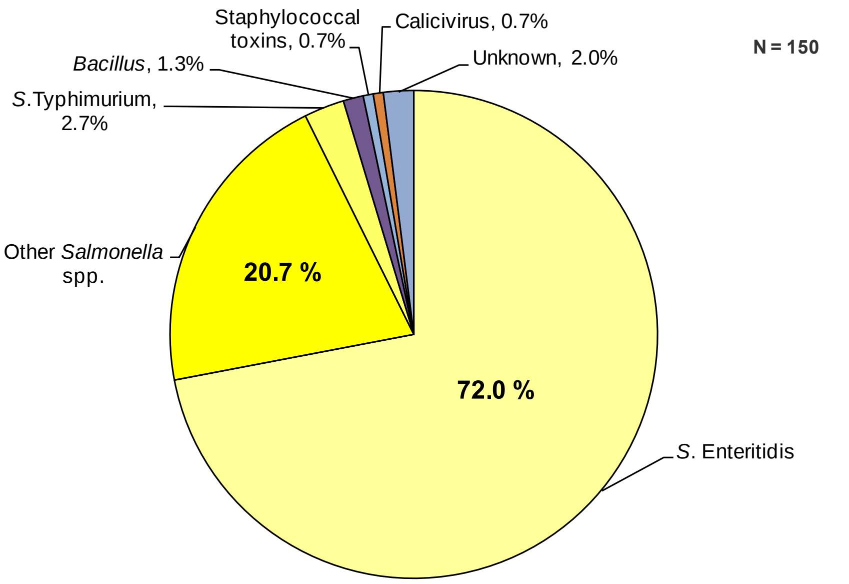
In 2011, fish and fish products were implicated in 71 outbreaks (Figure OUT9). The majority of these outbreaks were caused by histamine (56 outbreaks, 78.9 %). Other reported causative agents were *Salmonella* and marine biotoxins, and in 8.5 % of outbreaks the agent was not identified.

In 2011, there were 42 outbreaks attributed to crustaceans, shellfish, molluscs and products thereof (Figure OUT10). The majority were caused by calicivirus (40.5 %), followed by marine biotoxins (16.7 %). A relevant percentage of outbreaks was reported with unknown causative agent (28.6 %).

Food of non-animal origin was reported as the food vehicle in 80 strong evidence outbreaks (Figure OUT11). This category includes: cereal products including rice and seeds/pulses; drinks; fruit, berries and juices and other products thereof; herbs and spices; and vegetables and juices and other products thereof. In addition, some outbreaks related to mixed foods or other foods were included when it was clearly indicated that the food vehicle was of non-animal origin (e.g. vegetarian dishes, rice with vegetables). Ten outbreaks due to mushroom toxins were not included as the type of food vehicle was not clearly described. Viruses and *Bacillus* were the most frequently detected causative agents (28.8 % and 22.5 %, respectively) in the food of non-animal origin outbreaks, followed by *Salmonella* (15.0 %), mycotoxins (7.5 %) and pathogenic *E. coli* (7.5 %).

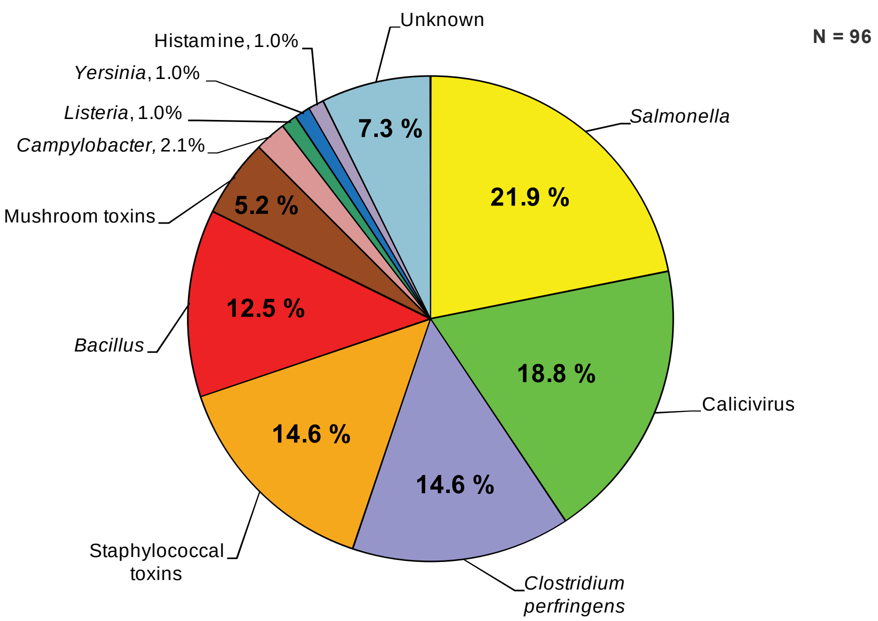
In 2011, vegetables were implicated in 37 outbreaks (Figure OUT12). The causative agents were primarily *Salmonella* (21.6 %), pathogenic *E. coli* (18.9 %) and viruses (16.2 %). Mycotoxins and bacterial toxins were quite frequently reported. Five outbreaks were related to sprouts, including the EHEC outbreak that occurred in Germany and the linked outbreaks in Denmark, France and the Netherlands due to fenugreek sprouts or seeds. In addition, a *S*. Newport outbreak was reported related to bean sprouts.

Figure OUT7. Distribution of strong evidence outbreaks caused by eggs and egg products by causative agent in the EU, 2011[8]



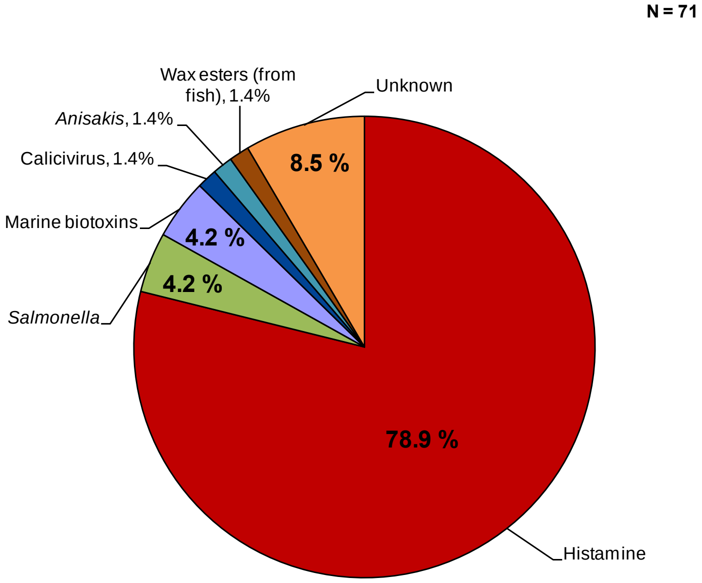
Note: Data from 150 outbreaks are included: Austria (1), France (11), Germany (2), Hungary (3), Poland (57), Slovakia (3), Spain (70) and United Kingdom (3).

Figure OUT8. Distribution of strong evidence outbreaks caused by mixed foods by causative agent in the EU, 2011



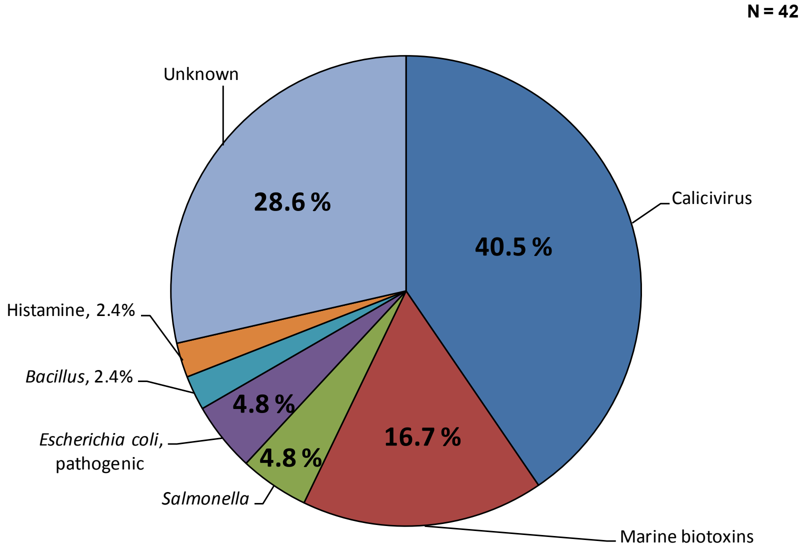
Note: Data from 96 outbreaks are included: Belgium (5), Denmark (26), France (6), Germany (12), Hungary (5), Ireland (1), Lithuania (2), Netherlands (2), Poland (8), Portugal (5), Romania (1), Spain (7), Sweden (2) and United Kingdom (14).

Figure OUT9. Distribution of strong evidence outbreaks caused by fish and fish products by causative agent in the EU, 2011



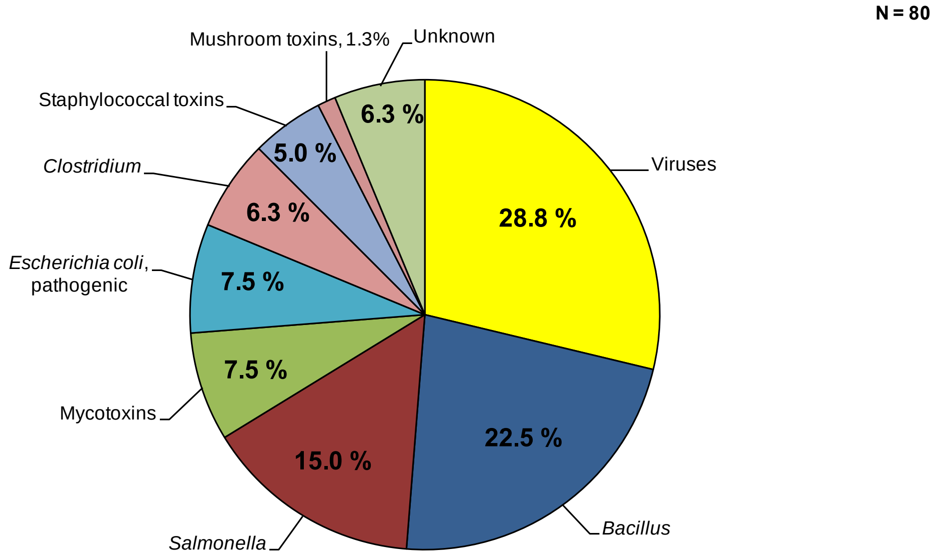
Note: Data from 71 outbreaks are included: Belgium (1), Denmark (5), France (34), Germany (3), Poland (1), Spain (19), Sweden (6) and United Kingdom (2).

Figure OUT10. Distribution of strong evidence outbreaks caused by crustaceans, shellfish, molluscs and products thereof by causative agent in the EU, 2011



Note: Data from 42 outbreaks are included: Austria (1), Denmark (1), France (14), Netherlands (3), Spain (15), Sweden (3) and United Kingdom (5).

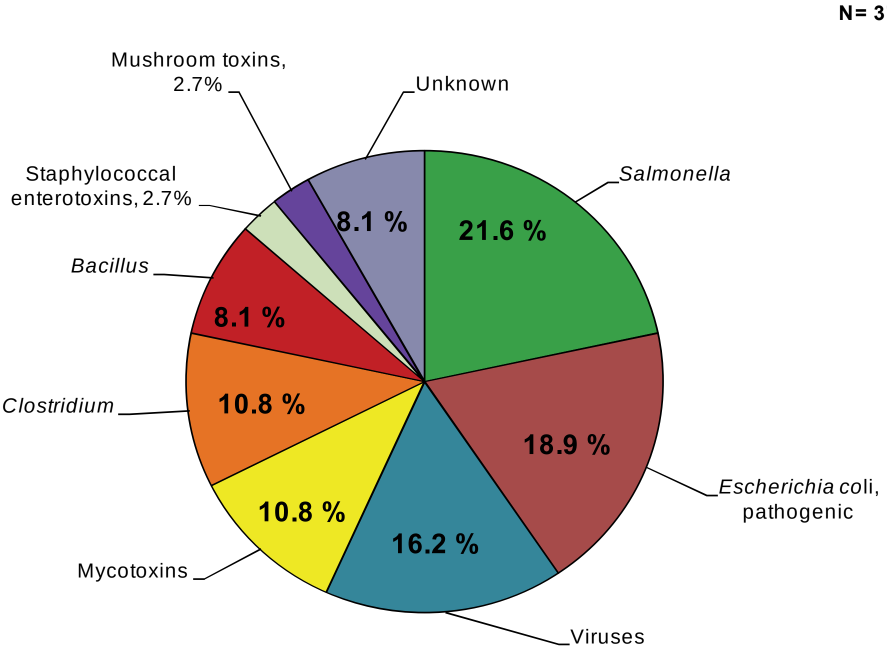
Figure OUT11. Distribution of strong evidence outbreaks caused by food of non-animal origin by causative agent in the EU, 2011



Note: Data from 80 outbreaks are included: Belgium (1), Denmark (24), Finland (9), France (5), Germany (12), Hungary (1), Netherlands (3), Poland (4), Portugal (1), Spain (8), Sweden (6) and United Kingdom (6).

Food of non-animal origin includes: cereal products including rice and seeds/pulses (nuts, almonds) (13), drinks (1), fruit, berries and juices and other products thereof (17), herbs and spices (4), vegetables and juices and other products thereof (37), mixed food (6), and other foods (2). For the last two categories, the outbreaks were included only when it was clearly stated that the food vehicle was of non-animal origin.

Figure OUT12. Distribution of strong evidence outbreaks caused by vegetables by causative agent in the EU, 2011



Note: Data from 37 outbreaks are included: Belgium (1), Denmark (7), Finland (2), France (2), Germany (5), Hungary (1), Netherlands (2), Poland (4), Spain (8), Sweden (1) and United Kingdom (4).

4.2. *Salmonella*

In 2011, 24 MSs reported a total of 1,501 food-borne outbreaks of human salmonellosis, which constituted 26.6 % of the total number of reported outbreaks of food-borne illness in the EU (Table OUT3). This represents a decrease of 6.4 % compared with 2010 (1,604 outbreaks). Within the EU, the majority of *Salmonella* outbreaks (88.5 %) were reported by Austria, France, Germany, Hungary, Italy, Poland, Slovakia and Spain. The overall reported incidence was 0.30 outbreaks per 100,000 population, ranging from <0.01 per 100,000 population in Romania to 4.91 per 100,000 population in Slovakia. Norway and Switzerland reported one outbreak each (Table OUT6).

The annual total number of *Salmonella* outbreaks within the EU has decreased markedly during recent years and this reduction continued in 2011. From 2008 to 2011, the total number of *Salmonella* outbreaks decreased by 20.5 %, from 1,888 to 1,501 outbreaks. This reduction parallels the general decline in notified human salmonellosis cases observed within the EU over the same period.

In total, 15 MSs reported 283 *Salmonella* outbreaks supported by strong evidence. These were mainly reported by Spain and Poland, which accounted for 67.5 % of strong *Salmonella* outbreaks (33.9 % and 33.6 %, respectively). No strong evidence *Salmonella* outbreaks were reported by non-MSs.

As in previous years, *Salmonella* Enteritidis (*S.* Enteritidis) was the predominant serovar associated with the *Salmonella* outbreaks, accounting for 67.1 % of all strong evidence *Salmonella* outbreaks and 66.0 % of human cases involved in these outbreaks.

S. Typhimurium was associated with 10.2 % of the strong evidence *Salmonella* outbreaks and 16.9 % of human cases involved in these. For 17.0 % of strong evidence outbreaks caused by *Salmonella*, the serovar was not reported or unknown.

In 2011, **Poland** reported 18 strong evidence *S.* Enteritidis outbreaks linked to consumption of sweets and chocolate, but no more detailed information was provided on the food vehicle involved. In total these outbreaks accounted for 178 human cases and 60 hospitalisations and no fatal cases were reported. Fourteen out of 18 were general outbreaks and four were reported as household outbreaks. In all but one of these outbreaks, the food originated from the domestic market. Epidemiological evidence (descriptive in four cases outbreaks and analytical in eight outbreaks) was the only evidence supporting two-thirds of the outbreaks; in the other outbreaks the pathogen was detected both in the food vehicle and from the human cases. The setting most frequently reported was household/domestic kitchen (in nine outbreaks).

