EUROPEAN CENTRE FOR DISEASE PREVENTION AND CONTROL

SURVEILLANCE REPORT

Surveillance of seven priority food- and waterborne diseases in the EU/EEA

2010–2012

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This report was commissioned by the European Centre for Disease Prevention and Control (ECDC), coordinated by Taina Niskanen, the Food- and Waterborne Diseases and Zoonoses Programme.

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This report was sent for consultation to the members of the Food- and Waterborne Diseases and Zoonoses Network.

Acknowledgements

The ECDC Food- and Waterborne Diseases Programme would like to thank all of those who – at different stages of the process – contributed to this report, both in the Member States and here at ECDC, particularly the members of the Food- and Waterborne Diseases and Zoonoses Network, who provided the data and reviewed the report. Chantal Quinten (ECDC) is acknowledged for supporting the TSA analysis, and Virginia Estevez (ECDC) for producing the maps used in this report.

Suggested citation: European Centre for Disease Prevention and Control. Surveillance of seven priority food- and waterborne diseases in the EU/EEA. Stockholm: ECDC; 2015.

Stockholm, April 2015

ISBN 978-92-9193-630-4

doi 10.2900/509146

Catalogue number TQ-02-15-289-EN-N

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Abbreviations

AER	Annual epidemiological report
ECDC	European Centre for Disease Prevention and Control
EEA	European Economic Area
EFSA	European Food Safety Authority
EPIS	Epidemic Intelligence Information System
EU	European Union
EUSR	European Union Summary Report on Trends and Sources of Zoonoses, Zoonotic Agents and Foodborne Outbreaks
FWD	Food- and waterborne diseases and zoonoses
HUS	Haemolytic-uraemic syndrome
RTE	Ready-to-eat (processed) food
STEC/VTEC	Shiga toxin/verocytotoxin-producing *Escherichia coli*
TESSy	The European Surveillance System

Country codes

AT	Austria
BE	Belgium
BG	Bulgaria
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
EL	Greece
ES	Spain
FI	Finland
FR	France
HU	Hungary
HR	Croatia
IE	Ireland
IS	Iceland
IT	Italy
LT	Lithuania
LU	Luxembourg
LV	Latvia
MT	Malta
NL	The Netherlands
NO	Norway
PL	Poland
PT	Portugal
RO	Romania
SE	Sweden
SI	Slovenia
SK	Slovakia
UK	United Kingdom

Summary

This surveillance report on seven priority food- and waterborne diseases is the second dedicated epidemiological report for campylobacteriosis, listeriosis, non-typhoidal salmonellosis, shigellosis, Shiga toxin/verocytotoxin-producing *Escherichia coli* (STEC/VTEC) infections, typhoid and paratyphoid fever, and yersiniosis, offering detailed analyses of these diseases in the European Union (EU) and European Economic Area (EEA) for the years 2010 to 2012. This report is intended for policymakers and health sector leaders, epidemiologists, scientists, food safety professionals and the wider public. It is hoped that readers will find it a useful overview and reference to better understand the present situation in relation to these diseases in Europe.

The surveillance of 21 food-and waterborne diseases and zoonoses is carried out under the auspices of the European Centre for Disease Prevention and Control (ECDC), Programme of Food- and Waterborne Diseases and Zoonoses (FWD). For the seven priority diseases, surveillance has been developed further in close collaboration with nominated disease experts, epidemiologists and microbiologists since 2007. Each year, improvements in the harmonisation of systems, definitions, protocols and data at Member State and at EU/EEA level are observed. Nevertheless, data provided by the EU Member States and EEA reflect differences in ascertainment by national surveillance systems as well as disease incidence, and as such, comparisons of raw numbers and rates cannot be relied upon as a true reflection of differences in epidemiology between countries. In this report, some country-specific data are presented, however the stronger focus is on the overall EU/EEA level trends based on the confirmed data from reporting countries.

Campylobacteriosis continued to be the most commonly reported zoonosis, with 662 521 confirmed cases and an average notification rate of 67 per 100 000 population in 2010–2012. The number of confirmed cases of campylobacteriosis in the EU/EEA has followed an increasing trend in the last five years (2008–2012), with a clear seasonality and peaking of cases in June–August. The majority (about 90%) of *Campylobacter* infections were acquired in EU/EEA countries. Of the two most commonly reported species, *C. jejuni* remained stable, while *C. coli* increased significantly in 2008–2012.

A significant increasing trend in domestically acquired listeriosis cases was reported at EU/EEA level between 2008 and 2012. In 2010–2012, 4 851 listeriosis cases were reported, representing an average rate of 0.35 cases per 100 000 population. Surveillance of listeriosis has a focus on invasive cases and 94% of the cases with available data were hospitalised and a high case fatality rate (16%) was reported during the three-year period described in this report. A total of 517 deaths due to listeriosis were reported in 2010–2012. Infections are almost solely acquired domestically. Less than 2% of the listeriosis cases were travel-related, most often from another EU country. Reported human listeriosis cases in 2010–2012 were most frequently associated with serotypes 1/2a and 4b. There was increase in notification rates of listeriosis in age group older than 65 years.

Reporting of non-typhoidal salmonellosis cases continued decreasing and dropped by 10 013 cases between 2010 and 2012, representing a reduction of 10%. A total of 291 806 confirmed cases were reported in 2010–2012 (average notification rate: 21.5 cases per 100 000 population). A statistically significant decreasing trend was observed over the period 2008–2012. The decrease was particularly noticeable in domestic cases due to the two most common serotypes; *Salmonella* Enteritidis and *S.* Typhimurium. *Salmonella* infections were mostly acquired in the EU/EEA (83% of all cases).

A stable trend in the number of confirmed shigellosis cases was observed from 2008 to 2012. The average notification rate of shigellosis was 1.8 per 100 000 population, with 21 969 reported cases in 2010–2012. Shigellosis is not endemic in the EU/EEA countries, and two thirds of the reported cases between 2010 and 2012 were travel-related from countries outside the EU/EEA. *Shigella sonnei* was the most commonly reported species (56% of total species reported) in 2010–2012, followed by *S. flexneri* (33% of total species reported). The trend in the number of *S. flexneri* cases significantly increased during 2008–2012.

STEC/VTEC infections showed a significantly increasing trend over the five-year surveillance period from 2008—2012. Even without counting the cases reported in the large STEC/VTEC O104:H4 outbreak in Germany in 2011, the STEC/VTEC trend was significantly increasing in 2008–2010 before the outbreak. In 2010–2012, 18 995 confirmed STEC/VTEC cases (1.7 cases per 100 000 population) were reported. The number of cases reported in 2012 increased by 55% (2 037 cases) compared with 2010. An increasing number of reports of confirmed STEC/VTEC cases is possibly an effect of increased awareness and improved capacity in the EU/EEA countries following the outbreak. Of those isolates in which the serogroup was known, most were serogroup O157 (55%). The five most common STEC/VTEC serotypes reported in 2010–2012 were: O157:H7 (26%), O157:H- (10%), O104:H4 (6.1%), O26:H11 (5.8%) and O103:H2 (5.7%). Almost 90% of the STEC/VTEC infections were of domestic origin.

Reporting of typhoid fever cases decreased significantly between 2008 and 2012, with a notification rate of 0.13 cases per 100 000 population (532 reported cases) in 2012. The same was observed for paratyphoid fever, although slightly fewer cases were (N=430) reported in 2012. Typhoid and paratyphoid fever are diseases largely

(> 85%) related to travel to countries outside the EU/EEA. The most frequently reported form of antimicrobial resistance in typhoid and paratyphoid fever infections was against nalidixic acid (>70% strains resistant).

Yersiniosis showed a constant decreasing five-year trend in 2008–2012. The average notification rate in 2010–2012 was 2.1 cases per 100 000 population with 20 477 confirmed cases reported in the EU/EEA in 2010–2012. Yersinia infections are almost entirely of domestic origin, with 98% of cases reported as domestically acquired. The reduction in cases was mainly seen in *Y. enterocolitica* infections; the most commonly (> 95%) reported species. The most commonly reported *Y. enterocolitica* serotype in the EU/EEA was O:3 (88%), showing a significant decreasing trend since 2008.

For most of the priority diseases, the case–fatality rate was below 1%, except for listeriosis, for which the average case–fatality rate was 16% between 2010 and 2012. Despite the relatively low number of cases caused by *Listeria*, compared with the number of e.g. campylobacteriosis and salmonellosis cases, listeriosis is considered an important food-borne infection because of the severity of the illness and the high case–fatality rate.

Of special concern are *Listeria* infections among the elderly. Hospital-related outbreaks remain a significant patient safety concern and they underscore the high infection risk related to processed, ready-to-eat (RTE) foods in settings where vulnerable population groups are served, for example in hospitals and homes for the elderly. The trend of listeriosis cases increased sharply among the elderly, particularly in men older than 65 years of age. Awareness should be increased about the listeriosis risk connected to RTE foods in risk groups. Although the proportion of food samples exceeding the legal EU food safety limit for *L. monocytogenes* has been low, the possible presence of the bacteria in food may be still a concern for public health.