Ireland reported an outbreak due to *S.* Heidelberg that accounted for ten human cases out of which two were hospitalised. The cases were linked to mixed food consumed in aircraft, ships or trains. This outbreak was part of an international outbreak accounting for, in total, 24 cases and five hospitalisations in other EU countries as well as in Canada and the United States.

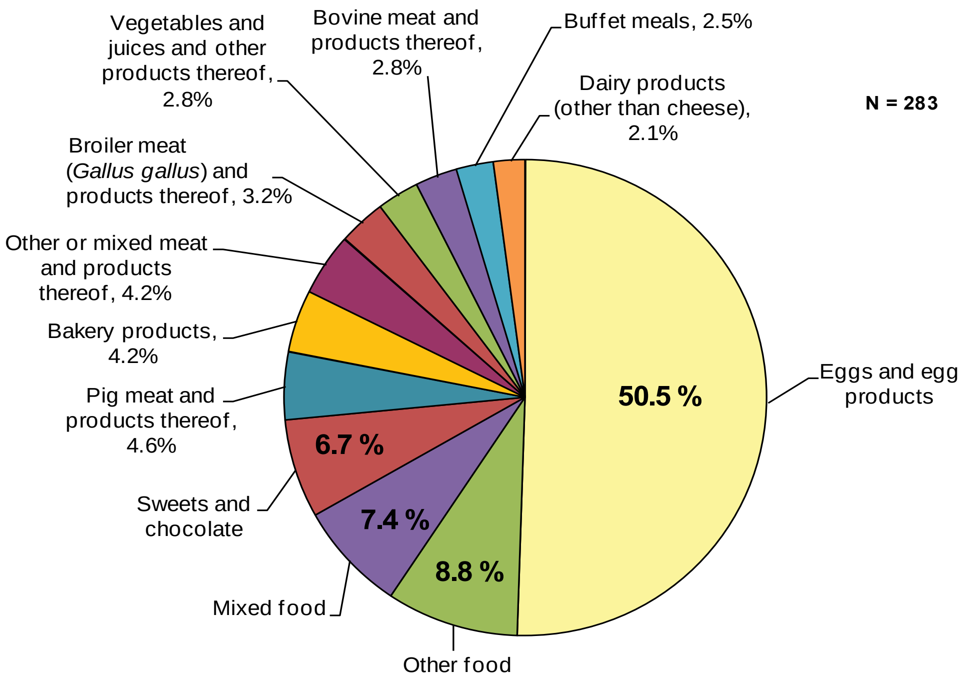
Table OUT6. Strong and weak evidence food-borne outbreaks caused by **Salmonella** *in the EU, 2011*

Country	Total outbreaks		Strong evidence outbreaks				Weak evidence outbreaks			
	N	Reporting rate per 100,000	N	Human cases			N	Human cases		
				Cases	Hospitalised	Deaths		Cases	Hospitalised	Deaths
Austria	100	1.19	5	81	28	0	95	272	87	0
Belgium	2	0.02	-	-	-	-	2	7	2	0
Bulgaria	1	0.01	-	-	-	-	1	2	2	0
Czech Republic	4	0.04	-	-	-	-	4	168	4	0
Denmark	6	0.11	5	121	0	0	1	4	0	0
Estonia	9	0.67	2	131	40	0	7	16	7	0
Finland	2	0.04	1	15	3	0	1	2	1	0
France	154	0.24	17	102	23	1	137	940	131	1
Germany	198	0.24	20	693	106	0	178	678	170	0
Greece	3	0.03	-	-	-	-	3	46	28	0
Hungary	111	1.11	10	248	31	0	101	614	122	0
Ireland	4	0.09	1	10	2	0	3	17	2	0
Italy	132	0.22	-	-	-	-	132	539	-	-
Latvia	16	0.72	-	-	-	-	16	276	71	0
Lithuania	67	2.06	2	27	12	0	65	226	142	0
Malta	6	1.44	-	-	-	-	6	28	5	0
Netherlands	16	0.10	5	74	13	0	11	33	5	0
Poland	177	0.46	95	1,059	289	1	82	714	187	0
Romania	1	<0.01	-	-	-	-	1	5	5	0
Slovakia	267	4.91	5	123	31	0	262	1,003	211	0
Slovenia	5	0.24	-	-	-	-	5	39	7	4
Spain	190	0.41	96	1,271	164	3	94	946	106	2
Sweden	11	0.12	4	154	0	0	7	113	2	0
United Kingdom	19	0.03	15	553	73	1	4	44	2	0
EU Total	**1,501**	**0.30**	**283**	**4,662**	**815**	**6**	**1,218**	**6,732**	**1,299**	**7**
Norway	1	0.02	-	-	-	-	1	3	3	0
Switzerland	1	0.01	-	-	-	-	1	90	19	0

Detailed information from strong evidence *Salmonella* outbreaks

Figure OUT13 shows the distribution of the most common food vehicles implicated in the strong evidence *Salmonella* outbreaks in 2011. As in previous years, eggs and egg products were the most frequently identified food vehicles, associated with 50.5 % of these outbreaks. The proportion of strong evidence *Salmonella* outbreaks implicating contaminated eggs and egg products was higher than in 2010 (43.7 %) and previous years (49.1 %, 40.8 % and 42.0 % in 2009, 2008 and 2007, respectively). However, the number of *Salmonella* outbreaks due to eggs decreased from 159 in 2009, 149 in 2010 to 143 in 2011, and most of the outbreaks in 2011 were mainly reported by two MSs (Poland and Spain). The next most commonly implicated single food vehicle category in the *Salmonella* outbreaks was mixed food (7.4 % of strong evidence outbreaks), followed, interestingly, by sweets and chocolate (6.7 %). Most of the outbreaks associated with the last food vehicle category were reported by a single MS (Poland). A decrease was observed both in the proportion and in the numbers of outbreaks related to bakery products, from 14.4 % (48 outbreaks) in 2010 to 4.2 % in 2011 (12 outbreaks). In addition, the proportion and number of outbreaks linked to different types of meat (bovine meat, broiler meat, pig meat) decreased compared with 2010, in particular for outbreaks associated with broiler meat, from 5.3 % in 2010 (18 outbreaks) to 3.2 % in 2011 (nine outbreaks); for outbreaks associated with bovine meat, from 4.7 % in 2010 (16 outbreaks) to 2.8 % in 2011 (eight outbreaks); and for outbreaks associated with pig meat, from 5.3 % in 2010 (17 outbreaks) to 4.6 % in 2011 (13 outbreaks).

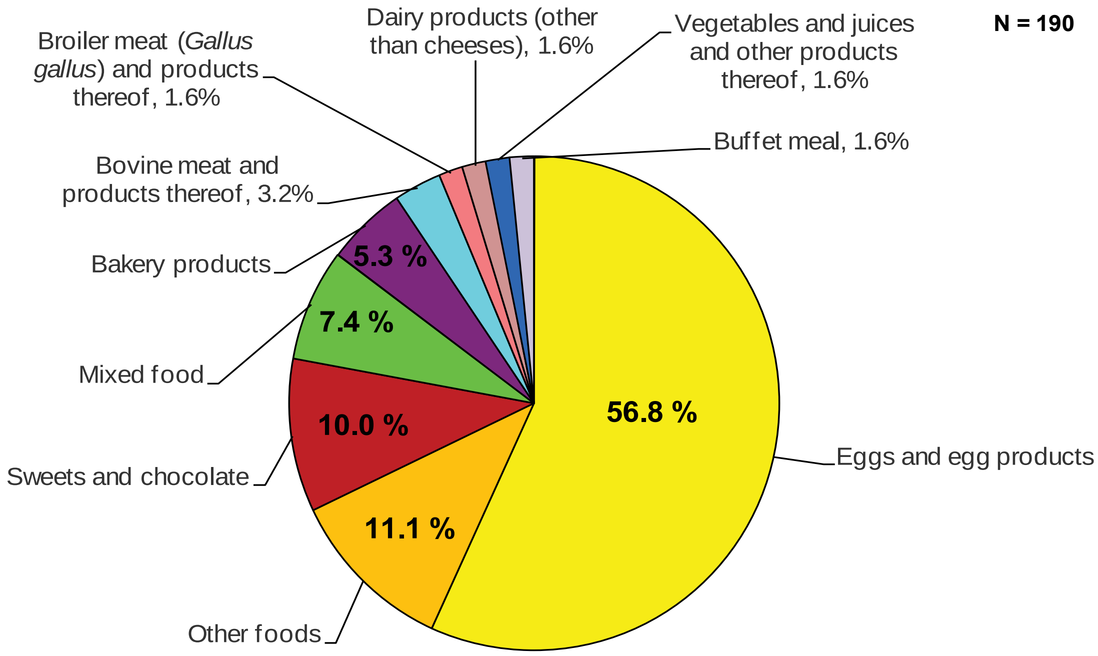
Figure OUT13. Distribution of food vehicles in strong evidence outbreaks caused by* Salmonella *in the EU, 2010



Note: Data from 283 outbreaks are included: Austria (5), Denmark (5), Estonia (2), Finland (1), France (17), Germany (20), Hungary (10), Ireland (1), Lithuania (2), Netherlands (5), Poland (95), Slovakia (5), Spain (96), Sweden (4) and United Kingdom (15).

Other foods (N = 25) include: cheese (3), cereals products including rice and seeds/pulses (nuts, almonds) (2), crustaceans, shellfish, molluscs and products thereof (2), fish and fish products (3), fruits and juices and other products thereof (1), and other foods (14).

Figure OUT14. Distribution of food vehicles in strong evidence outbreaks caused by* S. *Enteritidis in the EU, 2011

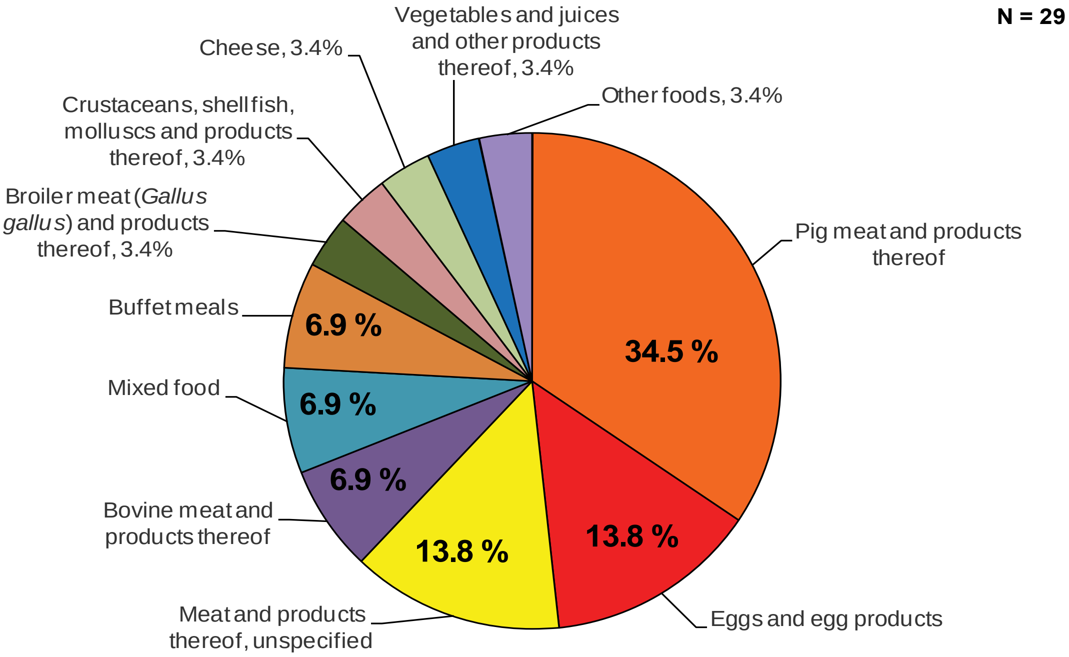


Note: Data from 190 outbreaks are included: Austria (1), Denmark (1), Estonia (2), France (5), Germany (13), Hungary (8), Lithuania (2), Netherlands (2), Poland (94), Slovakia (4), Spain (48), Sweden (1) and United Kingdom (9)

Other foods (N = 21) include: cereal products including rice and seed/pulses (nuts, almonds) (1), fish and fish products (2), meat and product thereof, unspecified (3), other, mixed or unspecified poultry meat (2), other or mixed red meat and products thereof (1), pig meat and products thereof (2), turkey meat and products thereof (1), and other foods (9).

In 2011, 190 outbreaks, in total, with strong evidence, were caused by *S*. Enteritidis. Most of these outbreaks were attributed to eggs and egg products (108 strong evidence *S.* Enteritidis outbreaks), showing an increase compared with 2010 (49.0 %). The second single food category reported was sweets and chocolate, involved in 19 *S*. Enteritidis outbreaks, while no such outbreaks were reported in 2010. The next most common implicated food categories in *S*. Enteritidis outbreaks were mixed food (7.4 %) and bakery products (5.3 %), the latter decreasing by 14.2 % compared with 2010 data (Figure OUT14).

Figure OUT15. Distribution of food vehicles in strong evidence outbreaks caused by* S. *Typhimurium in the EU, 2011



Note: Data from 29 outbreaks are included: Austria (2), Denmark (2), France (4), Germany (4), Hungary (2), Netherlands (1), Poland (1), Slovakia (1), Spain (7) and United Kingdom (5).

In total, 29 strong evidence outbreaks were caused by *S*. Typhimurium (Figure OUT15). The food vehicle most frequently reported was pig meat and products thereof (10 outbreaks). Other important vehicles were eggs and egg products and meat and products thereof, unspecified, each reported in four outbreaks. Germany reported three outbreaks due to monophasic *S*. Typhimurium; all were related to consumption of pig meat.

The type of outbreak was reported in 93.3 % of *Salmonella* outbreaks: altogether 55.5 % (157) were classified as general and 37.8 % (107) as household outbreaks. Household was also reported as the main setting of these outbreaks (49.8 %), followed by restaurant, café, pub, bar, hotel (24.7 %). No specific information on setting was provided in 8.1 % of the outbreaks.

4.3. *Campylobacter*

Within the EU, 16 MSs reported a total of 596 food-borne *Campylobacter* outbreaks (Table OUT7), excluding two strong evidence waterborne outbreaks (Table OUT17). This represents 10.6 % of the total reported food-borne outbreaks in the EU and an increase of 26.8 % compared with 2010 (470 outbreaks). This increase is mainly because Slovakia reported 193 outbreaks in 2011 compared with 98 in 2010. The overall reporting rate in the EU was 0.12 per 100,000 population, similar to that reported in 2010 (0.10). Austria, Germany and Slovakia reported 75.7 % of the total number of *Campylobacter* outbreaks. In addition, Norway reported five outbreaks.

Only 37 (6.2 %) *Campylobacter* outbreaks were classified as strong evidence outbreaks, and these outbreaks were reported primarily by the United Kingdom and France. One fatal case was reported out of the 646 human cases related to these outbreaks. No strong evidence outbreaks were reported by non-MSs.