Introduction

The European Centre for Disease Prevention and Control (ECDC) is an EU agency [1] with a mandate to operate surveillance networks and to identify, assess, and communicate current and emerging threats to human health from communicable diseases. Data on 52 communicable diseases reported by Member States are entered in ECDC's database system, known as The European Surveillance System (TESSy). Epidemiological overviews of all diseases are provided in the ECDC's Annual Epidemiological Report.

The surveillance of salmonellosis, campylobacteriosis and Shiga toxin/verocytotoxin-producing *Escherichia coli* (STEC/VTEC) infections was carried out until 2007 by an EU-funded dedicated surveillance network, Enter-net. In October 2007, the coordination of Enter-net was transferred to ECDC under of the Programme of Food- and Waterborne Diseases and Zoonoses (FWD). After the transfer of Enter-net to ECDC, the scope of enhanced surveillance was broadened to cover three additional bacterial enteric diseases: listeriosis, yersiniosis, and shigellosis. A new network for priority diseases was established: the ECDC Food- and Waterborne Diseases Network (FWD-Net). Efforts to identify multinational foodborne outbreaks included the creation of an information exchange platform called EPIS (Epidemiological Information Sharing), which is available to network members and other key experts working with food- and waterborne diseases in all EU/EEA and some non-EU countries.

ECDC produces an annual epidemiological report (AER) on all diseases that are to be covered by EU-wide surveillance [2] as per Commission Decisions 2119/98/EC, 2000/96/EC and their amendments. In addition, ECDC analyses human data for several zoonoses. The results are combined with food and animal data into an annual `European Union Summary Report on Trends and Sources of Zoonoses, Zoonotic Agents and Food-borne Outbreaks', published jointly with the European Food Safety Authority (EFSA) [3]. ECDC and EFSA also publish an `EU Summary Report on antimicrobial resistance in zoonotic and indicator bacteria obtained from humans, animals and food' [4]; ECDC provides the analyses of human data with regard to antimicrobial resistance of *Campylobacter* and non-typhoidal *Salmonella*.

This is the second ECDC surveillance report covering enhanced surveillance of seven priority food- and waterborne diseases. The first surveillance report for these diseases covered years 2006–2009 and it is available on the ECDC website [5]. The second report (called seven priority disease report since salmonellosis data are shown separately for non-typhoidal salmonellosis and typhoid/paratyphoid fever cases) provides an in-depth epidemiological overview of priority diseases as defined in the strategy (2010–2013) for ECDC's FWD programme [6]. The report was further developed based on comments from Member States during the consultation on the first report and additional and more detailed analyses have been included. The report is produced within the framework of an approved long-term surveillance strategy (2008–2013) [7].

The report's intended readership includes public health and food safety professionals, policymakers, scientists, and the general public. The content of the report will be regularly reviewed by ECDC's network of nominated experts on food- and waterborne diseases and zoonoses (FWD network) to allow continuous improvement. The report also focuses on findings that provide useful information for public health experts in EU/EEA countries who need to prepare short- and long-term prevention and control activities.

Data collection and analyses

Reporting to the European Surveillance System

Data on food- and waterborne diseases (FWD) and Zoonoses is reported to ECDC's database system, The European Surveillance System (TESSy), by all Member States and three EEA countries (Iceland, Liechtenstein and Norway). This report focuses on the analyses of disease-specific variables in addition to a dataset of 27 variables common to all diseases.

Table 1 presents the variables common for the seven priority diseases. All additional disease-specific variables and their descriptions are provided in the respective disease-specific chapters. The aim of this report is to summarise additional descriptive information in tables and graphs not previously published in other ECDC publications. In general, the case numbers have been checked to be compatible with published data but slight variations may occur due to differences in the timing of data collection and validation. The TESSy data analysis in this report presents the epidemiological situation for the seven priority diseases as of 3 September 2013.