Table OUT7. Strong and weak evidence food-borne outbreaks caused by* Campylobacter *(excluding strong evidence waterborne outbreaks) in the EU, 2011

Country	Total outbreaks		Strong evidence outbreaks				Weak evidence outbreaks			
	N	Reporting rate per 100,000	N	Human cases			N	Human cases		
				Cases	Hospitalised	Deaths		Cases	Hospitalised	Deaths
Austria	116	1.38	-	-	-	-	116	256	49	0
Belgium	4	0.04	1	4	0	0	3	35	1	0
Denmark	1	0.02	-	-	-	-	1	14	0	0
Estonia	2	0.15	-	-	-	-	2	4	4	0
France	35	0.05	11	64	8	0	24	82	12	0
Germany	142	0.17	6	71	2	0	136	356	33	0
Hungary	19	0.19	-	-	-	-	19	41	2	0
Italy	19	0.03	-	-	-	-	19	102	-	-
Lithuania	5	0.15	-	-	-	-	5	16	6	-
Malta	12	2.87	-	-	-	-	12	25	5	0
Netherlands	15	0.09	-	-	-	-	15	68	0	0
Poland	1	<0.01	-	-	-	-	1	3	0	0
Slovakia	193	3.55	-	-	-	-	193	463	59	0
Sweden	4	0.04	1	13	1	0	3	10	2	0
Spain	6	0.01	1	13	1	0	5	34	1	0
United Kingdom	22	0.04	17	481	5	1	5	70	0	0
EU Total	**596**	**0.12**	**37**	**646**	**17**	**1**	**559**	**1,579**	**174**	**0**
Norway	5	0.10	-	-	-	-	5	60	3	0

Detailed information from strong evidence *Campylobacter* outbreaks

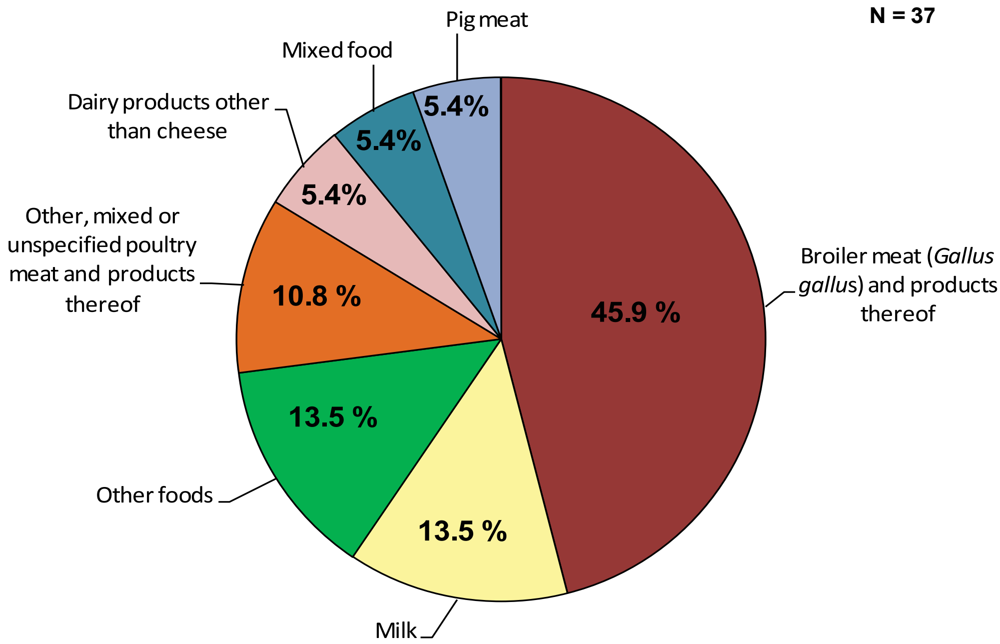
Of the 37 strong evidence *Campylobacter* outbreaks, 25 were categorised as general outbreaks and one as a household outbreak. No information was provided for the remaining 11 outbreaks.

Broiler meat was the most commonly implicated food vehicle in the *Campylobacter* outbreaks, accounting for 17 outbreaks (45.9 %) and affecting 61.0 % of human cases (Figure OUT16). Twelve of the outbreaks associated with broiler meat were reported by the United Kingdom, four by France and one by Belgium. The second most commonly reported food vehicle was milk (five outbreaks); in three outbreaks the milk was raw or insufficiently heated, and in the other two outbreaks the milk was pasteurised. Out of the four outbreaks linked to the consumption of other, mixed or unspecified poultry meat and products thereof, two were related to consumption of duck liver pâté.

The type of outbreak was reported for 27 of these *Campylobacter* outbreaks: 26 were general, while one was a household outbreak. In 34 outbreaks the setting was identified: the most frequently reported was restaurant, café, pub, bar, hotel (19 outbreaks), followed by household/domestic kitchen (eight outbreaks). It is interesting that farm was the setting reported in the three outbreaks linked to the consumption of raw milk.

In addition, two waterborne outbreaks attributable to *Campylobacter* spp. were reported (Table OUT17).

Figure OUT16. Distribution of food vehicles in strong evidence* Campylobacter *outbreaks (excluding strong evidence waterborne outbreaks) in the EU, 2011



Note: Data from 37 outbreaks are included: Belgium (1), France (11), Germany (6), Spain (1), Sweden (1) and United Kingdom (17). Other foods (N = 5) include: bovine meat (1), cheese (1), meat and meat products (1), and other foods (2).

4.4. Verotoxigenic *Escherichia coli* and other pathogenic *Escherichia coli*

Twelve MSs reported a total of 60 food-borne outbreaks caused by human pathogenic *Escherichia coli* (*E. coli*) (Table OUT8), excluding three strong waterborne outbreaks (Table OUT17). This represents 1.1 % of the total number of reported food-borne outbreaks in the EU and an increase of 93.5 % compared with 2010 (31 outbreaks). The overall reporting rate in the EU in 2011 was 0.01 per 100,000 population, which is higher than in 2010 (<0.01), but lower than the reporting rates in the previous years 2007, 2008 and 2009 (0.02 per 100,000). France and Germany together reported 45.0 % of pathogenic *E. coli* outbreaks. No outbreaks due to human pathogenic *E. coli* were reported by non-MSs.

Fourteen *E. coli* outbreaks (23.3 %) were supported by strong evidence and these outbreaks were reported by seven MSs, mainly by the United Kingdom (six outbreaks) which reported one fatal case. The EHEC outbreak reported by Germany was responsible of 89.2 % of human cases, 94.3 % of hospitalisations and 98.1 % of deaths related to strong evidence outbreaks due to pathogenic *E. coli* (see specific box). More information on this outbreak as for the number of human cases per country is available in Table VT4 (chapter 3.4. Verotoxigenic *E. coli*).

Table OUT8. Strong and weak evidence food-borne outbreaks caused by pathogenic* Escherichia coli *(excluding strong evidence waterborne outbreaks) in the EU, 2011

Country	Total outbreaks		Strong evidence outbreaks				Weak evidence outbreaks			
	N	Reporting rate per 100,000	N	Human cases			N	Human cases		
				Cases	Hospitalised	Deaths		Cases	Hospitalised	Deaths
Austria	3	0.04	-	-	-	-	3	8	3	0
Belgium	3	0.03	-	-	-	-	3	8	6	0
Denmark	4	0.07	2	113	20	0	2	64	1	0
France	13	0.02	1	15	15	0	12	43	7	0
Germany	14	0.01	1	3,793	2,353	53	13	33	6	0
Hungary	1	0.01	-	-	-	-	1	2	0	0
Ireland	5	0.11	-	-	-	-	5	15	1	0
Netherlands	2	0.01	2	14	8	0	-	-	-	-
Romania	1	<0.01	1	13	13	0	-	-	-	-
Spain	3	<0.01	1	14	0	0	2	21	1	0
Sweden	3	0.03	-	-	-	-	3	24	2	0
United Kingdom	8	0.01	6	288	86	1	2	8	2	0
EU Total	**60**	**0.01**	**14**	**4,250**	**2,495**	**54**	**46**	**226**	**29**	**0**

Detailed information from strong evidence *E. coli* outbreaks

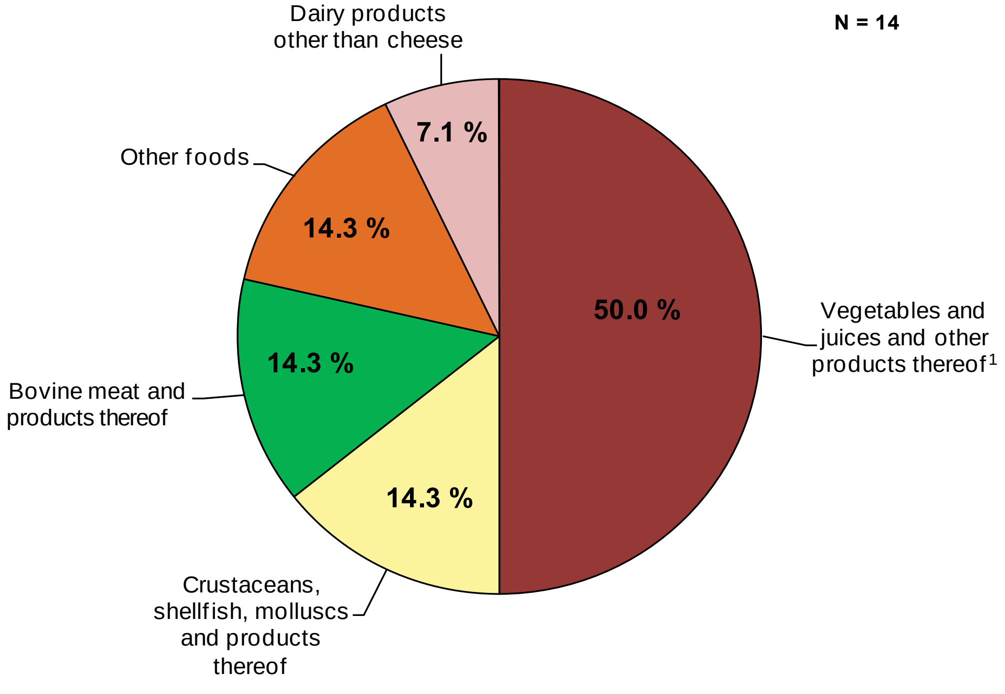
The 14 strong evidence pathogenic *E. coli* outbreaks were due to verotoxigenic *E. coli* (VTEC) except two (one caused by enteropathogenic *E. coli* (EPEC) and one due to unspecified *E. coli*). Different serotypes were reported: VTEC O157 in seven outbreaks, VTEC O27:H30 in one, and the enteroaggregative Shiga toxin-producing (STEC) *E. coli* O104:H4 in four outbreaks that were related to the German outbreak.

Vegetables and juices and other products thereof were involved in seven outbreaks (50.0 %) (Figure OUT17), causing 98.6 % of human cases, 99.3 % of hospitalisations and all deaths reported in strong evidence pathogenic *E. coli* outbreaks. Four of these seven outbreaks were associated with the consumption of imported fenugreek sprouts or seeds (i.e. the German outbreak and the related outbreaks in Denmark, France and in the Netherlands). The remaining three outbreaks were linked to imported sugar peas, mixed salad, raw leeks and raw potatoes.

As for the outbreak type, 12 were general outbreaks, one was a household outbreak and the information was not reported for the remaining outbreak. The setting was reported for all pathogenic *E. coli* strong outbreaks: restaurant, café, pub, bar, hotel was the most frequently reported setting (five cases) followed by disseminated cases (four outbreaks).

Three waterborne outbreaks attributable to pathogenic *E. coli* were also reported (Table OUT17).

Figure OUT17. Distribution of food vehicles in strong evidence outbreaks caused by pathogenic* Escherichia coli *(excluding strong evidence waterborne outbreaks) in the EU, 2011



Note: Data from 14 outbreaks are included: Denmark (2), France (1), Germany (1), Netherlands (2), Romania (1), Spain (1) and United Kingdom (6).

1. Two out of the seven outbreaks associated with vegetables and juices and other products thereof were part of the large EHEC outbreak reported by Germany.

From May to July 2011, a large outbreak of haemolytic-uraemic syndrome (HUS) and bloody diarrhoea associated with STEC O104:H4 infections occurred primarily in northern Germany. This outbreak of STEC infections is the largest recorded to date in **Germany** and, based on the number of cases of HUS, is the largest outbreak of this sort worldwide.

The outbreak involved the rare serotype O104:H4, which possesses virulence characteristics of EHEC and enteroaggregative *E. coli* (EAEC). Fenugreek sprouts were identified as the most likely vehicle of infection. The outbreak started at the beginning of May 2011 and reached its peak on 22 May 2011. After that date, the number of outbreak-related STEC infections as well as the number of new HUS cases decreased. After mid-June only sporadic cases of HUS occurred. On 26 July 2011, the Robert Koch Institute declared that the outbreak had ended. At that point, there had been no new cases clearly associated with the outbreak for three weeks, since the last illness on 4 July. In total, 3,793 STEC cases, including HUS cases were attributed to the outbreak, based on the outbreak case definition, 827 HUS cases (including 30 suspected cases that did not fulfil the reference case definition) and 2,966 cases of acute gastroenteritis due to STEC infection. Death was reported for 35 (4.2 %) of the patients identified with HUS and 18 (0.6 %) of the patients with STEC gastroenteritis. Women outnumbered men among both HUS (570; 69 %) and STEC cases (1,724; 58 %). The majority of cases involved adults (88 % of HUS cases, 89 % of STEC cases).

The median age of HUS cases was 43 years and of STEC gastroenteritis cases was 46 years. This is in stark contrast to the observed cases of STEC gastroenteritis and HUS reported in previous years, in which small children were predominantly affected. Internationally, 137 cases (including 54 HUS cases) in 15 European and non-European countries related to the outbreak were reported. The majority of individuals had become infected in Germany during the outbreak period. One exception was a local outbreak in France in June 2011 that was not related to travel to Germany but was also caused by consumption of fenugreek sprouts. After 20 May 2011, the Robert Koch Institute investigated the outbreak in cooperation with human health and veterinary agencies on the federal, state and local level. The food vehicle was identified by a series of epidemiological studies. The outbreak investigation was challenging because of the unusually long incubation period (median eight days), novel for disease outbreaks caused by STEC infections. In addition, many patients apparently remembered only the main ingredients of the dishes they had consumed but not sprouts, which had been added as garnish or minor ingredients. A recipe-based restaurant cohort study provided strong epidemiological evidence for the implicated food. In this study, participants were only asked to remember which dish they had ordered. Information on the preparation and ingredients of the menu items was provided by the chef of the restaurant. The risk of becoming ill was 14.2-fold higher in persons who had been served sprouts than in persons who had not been served sprouts. No other food item was statistically significantly associated with a higher disease risk in multivariable analyses. All diseased persons had been served sprouts.

In parallel with these investigations, the Robert Koch Institute identified places, e.g. restaurants, where several people had probably become infected (so-called ‘clusters’). This information was forwarded to the German ‘Task Force EHEC’ which was located at the Federal Office of Consumer Protection and Food Safety. This group conducted trace-back and trace-forward investigations regarding supply chains of certain food items. The Task Force EHEC investigated a total of 41 clusters with more than 300 STEC or HUS cases in six federal states. All investigated clusters could be linked to sprouts from a sprout-producing farm in Lower Saxony. At least two infected persons had consumed sprouts which they had grown themselves at home from sprout seeds. From this information it could be concluded that the seeds used for sprouting may have been contaminated. Trace-back investigations of sprout seeds revealed that fenugreek seeds used in France as well as on the farm in Germany for sprout production were obtained from a supplier who had received seeds from Egypt.

Data source: This text derives from the information provided by Germany through the EFSA’s Zoonoses Web reporting application.

4.5. Other bacterial agents

Under the category 'other bacterial agents', outbreaks due to *Brucella*, *Listeria* and *Shigella* are reported. In 2011, 47 outbreaks caused by these bacteria were reported by 12 MSs, representing 0.8 % of all outbreaks reported in the EU. Six of them (12.8 %), reported by four MSs, were supported by strong evidence.

Three of these strong evidence outbreaks were caused by *Listeria monocytogenes* (*L. monocytogenes*), two of which were general and the third was a household outbreak. One general *Listeria* outbreak occurred in Belgium and accounted for 11 human cases, all admitted to hospital, and four fatalities. The food vehicle identified was cheese produced domestically. No information on the thermal treatment of the milk was provided. The other two *Listeria* outbreaks involved five persons in total (all admitted to hospital) and were linked to bakery products and mixed food (reported by Finland and the United Kingdom, respectively). One strong evidence outbreak due to *L. monocytogenes* was also reported by Switzerland; it was a general outbreak linked to consumption of pig meat and products thereof and accounted for nine human cases.

The other three strong outbreaks reported by MSs in the category 'other bacterial agents' were caused by *Shigella*; these were general outbreaks and were linked to buffet meals. Two of them, reported by Denmark, were caused by *Shigella* (*S. flexneri*) and accounted for 70 human cases, of whom 11 were hospitalised; no deaths were reported. The other outbreak was due to *S. somnei*, reported by Belgium, and accounted for 37 human cases and two hospitalisations. Two strong evidence outbreaks due to *S. somnei* were also reported by Norway; these were both general outbreaks and were linked to vegetables and buffet meals. In total, 77 persons became ill and six of them were admitted to hospital. There were no fatalities.

No strong evidence outbreaks due to *Brucella* were reported in 2011.