Table 1. TESSy definition of common variables for seven priority diseases (campylobacteriosis, listeriosis, non-typhoidal salmonellosis, shigellosis, STEC/VTEC infection, typhoid and paratyphoid fever and yersiniosis)

Variable	Definition in TESSy
Age	Age of patient as reported in the national system
Classification	Case classification according to EU case definition
Clinical criteria	The criteria for a clinical picture of the disease are met
DateOfReceiptReferenceLab	Date of receipt in reference laboratory.
DateOfReceiptSourceLab	Date (YYYY-MM-DD or YYYY-ww or YYYY-MM or YYYY-Qq or YYYY), UNK.
DataSource	The data source (surveillance system) from which the record originates
DateOfDiagnosis	First date of clinical or lab diagnosis. In case DateofOnset is missing, this timestamp is used.
DateOfNotification	Date when the case report is notified the first time to the place of notification
DateOfOnset	Date of onset of disease. Not applicable (N/A) in asymptomatic cases. If not applicable, please use 'Unk'
DateUsedForStatistics	The reference date used for standard reports that is compared with the reporting period. The date used for statistics can be any date that the reporting country finds applicable, e.g. date of notification, date of diagnosis, or any other date. Accepted formats for this record type: yyyy, yyyy-Qq, yyyy-mm, yyyy-ww, yyyy-mm-dd.
EpiLinked	The criteria for an epidemiological diagnosis of the disease are met
Sex	Sex of the infected person
Hospitalisation	Hospitalisation of a case due to the cause of the disease.
Imported	Having been outside the country of notification during the incubation period of the reported disease.
Laboratory result	Laboratory criteria used to classify a case as confirmed or probable
Outcome	Information if the case is alive or deceased. The death should be due to the reported disease
PlaceOfNotification	Place of notification of patient. Select the most detailed NUTS level possible.
PlaceOfResidence	Place of residence of patient. Select the most detailed NUTS level possible.
Probable country of infection	If Imported=Yes: one entry for each country/region visited during the incubation period of the disease. The variable is repeatable in case several countries/regions were visited.
RecordId	Unique identifier for each record within and across the national surveillance system –*Member State*-selected and -generated
RecordType	Structure and format of the data (case-based reporting and aggregate reporting)
RecordTypeVersion	There may be more than one version of a recordType. This element indicates which version the sender uses when generating the message. Required when no metadata set is provided at upload.
ReportingCountry	The country reporting the record
Status	Status of reporting NEW/UPDATE or DELETE (inactivate)
Suspected vehicle	Suspected vehicle or source of infection.
Subject	Disease to report
Transmission	Suspected main mode of transmission.

Data are reported as case-based data or in an aggregated form. Countries report the data mainly from the National Surveillance Centres. For some diseases, additional laboratory data are reported from national reference laboratories (e.g. data on antimicrobial resistance). An overall description of national surveillance systems is provided in the disease-specific chapters.

Due to a wide variation in underlying factors that affect surveillance systems, comparisons between crude notification rates by countries have not been done. National surveillance systems vary by Member States and one should take into account such factors as the transition time to implement EU case definitions, variations in the countries' capacity to capture the requested information in their national systems, variations in population coverage, and obligations to report data to national bodies.

The data call for the surveillance report is made every year in May to ensure that the same validated data are used for the European Food Safety Authority's (EFSA) EU summary reports and ECDC's Annual epidemiological report and FWD surveillance reports. In supplementing the annual data call, countries are invited to report data on salmonellosis and STEC/VTEC infections on a quarterly basis to provide other Member States with a more timely feedback on newly emerging trends or recent changes in epidemiology.

EU case definitions

The EU case definitions for all 49 diseases were published on 28 April 2008 [8] (Commission Decision 2002/253/EC) and amended 8 August 2012 [9] (Commission Decision 2012/506/EU). The year 2009 was a transition period and EU case definitions were expected to be used starting on 1 January 2010. Countries have been encouraged to adapt their reporting to TESSy accordingly to the revised EU case definitions. However, it is acknowledged that adapting national surveillance systems to EU case definitions will require more time.

General objectives for food- and waterborne diseases and zoonoses surveillance

The following general objectives have been agreed for the surveillance of FWD and zoonoses at the EU level:

- facilitate early international outbreak detection and investigation of enteric pathogens through the rapid exchange of information on causative strains
- disseminate information on food- and waterborne outbreaks to support prevention and control actions and recommendations in the Member States
- strengthen the (inter)national collaboration between public health, food and veterinary sectors to support prevention and control of (inter)national FWD outbreaks.

In addition the following quality improvement objectives have been agreed for the FWD and zoonoses disease network(s):

- strengthen the integration of (laboratory) surveillance in humans, food and animals
- support identification of appropriate laboratory methods/techniques to enhance detection of international clusters and outbreaks due to international food trade
- strengthen capacity in the Member States to improve the laboratory detection of new and emerging FWD, including support for quality assessment and training in the methods.

Data analysis

Data are presented and analysed for confirmed cases only. All reported cases are included (both case-based and aggregated data included, where possible). Data from sentinel systems are excluded from the calculation of notification rates, unless the population covered is reported separately. Data from sentinel systems are included in analyses by number of cases. The 'month' variable used in the seasonality analyses is based on the date that the country chooses as its preferred date for reporting. This could be either date of onset of disease, date of diagnosis, date of notification, or some other date at the country's discretion. The summary tables of reported confirmed cases cover the data for 2010–2012. Trends were analysed for five-year period from 2008–2012.

Reported or notified FWD cases represent only a small proportion of the total amount of FWD cases in a population. In addition, some countries have no surveillance system, while others have nationwide compulsory surveillance system in place. In some countries the surveillance system is voluntary and covers a subset of the population. If estimated population coverage was provided, it was used in the analyses.

The following country-specific estimated population coverage was used in this report:

- France
  - 20% population coverage for campylobacteriosis
  - 44% population coverage for shigellosis
- The Netherlands
  - 64% population coverage for non-typhoidal salmonellosis
  - 52% population coverage for campylobacteriosis
- Spain
  - 25% population coverage for campylobacteriosis, listeriosis, salmonellosis and yersiniosis

All analyses were conducted using STATA/SE 12.1 and STATA/SE 13.0 (TSA).

Trends over time

Routine surveillance data from TESSy were used to describe two components of the temporal pattern (secular trend and seasonality) of human zoonoses cases for the EU/EEA and by Member States taking into account the underlying population or subset of a population. Diseases were analysed by month of the date variables available (date used for statistics). For assessing the temporal trends at EU/EEA level and by Member States, moving averages were applied. Linear regression was applied where appropriate to test the significance of trends.

For the assessment of the overall EU/EEA trend and the trends in the countries, a significance level of 99% confidence interval was used. As the trend calculation is relatively sensitive, it may detect trends that are a reflection of noteworthy changes in the national surveillance system or it may be influenced by nationwide outbreaks. Therefore, it is important to consider any significant changes in the national surveillance systems that may have had an impact on trend analyses.

Data (number of confirmed cases and total or subset of population) at the country level were only included in the trend analysis when human cases were reported throughout the period 2008–2012.

Seasonal distribution

For all diseases, a figure showing the seasonality by species or/and by serotype (for all confirmed cases, domestic and travel-related) and by age-group is presented. This shows the total number of confirmed cases reported for each month in 2010, 2011 and 2012 compared with the maximum, minimum and average number of cases observed for each month for the period 2008–2009. These analyses include only countries reporting confirmed case-based cases consecutive for all five years in 2008–2012; for some diseases this can result in exclusion of significant numbers of cases. It will be noted that for some diseases, reported numbers are too small for some or all of the above analyses to be presented.

Notification rates

The notification rate for each year is calculated as the ratio between the number of confirmed cases per 100 000 inhabitants (per 1 million for *Salmonella* Typhi and *S.* Paratyphi) in the population as of 1 January for the respective year. Population data were extracted from the Eurostat database where totals per year and per country are available. For each displayed year, notification rates were calculated, with the exception of countries where the population coverage was unknown or the number of cases reported was incomplete. Populations of countries reporting zero cases were included.

Age groups

Age- and sex-specific rates for the EU/EEA Member States are presented and given per 100 000 persons. It should be noted that these analyses are based only on cases for which both age and sex were reported.

Previously, age group 0–4 years has presented with the highest rate of reported infections for most of the seven priority food- and waterborne diseases. For this report, the trends in notification rates for children in the age group below one year were analysed separately to see if there was any difference between this age group and the group of 1–4-year-olds.

Age group intervals of 10 years for listeriosis cases above 65 years of age were introduced to facilitate analysis. This is due to the fact that listeriosis cases increased sharply among the elderly, particularly in men over 85 years of age.

Severity

The severity was evaluated by analysing the hospitalisation ratio and the proportion of deaths due to particular infection among all confirmed cases. For VTEC/STEC, the proportion of haemolytic uraemic syndrome (HUS) cases, as well as the symptoms (diarrhoea) and number of cases of deaths in HUS cases vs. cases without HUS was also evaluated. Information about the specimen type used for diagnosis was reported for listeriosis, VTEC/STEC infections, non-typhoidal salmonellosis, as well as typhoid and paratyphoid fever cases. For listeriosis, occurrence of pregnancy-associated infections with adverse outcomes were analysed, along with the case–fatality ratio (CFR) by age-group and serotype. Acknowledging the differences in surveillance systems and reporting across Europe, relative confidence intervals (95%CI) were calculated when analysing the hospitalisation ratio, and CFR and results were described on a country basis. To estimate CFR, only countries that reported information on hospitalisation outcome (alive/dead) were included. Only cases with known outcome were considered, and CFR was calculated as the number of deaths/number of cases with known outcome.