Under the category '*Yersinia'*, seven MSs reported in total 17 outbreaks due to *Yersinia* (0.3 % of total outbreaks). One of them, reported by Denmark and supported by strong evidence, was linked to mixed food consumed at a restaurant and accounted for seven human cases (no hospitalisations or deaths were reported). One strong outbreak due to *Yersinia enterocolitica* O:9 was also reported by Norway (see box below).

In **Norway**, the same strain of *Yersinia enterocolitica* (*Y. enterocolitica*) O:9 was isolated in samples from 21 cases during the period April to September 2011. Epidemiological studies showed that the outbreak was associated with consumption of ready-to-eat salad products.

4.6. *Bacillus*

This section details food-borne outbreaks in which the causative agent was reported as *Bacillus* toxins.

In 2011, 11 MSs reported 220 outbreaks in which *Bacillus* toxins were the causative agent, representing 3.9 % of all outbreaks reported within the EU. These outbreaks increased by 122.2 % compared with 2010 (99 outbreaks), which was mainly due to an increase in the number of outbreaks reported by France, where 154 outbreaks were detected in 2011 and only 61 in 2010. The overall reporting rate in the EU was 0.04 per 100,000. France reported the majority (70.0 %) of these outbreaks, which involved 1,383 human cases, 113 hospitalisations and one death (Table OUT9). In addition, one non-MS reported one outbreak.

In total, 47 strong evidence outbreaks caused by *Bacillus cereus* toxins were reported in the EU, with the distribution of these outbreaks fairly evenly spread among the nine reporting MSs (Table OUT9). These outbreaks affected 658 people, out of which 4.0 % were hospitalised. No strong outbreaks due to *Bacillus* were reported by non-MSs.

Table OUT9. Strong and weak evidence food-borne outbreaks caused by* Bacillus *toxins in the EU, 2011

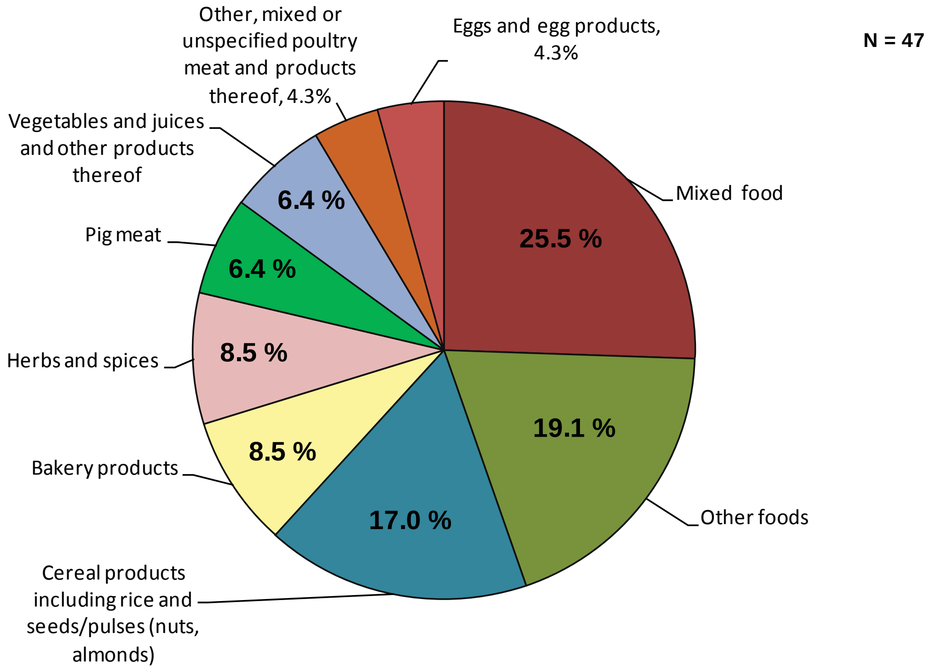
Country	Total outbreaks		Strong evidence outbreaks				Weak evidence outbreaks			
	N	Reporting rate per 100,000	N	Human cases			N	Human cases		
				Cases	Hospitalised	Deaths		Cases	Hospitalised	Deaths
Belgium	11	0.10	9	267	4	0	2	9	9	0
Denmark	10	0.18	10	148	0	0	-	-	-	-
Finland	4	0.07	3	26	0	0	1	2	0	0
France	154	0.24	7	79	20	0	147	1,304	93	1
Germany	6	0.01	6	35	2	0	-	-	-	-
Hungary	2	0.02	1	62	0	0	1	44	44	0
Italy	10	0.02	-	-	-	-	10	100	-	-
Netherlands	10	0.06	5	11	-	-	5	71	0	0
Spain	7	0.02	5	27	0	0	2	6	2	0
Sweden	4	0.04	1	3	0	0	3	96	0	0
United Kingdom	2	<0.01	-	-	-	-	2	17	0	0
EU Total	**220**	**0.04**	**47**	**658**	**26**	**0**	**173**	**1,649**	**148**	**1**
Norway	1	0.02	-	-	-	-	1	22	0	0

Detailed information from strong evidence *Bacillus* outbreaks

In strong evidence *Bacillus* outbreaks, mixed food was the most commonly implicated food vehicle (25.5 % of outbreaks). The second most frequently reported implicated single food vehicle was cereal products (17.0 % of outbreaks), followed by bakery products (8.5 %) and herbs and spices (8.5 %) (Figure OUT18).

Information on the type of outbreak was available for 37 strong evidence outbreaks: 28 were general outbreaks, involving 550 cases and two hospitalisations; nine were household outbreaks, involving 26 cases, and four hospitalisations. For all outbreaks, information on setting was provided: restaurant, café, pub, bar, hotel was the most frequently reported (16 outbreaks) followed by household/domestic kitchen (nine outbreaks). Inadequate chilling, inadequate heat treatment, storage time or temperature abuse were contributing factors in 24 of the 47 outbreaks, with other factors including cross contamination or unprocessed contaminated ingredients.

Figure OUT18. Distribution of food vehicles in strong evidence outbreaks caused by* Bacillus *toxins in the EU, 2011



Note: Data from 47 outbreaks are included: Belgium (9), Denmark (10), Finland (3), France (7), Germany (6), Hungary (1), Netherlands (5), Spain (5) and Sweden (1).

Other foods (N = 9) include: broiler meat (*Gallus gallus*) and products thereof (1), crustaceans, shellfish, molluscs and products thereof (1), milk (1), and other foods (6).

4.7. *Clostridium*

Fifteen MSs reported 165 food-borne outbreaks caused by *Clostridium perfringens* (*C. perfringens*), *C. botulinum* or other *Clostridia* (Table OUT10). This represents 2.9 % of all food-borne outbreaks reported in 2011 and an increase of 87.5 % compared with 2010 (88 outbreaks). This increase is mainly because France reported 102 outbreaks in 2011 compared with 47 in 2010. The overall reporting rate in the EU was 0.03 per 100,000. France reported the majority (61.8 %) of these outbreaks, and they were mainly supported by weak evidence (Table OUT10). In addition, one non-MS reported three outbreaks.

Thirty seven of these outbreaks (22.4 %) were strong evidence outbreaks, with the distribution of these outbreaks fairly evenly shared among the 11 reporting MSs. No strong outbreaks due to *Clostridium* were reported by non-MSs (Table OUT10).

In total, 16 outbreaks caused by *C. botulinum* were reported by nine MSs; 10 of these outbreaks were supported by strong evidence and accounted for 35 human cases, with 28 hospitalisations and one death (Table OUT11). The six weak evidence outbreaks due to *C. botulinum* were reported by Austria (two outbreaks), Germany (one outbreak), Lithuania (two outbreaks) and Poland (one outbreak), and affected 12 people and resulted in 11 hospitalisations with no fatal cases. No outbreaks due to *C. botulinum*, either with strong or weak evidence, were reported by non-MSs.

Finland reported on an outbreak caused by *C. perfringens* in 2011 that took place at a catering establishment. Approximately 9-18 hours after a work place meal, 64.0 % (274/427) of the diners became ill. The typical symptoms were diarrhoea and stomach pain. According to analytical epidemiological analysis, lamb pastrami was the likely vehicle (Relative Risk 30.57); in addition, microbiological analyses showed *C. perfringens* 8,500,000 cfu/g and in further analyses *C. perfringens* type A with *cpe*-gene. *C. perfringens* (*cpe*+) was also found in faecal samples from the patients. Storage time and temperature abuse were reported as contributory factors.

Table OUT10. Strong and weak evidence food-borne outbreaks caused by* Clostridium *toxins in the EU, 2011

Country	Total outbreaks		Strong evidence outbreaks				Weak evidence outbreaks			
	N	Reporting rate per 100,000	N	Human cases			N	Human cases		
				Cases	Hospitalised	Deaths		Cases	Hospitalised	Deaths
Austria	3	0.04	1	3	3	0	2	4	3	0
Denmark	7	0.13	7	109	0	0	-	-	-	-
Finland	4	0.07	3	316	2	1	1	3	0	0
France	102	0.16	3	41	9	0	99	1,689	21	3
Germany	3	<0.01	2	75	0	0	1	2	2	0
Hungary	2	0.02	2	48	4	0	-	-	-	-
Italy	2	<0.01	-	-	-	-	2	53	-	-
Lithuania	2	0.06	-	-	-	-	2	4	4	0
Netherlands	2	0.01	2	6	-	-	-	-	-	-
Poland	11	0.03	3	9	8	0	8	70	44	8
Portugal	2	0.02	2	11	1	0	-	-	-	-
Slovakia	3	0.06	-	-	-	-	3	15	11	0
Spain	13	0.03	5	234	2	0	8	1,189	0	0
Sweden	2	0.02	-	-	-	-	2	15	0	0
United Kingdom	7	0.01	7	198	0	0	-	-	-	-
EU Total	**165**	**0.03**	**37**	**1,050**	**29**	**1**	**128**	**3,044**	**85**	**11**
Norway	3	0.06	-	-	-	-	3	90	0	0

Note: Data include outbreaks caused by *Clostridium botulinum*, *Clostridium perfringens* and *Clostridium* spp., unspecified.

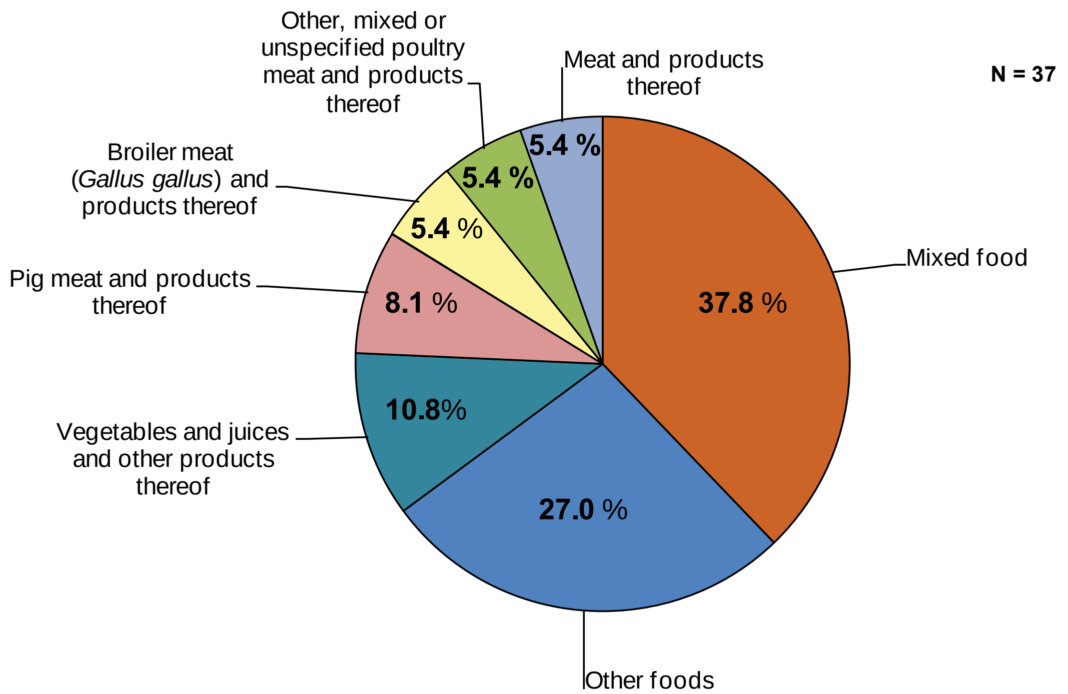
Table OUT11. Strong evidence food-borne outbreaks caused by **C. botulinum** *toxins in the EU, 2011*

Country	Strong evidence outbreaks			
	N	Human cases		
		Cases	Hospitalised	Deaths
Austria	1	3	3	0
Finland	1	3	2	1
France	2	9	9	0
Hungary	1	3	3	0
Poland	3	9	8	0
Portugal	1	6	1	0
Spain	1	2	2	0
EU Total	**10**	**35**	**28**	**1**

Detailed information from strong evidence *Clostridium* outbreaks

Mixed food was the most frequently identified food vehicle, associated with 37.8 % of strong evidence *Clostridium* outbreaks, which affected 205 people, but with no hospitalisations or deaths. The second most frequently reported food vehicle was vegetables (10.8 %), followed by pig meat and products thereof (8.1 %) (Figure OUT19).

Figure OUT19. Distribution of food vehicles in strong evidence outbreaks caused by **Clostridium** *toxins (including* **C. botulinum***) in the EU, 2011*



Note: Data from 37 outbreaks are included: Austria (1), Denmark (7), Finland (3), France (3), Germany (2), Hungary (2), Netherlands (2), Poland (3), Portugal (2), Spain (5) and United Kingdom (7).

Other foods (N = 10) include: bovine meat and products thereof (1), buffet meals (1), canned food products (1), other or mixed red meat and products thereof (1), sheep meat and products thereof (1), and other foods (5).

Information on the type of outbreak was available for 33 out of 37 strong evidence outbreaks: 24 were general outbreaks, and nine were household/domestic kitchen outbreaks. The setting most frequently reported was restaurant, café, pub, bar, hotel (nine outbreaks), followed by household/domestic kitchen (seven outbreaks) and canteen or workplace catering (six outbreaks). The setting was not identified in five outbreaks.

Many contributory factors, either alone or in combination, were reported in 25 outbreaks: inadequate heat treatment, inadequate chilling, cross-contamination, storage time/temperature abuse and unprocessed contaminated ingredient.

C. botulinum

The ten strong evidence *C. botulinum* outbreaks were associated with vegetables (three outbreaks), pig meat and products thereof (two outbreaks), other, mixed or unspecified poultry meat and products thereof (one outbreak), canned food products (one outbreak), and other food (three outbreaks).

Eight out of ten *C. botulinum* outbreaks were household/domestic kitchen outbreaks. No information was available for the remaining two outbreaks. For these outbreaks the setting most commonly reported was household/domestic kitchen (six outbreaks). No information on setting was provided for the other four outbreaks.

Contributory factors were reported for five out of ten *C. botulinum* outbreaks: unprocessed contaminated ingredients were reported in two cases, and storage time/temperature abuse and inadequate heat treatment in one outbreak each.

In 2011 in **Finland**, two persons fell ill with symptoms compatible with botulism after having eaten conserved olives stuffed with almonds. One of them died. A third person, who only ate a very small number of the olives, suffered from diarrhoea. *C. botulinum* type B and its neurotoxin were detected in the implicated olives by PCR, and mouse bioassay, respectively. Several of the jars withdrawn from the market were analysed, but only the olives from the patients' home were positive for botulinum neurotoxin. Some of the jars were leaking and by visual inspection it was established that their contents were spoiled. See Eurosurveillance Rapid communications, Volume 16, Issue 49, 08 December 2011. Two cases of food-borne botulism in Finland caused by conserved olives, October 2011
More information can be found at: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=20034

4.8. Staphylococcal enterotoxins

Fifteen MSs reported 345 food-borne outbreaks caused by staphylococcal toxins, representing 6.1 % of all outbreaks reported in the EU. This was an increase of 25.9 % compared with 2010 (274 outbreaks), and was mainly due to the fact that France that reported 290 outbreaks in 2011 compared with 220 in 2010. The overall reporting rate in the EU was 0.07 per 100,000. The highest number of outbreaks was reported by France (84.1 % of the staphylococcal toxins outbreaks), even though, for most of these outbreaks, only weak evidence was provided. One case fatality was reported by France in one weak evidence outbreak (Table OUT12). In addition, one non-MS reported two outbreaks.

Thirty-five (10.1 %) of the outbreaks were strong evidence outbreaks, distributed fairly evenly among the ten reporting MSs. These accounted for 394 cases, of whom 27.9 % were hospitalised, but no case fatalities were reported (Table OUT12). One strong evidence outbreak due to staphylococcal enterotoxins was reported by Norway.

Table OUT12. Strong and weak evidence food-borne outbreaks caused by staphylococcal toxins in the EU, 2011

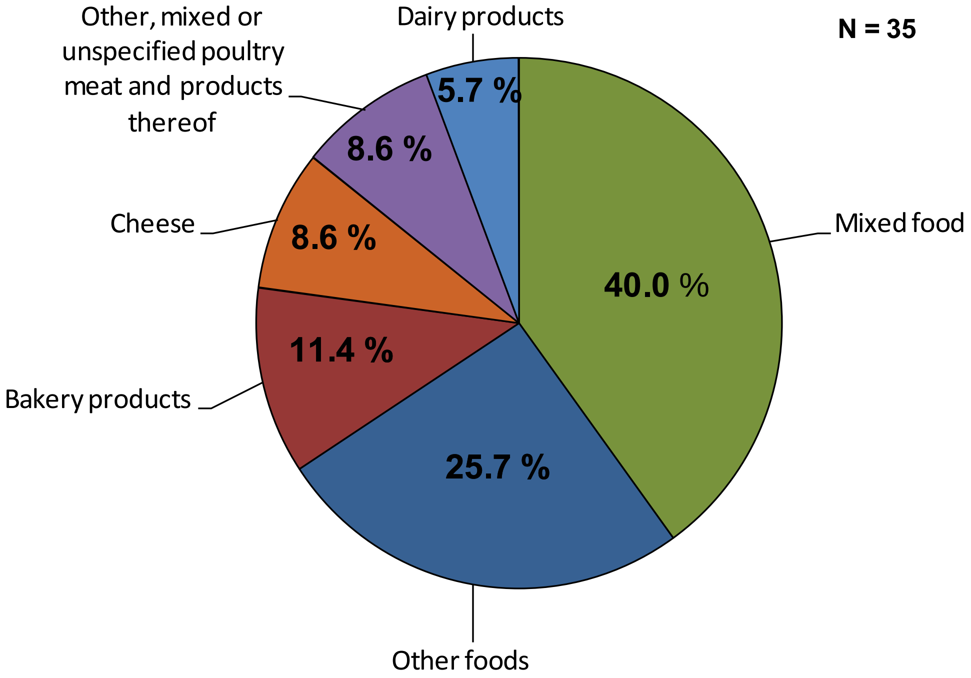
Country	Total outbreaks		Strong evidence outbreaks				Weak evidence outbreaks			
	N	Reporting rate per 100,000	N	Human cases			N	Human cases		
				Cases	Hospitalised	Deaths		Cases	Hospitalised	Deaths
Belgium	2	0.02	2	7	0	0	-	-	-	-
Bulgaria	4	0.05	-	-	-	-	4	46	-	0
Denmark	2	0.04	2	32	0	0	-	-	-	-
France	290	0.45	9	77	8	0	281	2,106	166	1
Germany	2	<0.01	2	17	4	0	-	-	-	-
Italy	4	0.01	-	-	-	-	4	89	-	-
Netherlands	1	0.01	-	-	-	-	1	2	0	0
Poland	4	0.01	2	78	63	0	2	125	0	0
Portugal	6	0.06	6	90	0	0	-	-	-	-
Romania	3	0.01	3	32	32	0	-	-	-	-
Slovakia	1	0.02	-	-	-	-	1	9	0	0
Slovenia	1	0.05	-	-	-	-	1	31	6	0
Spain	22	0.05	7	35	0	0	15	150	1	0
Sweden	2	0.02	1	8	0	0	1	2	1	0
United Kingdom	1	<0.01	1	18	3	0	-	-	-	-
EU Total	**345**	**0.07**	**35**	**394**	**110**	**0**	**310**	**2,560**	**174**	**1**
Norway	2	0.04	1	10	5	0	1	2	0	0

Detailed information from strong evidence *Staphylococcus* enterotoxin outbreaks

The largest proportion of strong evidence outbreaks caused by staphylococcal toxins was attributed to mixed food (40.0 %). The second most frequently single food category reported was bakery products (11.4 %) (Figure OUT20).

The type of outbreaks was provided for 25 outbreaks: 18 were general outbreaks and seven were household outbreaks. The most commonly reported settings were household/domestic kitchen and restaurant, café, pub, bar, hotel, reported in 11 (31.4 %) and ten (28.6 %) outbreaks, respectively, followed by canteen or workplace catering, residential institution, and school/kindergarten, each in three outbreaks (8.6 %). Several contributory factors were reported, mainly cross-contamination, reported in 15 outbreaks (42.9 %).

Figure OUT20. Distribution of food vehicles in strong evidence outbreaks caused by staphylococcal toxins in the EU, 2011



Note: Data from 35 outbreaks are included: Belgium (2), Denmark (2), France (9), Germany (2), Poland (2), Portugal (6), Romania (3), Spain (7), Sweden (1) and United Kingdom (1).

Other foods (N = 9) include: broiler meat (*Gallus gallus*) and products thereof (1), cereal products including rice and seeds/pulses (nuts, almonds) (1), eggs and egg products (1), meat and product thereof, unspecified (1), pig meat and products thereof (1), vegetables and juices and other products thereof (1), and other foods (3).

4.9. Viruses

Nineteen MSs reported a total of 521 food-borne outbreaks caused by viruses (Table OUT13), excluding four strong waterborne outbreaks (Table OUT17). This represents 9.2 % of all outbreaks reported in the EU and a decrease of 34.1 % compared with 2010 (790 outbreaks). At the national level, a substantial decrease in the number of outbreaks due to viruses was observed in Latvia (29 outbreaks in 2011 compared with 325 in 2010). The overall reporting rate in the EU was 0.10 outbreaks per 100,000 population. Poland reported the majority of the outbreaks (33.8 %), but the highest reporting rates were in Latvia and Lithuania (1.30 and 1.23 per 100,000 population, respectively). In addition two non-MSs reported 17 outbreaks.

Only 16.9 % of reported viral outbreaks had strong evidence and these were reported by 11 MSs (Table OUT14). This percentage could have led to an underestimation of the role of these agents associated with different food categories, as information on the food vehicle was not available for weak evidence outbreaks. However, the proportion of outbreaks with strong evidence, out of the total number of outbreaks due to viruses, increased compared with 2010 (11.0 %).

The proportion of strong evidence outbreaks within each country varied greatly amongst the MSs; the lowest rate was reported by Poland (0.6 %), whereas Denmark reported the highest proportion (88.1 %). Denmark also reported 42.0 % of all virus strong evidence outbreaks in the EU. One non-MS reported one viral strong evidence outbreak (Table OUT13).

Table OUT13. Total and weak evidence food-borne outbreaks caused by viruses (excluding strong evidence waterborne outbreaks) in the EU, 2011

Country	Total outbreaks		Strong evidence outbreaks				Weak evidence outbreaks			
	N	Reporting rate per 100,000	N	Human cases			N	Human cases		
				Cases	Hospitalised	Deaths		Cases	Hospitalised	Deaths
Austria	6	0.07	1	82	1	0	5	74	0	0
Belgium	2	0.02	-	-	-	-	2	13	0	0
Denmark	42	0.76	37	964	13	0	5	106	0	0
Estonia	1	0.07	-	-	-	-	1	2	1	0
Finland	17	0.32	10	403	1	0	7	164	6	0
France	67	0.10	13	372	5	0	54	913	18	0
Germany	37	0.05	7	64	9	0	30	133	9	0
Hungary	9	0.09	2	115	1	0	7	67	2	0
Italy	43	0.07	-	-	-	-	43	324	-	-
Latvia	29	1.30	-	-	-	-	29	348	92	0
Lithuania	40	1.23	-	-	-	-	40	135	107	0
Malta	3	0.72	-	-	-	-	3	46	0	0
Netherlands	3	0.02	2	7	-	-	1	28	0	0
Poland	176	0.46	1	5	0	0	175	2,400	464	4
Slovakia	3	0.06	-	-	-	-	3	100	22	0
Slovenia	2	0.10	-	-	-	-	2	25	0	0
Spain	7	0.02	3	44	1	0	4	203	0	0
Sweden	25	0.27	7	358	0	0	18	409	1	0
United Kingdom	9	0.01	5	60	6	0	4	110	0	0
EU Total	**521**	**0.10**	**88**	**2,474**	**37**	**0**	**433**	**5,600**	**722**	**4**
Norway	16	0.33	1	8	0	0	15	399	1	0
Switzerland	1	0.01	-	-	-	-	1	10	0	0

Table OUT14. Strong evidence food-borne outbreaks caused by viruses (excluding strong evidence waterborne outbreaks) in the EU, 2011

Agent	Country	Strong evidence outbreaks			
		N	Human cases		
			Cases	Hospitalised	Deaths
Calicivirus - norovirus (Norwalk-like virus)	Austria	1	82	1	0
	Denmark	37	964	13	0
	Finland	10	403	1	0
	France	13	372	5	0
	Germany	7	64	9	0
	Hungary	2	115	1	0
	Netherlands	2	7	-	-
	Poland	1	5	0	0
	Spain	3	44	1	
	Sweden	7	358	0	0
	United Kingdom	4	53	2	0
	EU Total	**87**	**2,467**	**33**	**0**
	Norway	1	8	0	0
Viruses - Hepatitis viruses	United Kingdom	1	7	4	0
	EU Total	**1**	**7**	**4**	**0**

Detailed information from strong evidence virus outbreaks

Out of the 88 strong evidence outbreaks due to viruses, only one was caused by viruses other than calicivirus, and this outbreak was reported by the United Kingdom. It was caused by hepatitis A virus and accounted for seven human cases, of whom four were admitted to the hospital. This outbreak was classified as a general outbreak and was associated with the consumption of semi-dried tomatoes.

Caliciviruses (including norovirus)

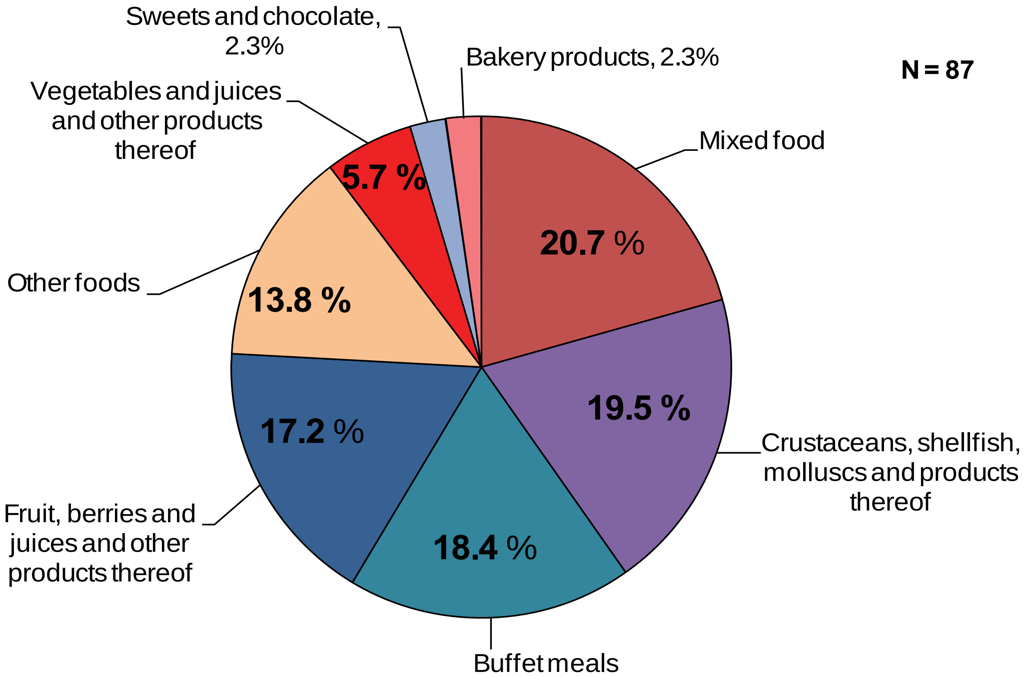
A total of 87 strong evidence food-borne outbreaks, caused by calicivirus, were reported by 11 MSs (Table OUT14). Of these, 71 were reported as general outbreaks, involving 84.8 % of human cases. Seven outbreaks were characterised as household outbreaks, involving 1.9 % of cases. No information was provided for nine outbreaks.

Information on the food vehicle was provided for all of the strong evidence outbreaks caused by caliciviruses. The distribution of food vehicles for these outbreaks was split between mixed food (20.7 %), crustaceans, shellfish and molluscs (19.5 %), buffet meals (18.4 %), and fruits, berries and juices (17.2 %). This represents a clear change compared with 2010, with an increased contribution of mixed food and buffet meals (altogether 22.6 % in 2010) and fruits (9.5 % in 2010) as food vehicles, and an important decrease in the contribution of vegetables and juices, which was the most frequent food vehicle reported in 2010 (31.0 %) (Figure OUT21).

The most commonly reported settings for the virus outbreaks were restaurant, café, pub, bar or hotel (39 outbreaks), but also other settings were identified, including specific communities, such as residential institutions, hospitals or home care establishments. Several contributory factors were reported, either alone or in combination, for 59 outbreaks; among the most common were infected food handlers (33 outbreaks) and unprocessed contaminated ingredients (19 outbreaks).

Four waterborne outbreaks attributable to calicivirus (including norovirus) were also reported (Table OUT17).

Figure OUT21. Distribution of food vehicles in strong evidence outbreaks caused by caliciviruses, (excluding strong evidence waterborne outbreaks) in the EU, 2011



Note: Data from 87 outbreaks are included: Austria (1), Denmark (37), Finland (10), France (13), Germany (7), Hungary (2), Netherlands (2), Poland (1), Spain (3), Sweden (7) and United Kingdom (4).

Other foods (N = 12) include: bovine meat and products thereof (1), dairy products (1), eggs and egg products (1), fish and fish products (1), and other foods (8).

4.10. Parasites

A total of 30 food-borne outbreaks caused by parasites were reported by 11 MSs, including four weak evidence waterborne outbreaks; in addition, one strong evidence waterborne outbreak due to *C. hominis* was reported in 2011 (Table OUT17). These outbreaks accounted for 0.5 % of food-borne outbreaks reported in 2011. The majority of the outbreaks were caused by *Trichinella* (65.4 %).

Only six of these outbreaks were supported by strong evidence: five *Trichinella* outbreaks reported by three MSs and one *Anisakis* outbreak reported by Spain. This represents a decrease compared with 2010, when 15 strong evidence outbreaks were reported.

For the *Trichinella* outbreaks, the identification of the agent species was provided in two outbreaks (*T. spiralis* and *T. pseudospiralis*). Three *Trichinella* outbreaks were classified as general ones and were linked to consumption of pig meat (one outbreak) and wild boar meat (two outbreaks); the other two *Trichinella* outbreaks were household outbreaks linked to pig meat and wild boar meat (one outbreak each). In one strong evidence *Trichinella* outbreak, which occurred in Romania, the pig meat that was reported as the food vehicle derived from backyard pigs. No information was provided for the other outbreaks on the type of husbandry for animals from which the meat came or if the meat was subjected to *Trichinella* inspection. Contributory factors reported were inadequate heat treatment and unprocessed contaminated ingredient.

The *Anisakis* outbreak was a household outbreak linked to consumption of fish and fish products and affected five people.

4.11. Other causative agents

In this report the category 'other causative agents' includes histamine, marine biotoxins, mushroom toxins, mycotoxins and wax esters from escolar fish as well as unspecified toxins.

Ten MSs reported a total of 113 food-borne outbreaks due to other causative agents (Table OUT15). This represents 2.0 % of all outbreaks reported at EU level and a decrease of 50.7 % compared with 2010 (229 outbreaks). This decrease is mainly due to a decreased number of outbreaks reported by France (43 in 2011 compared with 81 in 2010) and also due to the fact that Hungary reported only six outbreaks in 2011 (74 outbreaks in 2010). The reporting rate was 0.02 per 100.000 population, with the highest rate reported by Malta (0.96). France and Spain together reported 64.6 % of these outbreaks. In addition, two non-MSs reported three outbreaks (Table OUT15).