Antimicrobial resistance

Since 2007, Member States have been asked to provide results on antimicrobial susceptibility testing (AST) of *Salmonella*, *Campylobacter* and STEC/VTEC isolates, in the form of final interpretation, regardless of the test method. The final interpretation is expressed as Susceptible (S), Intermediate (I) or Resistant (R) to a certain antimicrobial in accordance with protocols and clinical breakpoints used to interpret the results from antimicrobial susceptibility testing at the national, regional or local level. It was recommended that all European public health reference laboratories move to using EUCAST guidelines for interpretation of results on antimicrobial resistance. However, at present, different guidelines are used by European countries or laboratories and information on which guidelines and interpretive criteria were used for antimicrobial susceptibility testing in each country was not available.

In this report, the antimicrobial resistance results (AMR) are presented for *S.* Typhi, *S*. Paratyphi and STEC/VTEC isolates as they have been reported to TESSy. Antimicrobial resistance data were provided for 11 different agents. Data on the final interpretation of antimicrobial susceptibility (SIR) were presented by country. As a general rule, data are expressed as a percentage, i.e. the percentage of resistant isolates out of all isolates with antimicrobial susceptibility testing (AST) information. Number of isolates tested and proportion of resistant isolates are presented.

The human AMR data are published annually together with European Food Safety Agency (EFSA) in a European Summary report and to avoid duplication no AMR data for *Salmonella* (other serotypes than typhoidal) and *Campylobacter* is included in this report.

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1 Campylobacteriosis in the EU/EEA, 2010–2012

Campylobacteriosis

Campylobacteriosis is a diarrhoeal disease caused by bacteria of the genus *Campylobacter*. It is the leading cause of reported gastrointestinal infections in the EU/EEA. In campylobacter infections, the most commonly reported species are *C. jejuni* (93% of cases known data on species), followed by *C. coli* (6%) and *C. lari* (<1%). Adults are the most affected group, but the highest notification rate is seen in young children. Most infections are reported in the summer.

The symptoms of campylobacteriosis usually develop after an incubation period of 2–5 days and are manifested by severe abdominal pain, watery or bloody diarrhoea, and fever. Symptoms last from a few days up to two weeks, and the illness is usually self-limiting. Occasionally, symptoms may persist and require hospital care. Infection has been associated with complications such as joint inflammation (5–10% of cases) and, on rare occasions, Guillain–Barré syndrome, a severe paralysis, which without prompt treatment may result in death.

The infective dose of bacteria is very small and the infection is most commonly acquired through the consumption of contaminated food (especially raw or undercooked poultry, raw milk) or contaminated drinking water. Other risk factors include swimming in natural surface waters and direct contact with farm animals and infected pets.

More information can be found at the ECDC website [23].

Surveillance of campylobacteriosis in the EU/EEA in 2010–2012

ECDC coordinates the European surveillance of campylobacteriosis, in close collaboration with a network of nominated experts, epidemiologists and microbiologists from EU/EEA countries as part of the Food- and Waterborne Diseases and Zoonoses (FWD) Network.

The scope of campylobacteriosis surveillance is determined by the general surveillance objectives for food- and waterborne diseases (see Introduction), in combination with the EU case definition for campylobacteriosis (see Annex H).

After discussions with the European Food- and Waterborne Diseases and Zoonoses Network it was decided to strengthen campylobacteriosis surveillance by:

- reviewing the laboratory culture and diagnostic methods in the EU
- reviewing data reporting and analysis.

The surveillance of campylobacteriosis through TESSy currently features the standard reporting of cases and includes data on species. However, speciation of positive samples is declining due to the increasing use of PCR-based diagnostics, which is reflected in the reporting of species-data. The monitoring of antimicrobial resistance (AMR) has been reviewed and ECDC has launched a new protocol for harmonised monitoring of AMR in human *Campylobacter* and *Salmonella* infections [1]. The human AMR data are published annually together with European Food Safety Agency (EFSA) in a European Summary report and thus no AMR data for *Campylobacter* is included in this report.

The European Surveillance System allows the standard reporting of cases of *Campylobacter* infections with an agreed set of variables. In 2010–2012, the reporting of campylobacteriosis covered 35 variables, 27 of which were common variables for all diseases, and eight were specific to *Campylobacter*. The common variables are presented in Table 1 in the Introduction'. Additional *Campylobacter*-specific variables are presented below in Table 2.1. In 2012, 21 EU/EEA countries had a compulsory reporting system with full population coverage for campylobacteriosis, six countries had a voluntary system and three countries did not report *Campylobacter* infections to TESSy (Table 2.2).