In total, 89 strong evidence outbreaks were reported by nine MSs, and 64.0 % of these outbreaks were reported by France and Spain. In addition one strong evidence outbreak was reported by Switzerland (Table OUT16).

Table OUT15. Strong and weak evidence food-borne outbreaks caused by other causative agents in the EU, 2011

Country	Total outbreaks		Strong evidence outbreaks				Weak evidence outbreaks			
	N	Reporting rate per 100,000	N	Human cases			N	Human cases		
				Cases	Hospitalised	Deaths		Cases	Hospitalised	Deaths
Belgium	1	<0.01	1	3	1	0	-	-	-	-
Denmark	8	0.14	8	88	0	0	-	-	-	-
France	43	0.07	38	158	32	0	5	17	1	0
Germany	4	<0.01	4	17	0	0	-	-	-	-
Hungary	6	0.06	5	19	19	1	1	3	3	0
Malta	4	0.96	-	-	-	-	4	11	0	0
Poland	5	0.01	5	13	12	0	-	-	-	-
Spain	30	0.07	19	92	12	0	11	179	0	0
Sweden	9	0.10	6	36	0	-	3	11	7	0
United Kingdom	3	<0.01	3	22	0	0	-	-	-	-
EU Total	**113**	**0.02**	**89**	**448**	**76**	**1**	**24**	**221**	**11**	**0**
Norway	2	0.04	-	-	-	-	2	11	0	0
Switzerland	1	0.01	1	3	0	0	-	-	-	-

Table OUT16. Strong evidence food-borne outbreaks caused by other causative agents in the EU, 2011

Agent	Country	Strong evidence outbreaks			
		N	Human cases		
			Cases	Hospitalised	Deaths
Histamine	Belgium	1	3	1	0
	Denmark	4	16	0	0
	France	30	130	30	0
	Germany	4	17	0	0
	Spain	10	35	0	0
	Sweden	6	36	0	-
	United Kingdom	3	22	0	0
	EU Total	**58**	**259**	**31**	**0**
	Switzerland	1	3	0	0
Marine biotoxins	France	8	28	2	0
	Spain	2	33	0	0
	EU Total	**10**	**61**	**2**	**0**
Mushroom toxins	Denmark	1	7	0	0
	Hungary	5	19	19	1
	Poland	5	13	12	0
	EU Total	**11**	**39**	**31**	**1**
Mycotoxins	Denmark	3	65	0	0
	Spain	4	10	1	0
	EU Total	**7**	**75**	**1**	**0**
Escolar fish (wax esters)	Spain	1	2	0	0
	EU total	**1**	**2**	**0**	**0**
Other causative agents	Spain	2	12	11	0
	EU total	**2**	**12**	**11**	**0**

Detailed information from strong evidence outbreaks

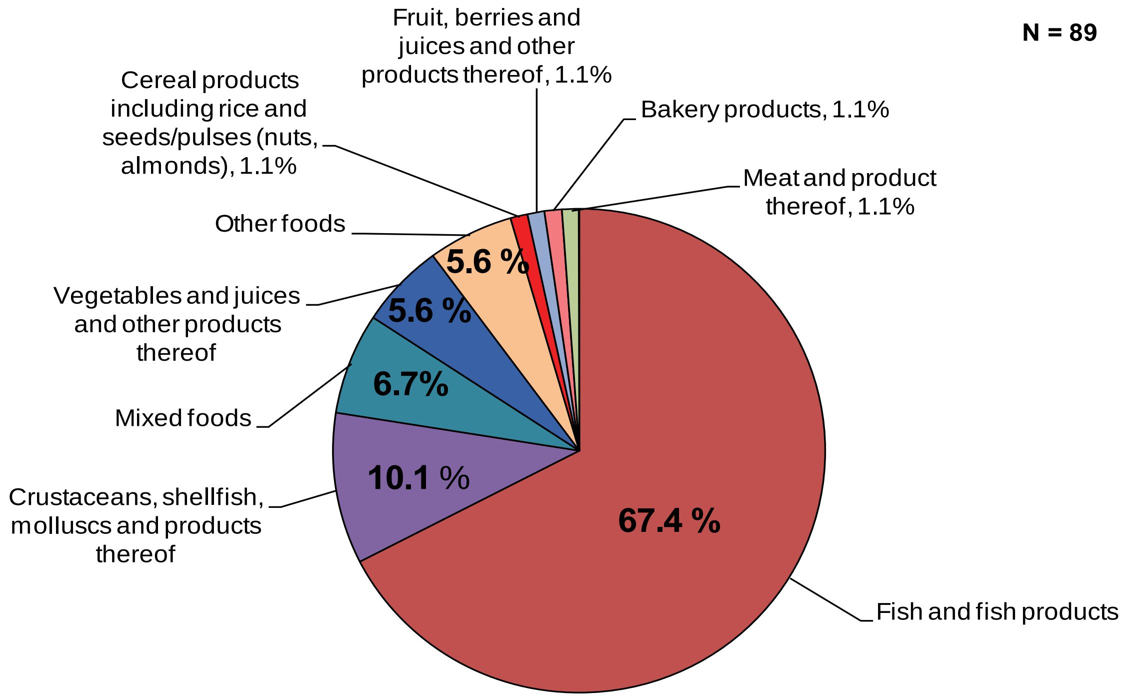
The majority (65.2 %) of strong evidence outbreaks due to other causative agents were caused by histamine and accounted for 57.8 % of human cases and 40.8 % of hospitalisations reported in these outbreaks. Other agents included marine biotoxins (11.2 %), mushroom toxins (12.4 %), mycotoxins (7.9 %) and wax esters (1.1 %). No specific information on the causative agent was provided for two outbreaks (Table OUT16). One fatal case was reported by Hungary in one outbreak due to mushroom toxins.

Information on the type of outbreak was provided for 49 outbreaks: 23 were classified as general outbreaks and 26 as household. The settings were reported to be restaurant, café, pub, bar, hotel in 46.1 % of cases and household in 31.5 % of them.

The majority of outbreaks were linked to consumption of fish and fish products (67.4 %) (Figure OUT22); the causative agent was histamine in all of these outbreaks except for four outbreaks caused by marine biotoxins (three outbreaks) and wax ester from escolar fish (one outbreak). The second most common food vehicle reported was crustaceans, shellfish, molluscs and products thereof (10.1 %), in which the agent was marine biotoxins in all but one outbreak caused by histamine. The next most common food category was mixed food, implicated in five outbreaks due to mushroom toxins and one outbreak due to histamine. Vegetables and juices and other products thereof were reported in four outbreaks due to mycotoxins and in one outbreak due to mushroom toxins. The food category other foods was reported in five outbreaks due to mushroom toxins, which were linked to dishes with mushrooms containing *Amanita phalloides* toxins, reported by Poland.

Several contributory factors were reported, mainly unprocessed contaminated ingredient (reported in 15 outbreaks) and storage time/temperature abuse (in 10 outbreaks).

Figure OUT22. Distribution food vehicles in strong evidence outbreaks caused by other causative agents in the EU, 2011



Note: Data from 89 outbreaks are included: Belgium (1), Denmark (8); France (38), Germany (4), Hungary (5), Poland (5), Spain (19), Sweden (6) and United Kingdom (3).

4.12. Unknown agents

Nineteen MSs reported 2,023 outbreaks in 2011 (35.8 % of all outbreaks) in which the causative agent was unknown (Table OUT3), including 48 strong evidence outbreaks (6.8 % of all strong evidence outbreaks). This represent an increase of 27.8 % in the proportion of total outbreaks due to unknown agents compared with 2010 (N = 1,583); however the proportion of strong evidence outbreaks with unknown aetiology out of the total number of reported strong evidence outbreaks decreased (from 8.5 % in 2010 to 6.8 % in 2011).

4.13. Waterborne outbreaks

Waterborne outbreaks may potentially be large, especially if the public drinking water supply is contaminated.

In waterborne outbreaks, several zoonotic agents are often detected in the water as well as in human samples as a result of unspecific contamination, e.g. with sewage water.

In 2011, four MSs reported 11 waterborne outbreaks involving 20,167 human cases, of whom 0.3 % were hospitalised (Table OUT17). No deaths were reported. Four different pathogens were detected from these 11 outbreaks: *Campylobacter jejuni* (*C. jejuni*), calicivirus, verotoxigenic *E. coli* and *Cryptosporidium hominis*. The outbreak due to *Cryptosporidium* reported by Sweden, accounted for 99.2 % (20,000 cases) of human cases reported in all strong waterborne outbreaks. There was one waterborne outbreak in which the causative agent was unknown.

No strong evidence waterborne outbreaks were reported by non-MSs.

In **Belgium**, during the summer of 2011, 64 out of 130 exposed children at a youth camp became ill. The children arrived at the camp place on 14 July, and the first cases were reported on 21 July. The symptoms reported were fever, vomiting and diarrhoea and *C. jejuni* was isolated from the stool of two children. The evening before the first cases were reported, the children themselves prepared turkey meat on a camp fire. Undercooked turkey meat was therefore suspected to be at the origin of the *Campylobacter* outbreak, but there were no leftovers. On the other hand, water originating from a water source in the fields nearby the camp site was supplied by the farmer and was considered to be for 'all use'. The water was transported in a water tank which was also used by the farmer to provide cattle with water and was collected in a water tank at the camp location. After the first cases were reported, tap water in the stables was provided to the children. Water samples from three different locations were sent for analysis: water from the water source in the field, water from a dirty hose connected to the transport tank and tap water from a dirty hose connected to the sink at the stable. *C. jejuni* was detected in the first two water samples. The antibiotic resistance of the strain isolated from the water samples corresponded to that observed in the human isolates.

The week before the outbreak, it started raining and this weather might have been the reason why cattle faeces contaminated with *Campylobacter* seeped into the water source.

Table OUT17. List of reported strong evidence waterborne outbreaks in the EU, 2011

Isolated agents	Country	Setting	Strong evidence outbreaks				Additional information
			N	Cases	Hospitalised	Deaths	
Calicivirus (including norovirus)	Finland	Household / domestic kitchen	3	54	0	0	In one outbreak, water treatment failure was reported as well as the isolation of *Campylobacter*.
		Other setting	1	8	0	0	
Campylobacter - C. jejuni	Belgium	Temporary mass catering (fairs, festivals)	1	64	0	0	Unprocessed contaminated ingredient.
	Finland	Household / domestic kitchen	1	10	0	0	
Cryptosporidium hominis	Sweden	Disseminated cases	1	20,000	46	0	
Escheria coli, pathogenic - Verotoxigenic *E. coli* (VTEC) VTEC 0157	Ireland	Household / domestic kitchen	1	3	-	-	
		Disseminated cases	1	20	7	0	Group water scheme, ground water. Private group water scheme from ground water source suspected to have been contaminated with animal faeces.
		Household / domestic kitchen	1	2	0	-	
Unknown	Finland	Household / domestic kitchen	1	6	0	0	Water distribution system
Total			**11**	**20,167**	**53**	**0**	

4.14. Discussion

In 2011, a total of 5,648 food-borne outbreaks were reported by 25 MSs, an increase of 7.1 % compared with 2010. The main causative agents in these reported outbreaks were *Salmonella*, bacterial toxins, *Campylobacter* and viruses. Compared with previous years, the number of outbreaks due to viruses decreased. In previous years viruses were classified as the second most frequently reported causative agents, but were ranked fourth in 2011. However, the decrease in numbers of reported virus outbreaks in 2011 was mainly related to one MS.

The food vehicle category most frequently implicated in outbreaks was eggs and egg products, as in 2010, followed by mixed food and fish and fish products. The increase in the number of outbreaks associated with mixed food seems to be mainly due to an increase in the number of outbreaks caused by *Clostridium*, *Bacillus* and staphylococcal toxins, whereas the increase in fish products as food vehicles is due to histamine outbreaks. The relevance of vegetables and products thereof as food vehicles was lower in 2011 than in the previous years, and this was mostly because fewer calicivirus outbreaks associated with vegetables were recorded in 2011. The increase in outbreaks associated with sweets and chocolate in 2011 is interesting, but all these outbreaks were reported by one MS only.

The number of waterborne outbreaks remained low (11 outbreaks), but one of these outbreaks accounted for a very large number of human cases.

Food-borne *Salmonella* outbreaks continued to decline in 2011 consistent with the notified salmonellosis cases in humans. Many types of foodstuffs were implicated as food vehicles in the *Salmonella* outbreaks, but eggs and egg products were once again the main food vehicle reported. Even though the numbers of *Salmonella* outbreaks associated with eggs and egg products continued to decrease slightly, their share of the *Salmonella* outbreaks with reported food vehicle increased compared with the previous year. However, the proportion of *Salmonella* outbreaks associated with bakery products, which are often caused by the use of unpasteurised eggs, continued to decline in 2011. In addition, the *Salmonella* outbreaks associated with mixed food or buffet meals and different types of meat decreased. Thus, on the basis of the reported food-borne outbreaks data, the decrease in the numbers of *Salmonella* outbreaks in 2011 was related not only to eggs but also to other types of food such as meat.

The number of outbreaks due to bacterial toxins and *Campylobacter* increased in 2011 compared with the previous year, but this was mainly due to the reporting of few MSs.

The largest food-borne outbreaks in terms of number of human cases in 2011 were the STEC O104 outbreak in Germany, France and some other MSs, and the waterborne *Cryptosporidium* outbreak in Sweden.

Generally the data reported on food-borne outbreaks in 2011 demonstrate that the reporting of single or few MSs can have a strong influence on the distribution of causative agents and food vehicles at EU level. It also seems that within the MSs, there may be large differences with regard to the causative agents and implicated food vehicles between years.

The revised food-borne outbreak reporting specifications were implemented for the second year in 2011. The two new evidence categories that could support the reporting of a detailed dataset (i.e. a strong evidence outbreak) are descriptive epidemiological evidence and the detection of the causative agent in the food chain or its environment. Similar to 2010 reporting, approximately one-third of the strong evidence outbreaks in 2011 were supported only by these new evidence categories, mainly by descriptive epidemiological evidence. This shows that the MSs had implemented the revised reporting specifications and that these specifications had an impact on the reported outbreaks. The number of outbreaks in which a detailed dataset was provided is similar to data provided in 2010. However, the proportion of these outbreaks, out of the total number of outbreaks reported, decreased compared with the previous year.

5. MATERIALS AND METHODS

5.1. Data received in 2011

Human data

The human data analyses in the EU Summary Report for 2011 were prepared by the Food- and Waterborne Diseases and Zoonoses programme at the European Centre for Disease Prevention and Control (ECDC) and were based on the data submitted to the European Surveillance System (TESSy), hosted at ECDC. Please note that the numbers presented in the report may differ from national reports owing to differences in case definitions used at EU and national level or to different dates of data submission and extraction. The latter may also result in some divergence in case numbers presented in different ECDC reports.

TESSy is a software platform that has been operational since April 2008 and in which data on 52 diseases and special health issues are collected. Both aggregated and case-based data were reported to TESSy. Although aggregated data did not include individual case-based information, both reporting formats were used to calculate country-specific notification rates and trends in diseases.

Data on human zoonoses cases were received from all 27 MSs and additionally from two non-MSs: Iceland and Norway. Switzerland sent its data on human cases directly to EFSA.

Data on foodstuffs, animals and feedingstuffs

All MSs submitted national zoonoses reports for 2011. In addition, reports were submitted by the three non-MSs, Iceland, Norway and Switzerland. For the seventh consecutive year, countries submitted data on animals, food, feed and food-borne outbreaks using a web-based zoonoses reporting system maintained by EFSA. In addition, some countries submitted their data electronically, through the Data Collection Framework (DCF).

In 2011, data were collected on a mandatory basis on the following eight zoonotic agents: *Salmonella*, thermotolerant *Campylobacter*, *Listeria monocytogenes* (*L. monocytogenes*), verotoxigenic *Escherichia coli* (VTEC), *Mycobacterium bovis* (*M. bovis*), *Brucella*, *Trichinella* and *Echinococcus.* Mandatory reported data also included antimicrobial resistance in isolates of *Salmonella* and *Campylobacter*, food-borne outbreaks and susceptible animal populations. Furthermore, based on epidemiological situations in each MS, data were reported on the following agents and zoonoses: *Yersinia*, *Lyssavirus (*rabies), *Toxoplasma*, *Cysticercus*, *Coxiella* (Q fever), *Francisella, Staphylococcus, Anisakis* and antimicrobial resistance in indicator *E. coli* and enterococci isolates. Finally, data concerning compliance with microbiological criteria were also reported on the staphylococcal enterotoxin, *Enterobacter sakazakii* (*Cronobacter* spp.) and histamine.

In this report, data are presented on the eight mandatory zoonotic agents, *Yersinia* and rabies.

For each pathogen, an overview table presenting all MSs reporting data is included at the beginning of each chapter. However, for the detailed tables, data reported as as hazard analysis and critical control point (HACCP), own control or imports and, unless stated otherwise, data from suspect sampling and outbreak or clinical investigations, are excluded. The general rule is to exclude data from samplings of fewer than 25 sampled units. Exceptions to this rule are presented on the following tables: compliance with the food safety criteria for *Salmonella* and *Listeria*; *Salmonella* in poultry species in countries implementing control programmes; distribution of the 10 most common *Salmonella* serovars in some foods and animals species; number of tested animals and positive cases of rabies in domestic animals and wildlife and from countries providing continuous data from foxes; and for *Trichinella*, *Echinococcus* and all food-borne outbreak data.

5.2. Statistical analysis of trends over time

Human data

Routine surveillance data from TESSy were used to describe two components of the temporal pattern (trend and seasonality) of human zoonoses cases for the EU and by MS.

Only confirmed human cases reported consistently by MSs, throughout the study period 2007-2011, were included in the time series analysis. Diseases were analysed either by week or by month, depending on the amount of data available. Consequently, campylobacteriosis, verotoxigenic *E. coli* infection, listeriosis and salmonellosis were analysed by week and brucellosis, yersiniosis and tuberculosis, due to *M. bovis,* by month. For diseases analysed by week, the year 2007 was dropped owing to lack of weekly data in that particular year. Of the date variables available (date of onset, date of diagnosis etc.) the date chosen by the MS as the official "date used for statistics" was selected.

For assessing the temporal pattern at EU level, a cyclical linear regression model was fitted to the data by disease. At MS level two methods were applied for trends (moving averages and linear regression) and seasonality (moving averages and spectral analysis).

The level of statistical significance was set at 0.01. All analyses were performed using Stata® 12.

Data on animals

In the current report, temporal trends have been analysed for bovine tuberculosis, as well as for brucellosis in cattle and small ruminants (for a period of eight years) in the group of MSs with a co-financed control and eradication programme.

MS-group-weighted prevalence figures were estimated by weighting the MS-specific proportion of positive units with the reciprocal of the sampling fraction. The reciprocal is the ratio of 'the total number of units per MS per year' to the 'number of tested units in the MS per year'. For cattle and small ruminants, the annually reported population data were used. The source of data for weighting is indicated in the footnotes of all figures that illustrate weighted prevalence estimates.

In order to obtain yearly estimates of the weighted prevalence for groups of examined MSs, the SURVEYLOGISTIC procedure in the Statistical Analysis System (SAS) was used. The weight was applied in order to take into account disproportionate sampling at MS level. The statistical significance of trends was tested by a weighted logistic regression for binomial data using the GENMOD procedure in the SAS software, at a 5 % significance level. As non-independence of observations within each MS could not be excluded, for example, because of the possibility of sampling animals belonging to the same holdings, the REPEATED statement was used. This yielded inflated standard errors for the effect of the year of sampling, reducing the probability of detecting significant time trends, and corresponding to a conservative approach to statistical analyses.

Changes in the proportions of positive units for zoonotic agents in animals during the time period from 2004 to 2011 were visually explored for each MS by *trellis* graphs using the *lattice* package in the R software (www.r-project.org). Specifically, trellis graphs have been presented for bovine tuberculosis, as well as for brucellosis in cattle and small ruminants in the MSs with a co-financed control and eradication programme. In addition, trellis graphs are presented for *Echinococcus multilocularis* (*E. multilocularis*) in foxes, as well as for the target *Salmonella* serovars in the different poultry species, except turkeys.

5.3. Data sources

In the following sections, the types of data submitted by the reporting countries are briefly described. Information on human surveillance systems is based on the countries reporting data to ECDC for 2011.

5.3.1. *Salmonella* data

Humans

The notification of salmonellosis in humans is mandatory in most MSs, Iceland, Norway and Switzerland, except for five MSs, where reporting is based on a voluntary system (Belgium, France, Luxembourg and Spain) or other system (the United Kingdom). In the United Kingdom, although the reporting of food poisoning is mandatory, isolation and specification of the organism is voluntary. In the Netherlands, the surveillance for non-typhoidal salmonellosis is voluntary. The coverage of the surveillance system for salmonellosis is estimated to be 25 % in Spain and 64 % in the Netherlands. These proportions of populations were used in the calculation of notification rates for Spain and the Netherlands. Diagnosis of human infections is generally done by culture from human stool samples. The majority of countries perform serotyping of strains.[63]

Foodstuffs

Salmonella in food is notifiable in 17 MSs (Austria, Belgium, Bulgaria, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Latvia, Romania, Slovakia, Slovenia, Spain and Sweden) and in two non-MSs, Norway and Iceland. Information was not provided from Cyprus, Greece, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal or Switzerland.

Commission Regulation (EC) No 2073/2005 on microbiological criteria for foodstuffs lays down food safety criteria for *Salmonella* in several specific food categories. This Regulation came into force in January 2006 and was modified by Regulation (EC) No 1441/2007, entering into force in December 2007. Sampling schemes for monitoring *Salmonella* in foodstuffs, e.g. place of sampling, sampling frequency and diagnostic methods, vary between MSs and according to food types. For a full description of monitoring schemes and diagnostic methods in individual MSs, refer to the national reports. The monitoring schemes are based on various types of samples, such as neck skin samples, carcass swabs and meat cuttings; these samples were collected at slaughter, at processing plants, at meat cutting plants and at retail. Several MSs reported data collected as part of HACCP programmes based on sampling at critical control points. These targeted samples could not be directly compared with those that were randomly collected for monitoring/surveillance purposes and were not included in data analysis and tables. Information on serotype distribution was not consistently provided by all MSs.

Animals

Salmonella in *Gallus gallus* (fowl) and/or other animal species is notifiable in all MSs, except for Hungary, and also in three non-MSs (Iceland, Norway and Switzerland). In Austria, the notification is mandatory for all positive findings in parent flocks of *Gallus gallus* and for clinical cases in other animals. In Denmark, detection of *Salmonella* is notifiable in broiler and laying hen flocks of *Gallus gallus* and in other animals. In France *Salmonella* detection is mandatory only for breeding flocks and laying hens of *Gallus gallus*, and in Malta for broilers and laying hen flocks of *Gallus gallus*. In Poland and in Romania, the notification of *Salmonella* is mandatory only in poultry (only for findings of *Salmonella* Enteritidis (*S*. Enteritidis), *S*. Typhimurium, *S*. Pullorum and *S*. Gallinarum in Poland and for findings of *S*. Enteritidis, *S*. Typhimurium in Romania).

The monitoring of *Salmonella* in animals is mainly conducted through passive, laboratory-based surveillance of clinical samples, active routine monitoring of flocks of breeding and production animals in different age groups, and tests on organs during meat inspection. Community Regulation (EC) No 2160/2003 prescribes a sample plan for the control of *S.* Enteritidis, *S.* Typhimurium, *S.* Infantis, *S.* Virchow and *S.* Hadar in breeding flocks of *Gallus gallus* and for the control of *S*. Enteritidis and *S.* Typhimurium in laying hen flocks and broiler flocks of *Gallus gallus* and for turkey flocks to ensure comparability of data among MSs. Non-MSs (European Free Trade Association members) must also apply the Regulation in accordance with the Decision of the European Economic Area Joint Committee No 101/2006.[64] No specific requirements for the monitoring and control of other commercial poultry production systems or in other animals were applicable in 2011.

Details of monitoring programmes and control strategies in breeding flocks of *Gallus gallus,* laying hen flocks, broiler flocks and breeding and production turkey flocks are available in the national reports.

Feedingstuffs

There is no common sampling scheme for feed materials in the EU. Results from compulsory and voluntary monitoring programmes, follow-up investigations and industry quality assurance programmes, as well as from surveys, are reported. The MS monitoring programmes often include both random and targeted sampling of feedstuffs that are considered at risk. Samples of raw material, materials used during processing and final products are collected from batches of feedstuffs of domestic and imported origin. The reported epidemiological units were either 'batch' (usually based on pooled samples) or 'single' (often several samples from the same batch). As in previous years, most MSs did not report separately data from the

63 ECDC (European Centre for Disease Prevention and Control). Survey of National Reference Laboratory (NRL) capacity for six food- and waterborne diseases in EU/EEA countries. Stockholm: ECDC; 2012.

64 Decision of the EEA Joint Committee No 101/2006 of 22 September 2006 amending Annex I (Veterinary and phytosanitary matters) to the EEA Agreement. OJ L 333, 30.11.2006, pp. 6–9.

different types of monitoring programmes or data from domestic and imported feed. Therefore, it must be emphasised that the data related to *Salmonella* in feedstuffs cannot be considered national prevalence estimates. Moreover, owing to the lack of a harmonised surveillance approach, information is not comparable among countries. Nevertheless, data, at country level are presented in the same tables. Information was requested on feed materials of animal and vegetable origin and on compound feedstuffs (mixture of feed materials intended for feeding specific animal groups). Data on the detection of *Salmonella* in fish meal, feed material of land animal origin (further categorised as meat and bone meal, dairy products or feed of other origin), cereals, oil seeds and products, and compound feed for cattle, pigs and poultry in 2008 to 2011 are presented. Single-sample and batch-based data from the different monitoring systems are summarised.

Serovars

Salmonella serovar distributions, over the reporting years, included data reported in the serovars tables. All data were used and no exclusion criteria were applied; thus, data on monitoring, industry own checks/HACCP, clinical investigations, and from investigations in which the framework of sampling was not stated are included. The serovars were ranked within the three main food producing animals (*Gallus gallus,* pigs and cattle), their meats and eggs and summing the isolates reported from 2004 to 2011 across all countries. The top 10 most common serovars are presented for each animal/food category. In tables and line graphs the top 10 *Salmonella* serovars are ordered according to the serovars most frequently reported in 2011. Non-typeable isolates were also taken account. Most MSs reported a subset designated ‘other serovars’ which was named ‘other serotypes’ from 2004 to 2009. For some MSs this category may include isolates belonging to the 10 most common serovars in the EU and the relative EU occurrence of some serovars may therefore be underestimated. Monophasic *S.* Typhimurium includes *S*. 1,4,[5],12:i:-, *S*. 1,4,5,12:i:-, *S*. 4,12:i:-, *S*. 4,12:i:-, *S*. 1,4,12:i:- and, *S*. 4,5,12:i:-.

5.3.2. *Campylobacter* data

Humans

The notification of campylobacteriosis is mandatory in most MSs, Iceland, Norway and Switzerland, except for seven MSs, where notification is based on a voluntary system (Belgium, France, Italy, Luxembourg, the Netherlands and Spain) or other system (the United Kingdom). No surveillance system exists in Greece and Portugal. The coverage of the surveillance system for campylobacteriosis is estimated to be 25 % in Spain and 52 % in the Netherlands. These proportions of populations were used in the calculation of notification rates for these two MSs. Diagnosis of human infection is generally based on culture from human stool samples and both culture and non-culture methods (PCR-based) are used for confirmation. The majority of MSs use biochemical tests for speciation of isolates submitted to the National Reference Level Laboratory.

Foodstuffs

In food, *Campylobacter* is notifiable in the following 11 MSs: Austria, Belgium, the Czech Republic, Estonia (only *Campylobacter jejuni* (*C. jejuni*)), Germany, Italy, Latvia, the Netherlands, Slovakia, Slovenia and Spain. *Campylobacter* is also notifiable in Iceland and Norway. Information on *Campylobacter* notification was not provided from Bulgaria, Cyprus, France, Lithuania, Luxembourg, Malta, Poland, Portugal and Romania. At processing, cutting and retail, sampling was predominantly carried out on fresh meat. Food samples were collected in several different contexts, i.e. continuous monitoring or control programmes, surveys and as part of HACCP programmes implemented within the food industry. Samples reported as HACCP or own controls were not included for analysis and, unless stated differently in the specific chapter, data from suspect and selective sampling and outbreak or clinical investigations were also excluded.

Animals

Campylobacter is notifiable in *Gallus gallus* in the Czech Republic, Finland, Slovenia, Iceland and Norway, in cattle in Germany and in all animals in Belgium, Estonia (only *C. jejuni*), Ireland, Latvia, Lithuania, the Netherlands, Spain and Switzerland. Information on *Campylobacter* notification was not provided from Bulgaria, Cyprus, France, Malta and Poland. The most frequently used methods for detecting *Campylobacter* in animals at farm, slaughter and in foodstuffs were bacteriological methods ISO 10272[65] and

65 ISO (International Organization for Standardization), 2006. ISO 10272 Microbiology of food and animal feeding stuffs - Horizontal method for detection and enumeration of *Campylobacter* spp.

NMKL 119[66] well as PCR methods. In some countries, isolation of the organism is followed by biochemical tests for speciation. For poultry sampled prior to slaughter, faecal material was collected either as cloacal swabs or as sock samples (faecal material collected from the floor of poultry houses by pulling gauze over footwear and walking through the poultry house). At slaughter, several types of samples were collected, including cloacal swabs, caecal contents and/or neck skin.

5.3.3. *Listeria* data

Humans

The notification of listeriosis in humans is mandatory in most MSs, Iceland, Norway and Switzerland, except for three MSs, where notification is based on a voluntary system (Belgium, Spain, and the United Kingdom). No surveillance system exists in Portugal. The estimated coverage of the surveillance system for listeriosis in Spain is 25 %, and this population proportion was used in the calculation of notification rates. Diagnosis of human infections is generally done by culture from blood, cerebro-spinal fluid and vaginal swabs.

Foodstuffs

Notification of *Listeria* in food is required in 12 MSs (Austria, Belgium, Estonia, France, Germany, Hungary, Italy, Latvia, the Netherlands, Slovakia, Slovenia and Spain); however, several other MSs reported data. Commission Regulation (EC) No 2073/2005 on microbiological criteria for foodstuffs lays down food safety criteria for *L. monocytogenes* in ready-to-eat (RTE) foods. This Regulation came into force in January 2006. Surveillance in RTE foods was performed in most MSs. However, owing to differences in sampling and analytical methods, comparisons from year to year were difficult.

5.3.4. VTEC data

Humans

The notification of VTEC infections is mandatory in most MSs, Iceland, Norway and Switzerland, except for six MSs, where notification is based on a voluntary system (Belgium, France, Italy, Luxembourg and Spain) or other system (the United Kingdom). No data were reported from Liechtenstein and no surveillance system exists in Portugal. In France, the VTEC surveillance is centred on paediatric HUS surveillance. Diagnosis of human gastrointestinal infections is generally done by culture from human stool samples.

Foodstuffs and animals

VTEC is notifiable in food in 11 MSs (Austria, Belgium, Estonia, Germany, Italy, Latvia, the Netherlands, Romania, Slovakia, Slovenia and Spain) and in animals in nine MSs (Belgium, the Czech Republic, Estonia, Finland, Latvia, Lithuania, Slovenia, Spain and Sweden). Information on the notification of VTEC was not provided from Bulgaria, Cyprus, the Czech Republic, Denmark, Greece, Hungary, Lithuania, Malta, Poland, Portugal and Switzerland for food, and from Bulgaria, Cyprus, France, Germany, Greece, Ireland, Malta, Poland, Portugal and Romania for animals.

Samples were collected in a variety of settings, such as slaughterhouses, cutting plants, dairies, wholesalers and at retail level, and included different types of samples such as carcass surface swabs, cuts of meats, minced meat, milk, cheese, and other products. The majority of investigated products were raw but intended to undergo preparation before consumption. The samples were taken as part of official control and monitoring programmes as well as random national surveys. The number of samples collected and types of food sampled varied among individual MSs. Most of the animal samples were collected at the slaughterhouse or at the farm.

66 NMKL (Nordisk Metodikkomité for Næringsmidler- Nordic Committee on Food Analysis), 2007. NMKL 119. Thermotolerant *Campylobacter*. Detection, semi-quantitative and quantitative determination in foods and drinking water.