Table 1.1. Enhanced epidemiological dataset collected for campylobacteriosis cases, EU/EEA, 2010–2012

Variable	Description in TESSy
Pathogen	Species or genus of the pathogen which is the cause of the reported disease
SIR_AMC, SIR_AMP, SIR_CIP, SIR_ERY, SIR_GEN, SIR_NAL, SIR_TCY	Susceptibility to seven different antibiotics (amoxicillin/clavulanic acid, ampicillin, ciprofloxacin, erythromycin, gentamicin, nalidixic acid, tetracyclines)

National surveillance systems for campylobacteriosis

Table 1.2. Notification systems for campylobacteriosis cases, EU/EEA, 2012

Country	Reported since	Legal character[a]	Case-based/aggregated[b]	National coverage[c]	Changes in surveillance system in 2010–12
Austria	1947	Cp	C	Y	
Belgium	2000	V	C	N	
Bulgaria	2004	Cp	A	Y	No changes
Cyprus	2005	Cp	C	Y	
Czech Republic	2008	Cp	C	Y	
Denmark	1979	Cp	C	Y	No changes
Estonia	1988	Cp	C	Y	
Finland	1995	Cp	C	Y	
France	2002	V	C	N (population coverage 20%)	
Germany	2001	Cp	C	Y	No changes
Greece	-	-	-	-	-[d]
Hungary	1998	Cp	C	Y	
Ireland	2004	Cp	C	Y	
Italy	1990	V	C	N	
Latvia	1999	Cp	C	Y	No changes
Lithuania	1990	Cp	C	Y	
Luxembourg	2004	V	C	Y	
Malta	Yes	Cp	C	Y	
Netherlands	2002	V	C	N (population coverage 52%)	
Poland	2004	Cp	C	Y	
Portugal	-	-	-	-	-
Romania	yes	Cp	C	Y	
Slovakia	1980	Cp	C	Y	
Slovenia	1987	Cp	C	Y	No changes
Spain	1989	V	C	N (population coverage 25%)	
Sweden	1978	Cp	C	Y	
United Kingdom	No	O	C	Y	
Iceland	Yes	Cp	C	Y	
Liechtenstein	Yes	-	-	-	-
Norway	1991	Cp	C	Y	

[a] *Legal character: Cp=compulsory, V=voluntary, O=other*

[b] *C=case based, A=aggregated*

[c] *National coverage Y=yes, N=no*

[d] *Not reported/no data provided*

Epidemiological situation in 2010–2012

Major findings

- Campylobacteriosis showed a slight increasing trend between 2008 and 2012 in EU/EEA countries
- The average notification rate in the EU/EEA in 2010–2012 was 67 cases per 100 000 population
- 89% of infections were domestically acquired

- 56% of travel-related infections were acquired in non-EU/EEA countries, in particular in Asia and Africa
- *Campylobacter jejuni* and *C. coli* were the two species most commonly reported. Both showed a seasonal peak in summer (June–August)
- The trend of *C. jejuni* remained stable during 2008–2012, while *C. coli* increased significantly
- The highest notification rate was observed in children younger than five years of age (>95 cases per 100 000 in females and > 118 cases per 100 000 in males), thus the notification rates decreased in age group 1–5 years
- Notification rates slightly increased in adults over 64 years. The risk of infection was generally higher in men; especially for men under 15 and over 45 years of age
- About 40% of cases with known hospitalisation data (10% of total cases) required hospital care in 2010–2012
- Campylobacteriosis had a low case–fatality ratio at EU/EEA level, ranging from 0.03% to 0.04%.