5.3.5. *Yersinia* data

Humans

Notification of yersiniosis in humans is mandatory in most MSs, Norway and Switzerland. Four MSs (Belgium, France, Italy and Spain) have a voluntary notification system and the United Kingdom has another system. No data were reported from Greece or the Netherlands and no surveillance system exists in Portugal and Iceland. The estimated coverage of the national surveillance for yersiniosis is 25 % in Spain, and this population proportion was used in the calculation of notification rates. Diagnosis of human gastrointestinal infections is generally done by culture from human stool samples.

Foodstuffs and animals

Yersinia is notifiable in food in 10 MSs (Austria, Belgium, Estonia, Germany, Italy, Latvia, the Netherlands, Slovakia, Slovenia and Spain), and in animals in seven MSs (Belgium, Ireland, Latvia, Lithuania, the Netherlands, Slovenia and Spain) and Switzerland. Information was not provided from Bulgaria, Cyprus, the Czech Republic, Denmark, France, Greece, Hungary, Lithuania, Malta, Portugal, Romania and Switzerland for food, and from Bulgaria, Cyprus, France, Germany, Greece, Malta and Poland for animals. Primarily, domestic animals were tested. Detailed data from 2011 are not presented in the report, but detailed information on the data reported on the occurrence of *Yersinia* in food and animals can be found in the level 3 tables. The reporting of specific human pathogenic serotypes/biotypes found in food and animals is often lacking and differences in sampling and analytical methods make comparison between countries difficult.

5.3.6. Tuberculosis data

Humans

The notification of tuberculosis in humans is mandatory in almost all MSs, Iceland, Norway and Switzerland. The type of surveillance system in Lithuania is unknown. In France, the notification system for human tuberculosis does not distinguish between tuberculosis cases caused by different species of *Mycobacterium* and in Greece only cases due to *Mycobacterium tuberculosis (M. tuberculosis*) are reported. Therefore, no reporting of cases due to *M. bovis* is available from these two countries.

Animals

Tuberculosis in animals is notifiable in 25 MSs, Norway and Switzerland (information was not provided from Bulgaria and Malta). In Cyprus, Greece, Hungary, Poland and Romania only bovine tuberculosis is notifiable, and in Ireland only tuberculosis in ruminant animals is notifiable. Rules for intra-EU bovine trade, including requirements for cattle herds and country qualification as officially free from tuberculosis, are laid down in Council Directive 64/432/EC, as last amended by Commission Decision 2007/729/EC.[67] By the end of 2011, 15 MSs (Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Latvia, Luxembourg, the Netherlands, Poland, Slovakia, Slovenia and Sweden), Switzerland and Norway were officially bovine tuberculosis free (OTF). In Iceland, which has no special agreement concerning animal health (status) with the EU, the last outbreak of bovine tuberculosis was in 1959. In the United Kingdom, Scotland is OTF, and in Italy 13 provinces and six regions have now been declared OTF. In 2011, eradication programmes in cattle herds in Ireland, Italy, Portugal, Spain and the United Kingdom received co-financing (Commission Decision 2010/712/EC).

67 Commission Decision 2007/729/EC of 7 November 2007 amending Council Directives 64/432/EEC, 90/539/EEC, 92/35/EEC, 92/119/EEC, 93/53/EEC, 95/70/EC, 2000/75/EC, 2001/89/EC, 2002/60/EC, Decisions 2001/618/EC and 2004/233/EC as regards lists of national reference laboratories and State institutes. OJ L 294, 13.11.2007, pp. 26–35.

5.3.7. *Brucella* data

Humans

The notification of brucellosis in humans is mandatory in almost all MSs, Iceland, Norway and Switzerland. Belgium has a voluntary system and the United Kingdom has a different surveillance system. Brucellosis is not notifiable in Denmark.

Foodstuffs

The notification of *Brucella* in food is mandatory in 10 MSs (Austria, Belgium, Finland, Germany, Italy, Latvia, the Netherlands, Slovenia, Spain and the United Kingdom). Information was not provided from Bulgaria, Cyprus, the Czech Republic, Denmark, France, Greece, Lithuania, Luxembourg, Malta, Poland, Portugal, Romania, Slovakia and Switzerland.

Animals

Brucellosis in animals is notifiable in 24 MSs, Norway and Switzerland (information was not provided from Bulgaria, Cyprus and Malta).

Cattle: Rules for intra-EU bovine trade, including requirements for cattle herds and country qualification as officially free from brucellosis, are laid down in Council Directive 64/432/EC, as last amended by Commission Decision 2007/729/EC. By the end of 2011, 15 MSs (Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Ireland, Luxembourg, the Netherlands, Poland, Slovakia, Slovenia and Sweden), Norway and Switzerland, were officially free from brucellosis in cattle (OBF). Moreover, in the non-MS Iceland, which has no special agreement concerning animal health (status) with the EU, brucellosis (*Brucella abortus* (*B. abortus*), *B. melitensis, B. suis*) has never been reported. OBF regions have been declared in Italy (10 regions and nine provinces), Portugal (six Islands of the Azores), Spain (two provinces of the Canary Islands) and in the United Kingdom (Great Britain, and Isle of Man). In 2011, eradication programmes in cattle herds in Cyprus, Italy, Portugal, Spain and the United Kingdom (Northern Ireland) received co-financing (Commission Decision 2010/712/EC).

Sheep and goats: Rules for intra-EU trade of ovine and caprine animals and country qualification as officially free from ovine and caprine brucellosis, caused by *B. melitensis* (ObmF) are laid down in Council Directive 91/68/EEC,[68] as last amended by Council Directive 2008/73/EC.[69] By the end of 2011, 19 MSs (Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Latvia, Lithuania, Luxembourg, the Netherlands, Poland, Romania, Slovakia, Slovenia, Sweden and the United Kingdom), Norway and Switzerland, were officially free from ovine and caprine brucellosis caused by *B. melitensis* (ObmF). Moreover, in the non-MS Iceland, which has no special agreement concerning animal health (status) with the EU, brucellosis (*B. abortus, B. melitensis, B. suis*) has never been reported. ObmF regions have been declared in France (64 departments), Italy (12 regions and nine provinces ObmF), Portugal (the Azores) and Spain (two provinces of the Canary Islands and the Balearic Islands). In 2011, eradication programmes for ovine and caprine brucellosis in Cyprus, Greece, Italy, Portugal and Spain received co-financing (Commission Decision 2010/712/EC).

5.3.8. *Trichinella* data

Humans

The notification of *Trichinella* infections in humans is mandatory in most MSs, Norway and Switzerland but not in Denmark. Three MSs (Belgium, France and the United Kingdom) have a voluntary surveillance system for trichinellosis. No surveillance system for trichinellosis exists in Iceland. In humans, diagnosis of *Trichinella* infections is primarily based on clinical symptoms and serology (Enzyme Linked Immunosorbent Assay (ELISA) and Western Blot). Histopathology on muscle biopsies is rarely performed.

---

68 Council Directive 91/68/EEC of 28 January 1991 on animal health conditions governing intra-Community trade in ovine and caprine animals. OJ L 46, 19.2.1991, pp. 19–36.

69 Council Directive 2008/73/EC of 15 July 2008 simplifying procedures of listing and publishing information in the veterinary and zootechnical fields and amending Directives 64/432/EEC, 77/504/EEC, 88/407/EEC, 88/661/EEC, 89/361/EEC, 89/556/EEC, 90/426/EEC, 90/427/EEC, 90/428/EEC, 90/429/EEC, 90/539/EEC, 91/68/EEC, 91/496/EEC, 92/35/EEC, 92/65/EEC, 92/66/EEC, 92/119/EEC, 94/28/EC, 2000/75/EC, Decision 2000/258/EC Directives 2001/89/EC, 2002/60/EC and 2005/94/EC. OJ L 219, 14.8.2008, pp. 40–54.

Foodstuffs and animals

Trichinella in foodstuffs is notifiable in 16 MSs and Norway. Ireland and Switzerland report that *Trichinella* is not notifiable. Information was not provided from Bulgaria, Cyprus, the Czech Republic, Denmark, Latvia, Lithuania, Luxembourg, Malta, the Netherlands and Poland.

Trichinella infections in animals are notifiable in most MSs except Hungary (information was not provided from Bulgaria and Malta).

Rules for testing for *Trichinella* in slaughtered animals are laid down by Commission Regulation (EC) No 2075/2005. In accordance with this Regulation, all finisher pigs, sows, boars, horses, wild boars and some other wild species must be tested for *Trichinella* at slaughter. The Regulation allows MSs to apply for status as a region with negligible risk of *Trichinella* infestation in animals. Denmark is the only MS to have been assigned this status. Some MSs reported using digestion and compression methods as described in Council Directive 77/96/EEC.[70]

5.3.9. *Echinococcus* data

Humans

Cases of both cystic and alveolar echinococcosis are reported jointly to ECDC as echinococcosis since the EU case definition does not distinguish between the two forms of the disease. ECDC can differentiate between the two forms in the data only by analysing the reported species, which was done whenever possible. The notification of echinococcosis in humans is mandatory in most MSs and Norway but not in Denmark. Four MSs (Belgium, France, the Netherlands and the United Kingdom) have a voluntary surveillance system for echinococcosis. Italy has no surveillance system for echinococcosis while no data were reported by Iceland.

Foodstuffs and animals

Echinococcus is notifiable in food in 11 MSs (Austria, Belgium, Estonia, Finland, Hungary, Italy, Latvia, the Netherlands, Slovenia, Spain and Sweden) and Norway and not notifiable in food in Ireland, Slovakia and the United Kingdom. Information was not provided from Bulgaria, Cyprus, the Czech Republic, Denmark, France, Greece, Germany Lithuania, Luxembourg, Malta, Poland, Portugal, Romania and Switzerland. *Echinococcus* is notifiable in animals in 18 MSs (Austria, Belgium, Denmark, Estonia, Finland, Germany, Greece, Italia, Latvia, Lithuania, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom), Norway and Switzerland and not notifiable in animals in the Czech Republic, France, Hungary and Luxembourg (information was not provided from Bulgaria, Cyprus, Ireland, Malta and Poland).

Guidelines for the control of *Echinococcus granulosus* (*E. granulosus*) through meat inspection of animal carcases for human consumption are provided through Council Directive 64/433/EC,[71] whereby visual inspection of all slaughtered animals is carried out by official veterinarians examining organs and muscles intended for human consumption. Whole carcasses or organs are destroyed in cases where *Echinococcus* cysts are found.

5.3.10. Rabies data

Humans

The notification of rabies in humans is mandatory in most MSs, Iceland, Norway and Switzerland. Belgium has a voluntary notification system and the United Kingdom has another system. Most countries examine human cases based on blood samples or cerebrospinal fluid, and saliva. However, in the case of post-mortem examinations, the central nervous system is sampled. Identification is mostly based on antigen detection, viral genome detection by RT-PCR and/or isolation of virus.

---

70 Council Directive 77/96/EEC of 21 December 1976 on the examination for trichinae (*Trichinella spiralis*) upon importation from third countries of fresh meat derived from domestic swine. OJ L 26, 31.1.1977, pp. 67–77.

71 Council Directive 64/433/EC of 26 June 1964 on health problems affecting intra-Community trade in fresh meat. OJ L 121, 29.7.1964, pp. 2012–2032.

Animals

Rabies is a notifiable disease in all MSs. In animals, most countries test samples from the central nervous system. Identification is mostly carried out using the fluorescent antibody test (FAT), which is recommended by both WHO[72] and OIE[73], and the mouse inoculation test. However, Enzyme Linked Immunosorbent Assay (ELISA), Polymerase Chain Reaction (PCR), and histology are also used.

5.3.11. Data on food-borne outbreaks

Food-borne outbreaks are incidents of two or more human cases of the same disease or infection in which the cases are linked or are probably linked to the same food vehicle. Situations in which the observed human cases exceed the expected number of cases and where the same food source is suspected are also indicative of a food-borne outbreak.

Information on the total number of food-borne outbreaks (including both 'weak evidence' and 'strong evidence' food-borne outbreaks) and the total number of strong food-borne outbreaks that occurred during the reporting year was provided by 25 MSs and two non-MSs. Cyprus and Luxembourg did not report any outbreaks. For 'weak evidence' food-borne outbreaks, the causative agent, as well as the number of human cases, hospitalisations and deaths, should be reported. For the 'strong evidence' food-borne outbreaks, an additional table is provided to collect more detailed information, including food vehicle and its origin, nature of evidence linking the outbreak cases to the food vehicle, type of outbreak, setting, place of origin of the problem and contributory factors. All food-borne outbreaks are included in the general tables and figures. In subsequent sections, outbreaks are presented in more detail and categorised by the causative agent, but excluding strong evidence waterborne outbreaks. All strong evidence waterborne outbreaks are addressed in a separate section (Section 4.13). The denominators used for the calculation of the reporting rates were the human populations from the EUROSTAT as extracted on 23 June 2012.

5.4. Terms used to describe prevalence or proportion-positive values

In the report a set of standardised terms are used to characterise the proportion of positive sample units or the prevalence of zoonotic agents in animals and foodstuffs:

- Rare: <0.1 %
- Very low: 0.1 % to 1 %
- Low: >1 % to 10 %
- Moderate: >10 % to 20 %
- High: >20 % to 50 %
- Very high: >50 % to 70 %
- Extremely high: >70 %

- Majority of MSs: 60 % (in 2011 this was 16 MSs)
- Most MSs: 75 % (in 2011 this was 20 MSs)

72 WHO (World Health Organization), 1996. Laboratory Techniques in Rabies, 493 pp.

73 OIE (Organisation Mondiale de la Santé Animale - World Organisation for Animal Health), 2009. Manual of Diagnostic Tests and Vaccines for Terrestrial Animals.

APPENDIX - APPENDIX 1.

List of abbreviations

Abbreviation	Definition
AHAW	EFSA Panel on Animal Health and Welfare
BIOHAZ	EFSA Panel on Biological Hazards
CFU	colony-forming unit
CI	confidence Interval
CONTAM	EFSA Panel on Contaminants in the Food Chain
DT	definitive phage type
EAEC	enteroaggressive *Escherichia coli*
EBLV	European bat *Lyssavirus*
EC	European Commission
ECDC	European Centre for Disease Prevention and Control
EEA	European Economic Area
EEC	European Economic Community
EFSA	European Food Safety Authority
EFTA	European Free Trade Association
EHEC	enterohaemorragic *Escherichia coli*
ELISA	enzyme-linked immunosorbent assay
EPEC	enteropathogenic *Escherichia coli*
EU	European Union
FAT	fluorescent antibody test
g	gram
HACCP	hazard analysis and critical control point
HUS	Haemolytic–Uraemic Syndrome
ISO	International Organization for Standardization
MS	Member State
NMKL	Nordic Committee on Food Analysis
NRL	National Reference Laboratory
NT	not typeable
OBF	officially brucellosis free specification, e.g. ‘as regards bovine herds’
ObmF	officially *Brucella melitensis* free specification, e.g. ‘as regards ovine and caprine’ herds
OIE	World Organisation for Animal Health
OTF	officially tuberculosis free specification, e.g. ‘as regards bovine herd’
PCR	polymerase chain reaction
RABV	rabies virus
RTE	ready-to-eat
SLT-PCR	Shiga-like polymerase chain reaction
spp.	subspecies
STEC	Shiga toxin-producing *Escherichia coli*
TESSy	The European Surveillance System
UHT	ultra-high temperature
VTEC	verotoxigenic *Escherichia coli*
WHO	World Health Organization

Member States of the European Union and other reporting countries in 2011

Member States of the European Union, 2011

Member State	ISO Country Abbreviations
Austria	AT
Belgium	BE
Bulgaria	BG
Cyprus	CY
Czech Republic	CZ[1]
Denmark	DK
Estonia	EE
Finland	FI
France	FR
Germany	DE
Greece	GR
Hungary	HU
Ireland	IE
Italy	IT
Latvia	LV
Lithuania	LT
Luxembourg	LU
Malta	MT
Netherlands	NL[1]
Poland	PL
Portugal	PT
Romania	RO
Slovakia	SK
Slovenia	SI
Spain	ES
Sweden	SE
United Kingdom	UK[1]

1. In text, referred to as the Czech Republic, the Netherlands and the United Kingdom.

Non Member States reporting in 2011

Country	ISO Country Abbreviations
Iceland	IS
Norway	NO
Switzerland	CH