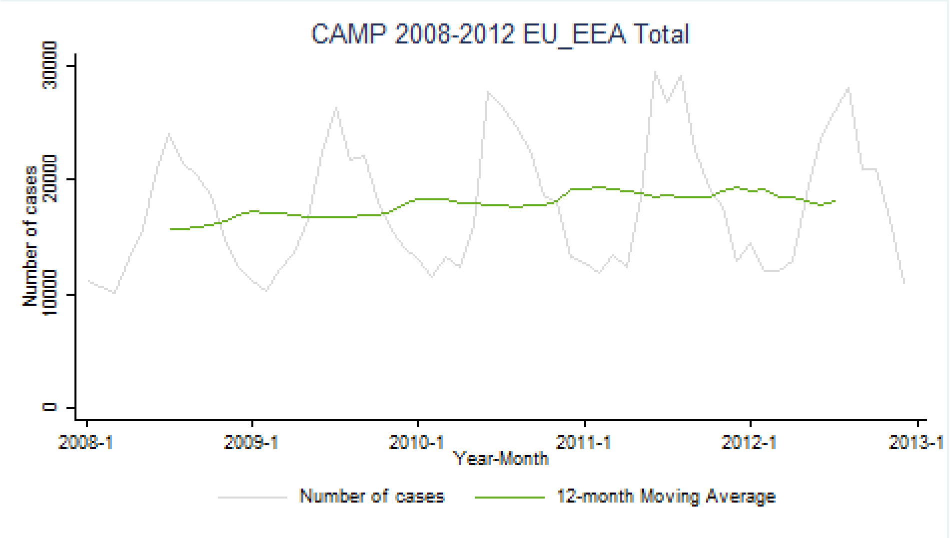
Overview of trends

From 2010 to 2012, 662 521 confirmed cases of campylobacteriosis were reported to TESSy by 25 EU Member States and two EEA countries, excluding Greece, Portugal and Liechtenstein.

At EU/EEA level, a slight increasing trend has been observed since 2008 (Figure 1.1), with the highest number of campylobacteriosis cases (227 126 confirmed cases) reported in 2011 (Figure 1.1, Table 1.3). Between 2011 and 2012, the number of confirmed campylobacteriosis cases in the EU/EEA countries declined by 4.3%, to 217 261 cases (Table 1.3).This was mainly the result of a decrease in the number of campylobacteriosis cases reported by Belgium and Germany.

Between 2010 and 2012, the highest country-specific notification rates were observed in the Czech Republic, followed by Luxembourg and the United Kingdom (>110 cases per 100000), while the lowest rates were reported in Bulgaria, Latvia, Poland and Romania (less than 2 cases per 100000) (Table 1.3).

Figure 1.1. Trend in number of confirmed campylobacteriosis cases in EU/EEA countries, 2008–2012 (N=1 060 706)



Source: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Table 1.3. Confirmed campylobacteriosis cases and notification rates (per 100 000 population) by country in EU/EEA countries, 2010–2012

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	4 404	52.6	5 129	61.0	4 710	55.8
Belgium*	6 047	-	7 716	-	6 607	-
Bulgaria^	6	0.1	73	1.0	97	1.3
Cyprus	55	6.7	62	7.4	68	7.9
Czech Republic	21 075	200.6	18 743	178.7	18 287	174.1
Denmark	4 037	72.9	4 060	73.0	3 720	66.7

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Estonia	197	14.7	214	16.0	268	20.0
Finland	3 944	73.7	4 267	79.4	4 251	78.7
France[a]	4 324	33.5	5 538	42.6	5 079	38.9
Germany	65 110	79.8	70 812	86.8	62 504	76.5
Greece	-	-	-	-	-	-
Hungary	7 180	72.9	6 121	62.4	6 367	65.1
Ireland	1 660	37.2	2 433	53.2	2 391	52.2
Italy*	457	-	468	-	774	-
Latvia	1	0.0	7	0.3	8	0.4
Lithuania	1 095	32.9	1 124	36.8	917	30.5
Luxembourg	600	119.5	704	137.5	581	110.7
Malta	204	49.2	220	52.9	214	51.3
Netherlands[b]	4 322	50.1	4 408	50.9	4 248	48.8
Poland	367	1.0	354	0.9	431	1.1
Portugal	-	-	-	-	-	-
Romania	175	0.8	149	0.7	92	0.4
Slovakia	4 476	82.5	4 565	84.7	5 704	105.5
Slovenia	1 022	49.9	998	48.7	983	47.8
Spain[c]	6 340	55.2	5 469	47.4	5 488	47.5
Sweden	8 001	85.7	8 214	87.2	7 901	83.3
United Kingdom~	70 298	114.2	72 150	116.3	72 578	115.3
EU total**	**215 397**	**66.7**	**223 998**	**68.9**	**214 268**	**65.7**
Iceland	55	17.3	123	38.6	60	18.8
Liechtenstein	-	-	-	-	-	-
Norway	2 682	55.2	3 005	61.1	2933	58.8
EU/EEA total**	**218 134**	**66.7**	**227 126**	**68.7**	**217 261**	**65.6**

** Sentinel surveillance. Population coverage unknown so notification rate not calculated*

^ Aggregated reporting

[a] Population coverage 20%

[b] Population coverage 52%

[c] Population coverage 25%

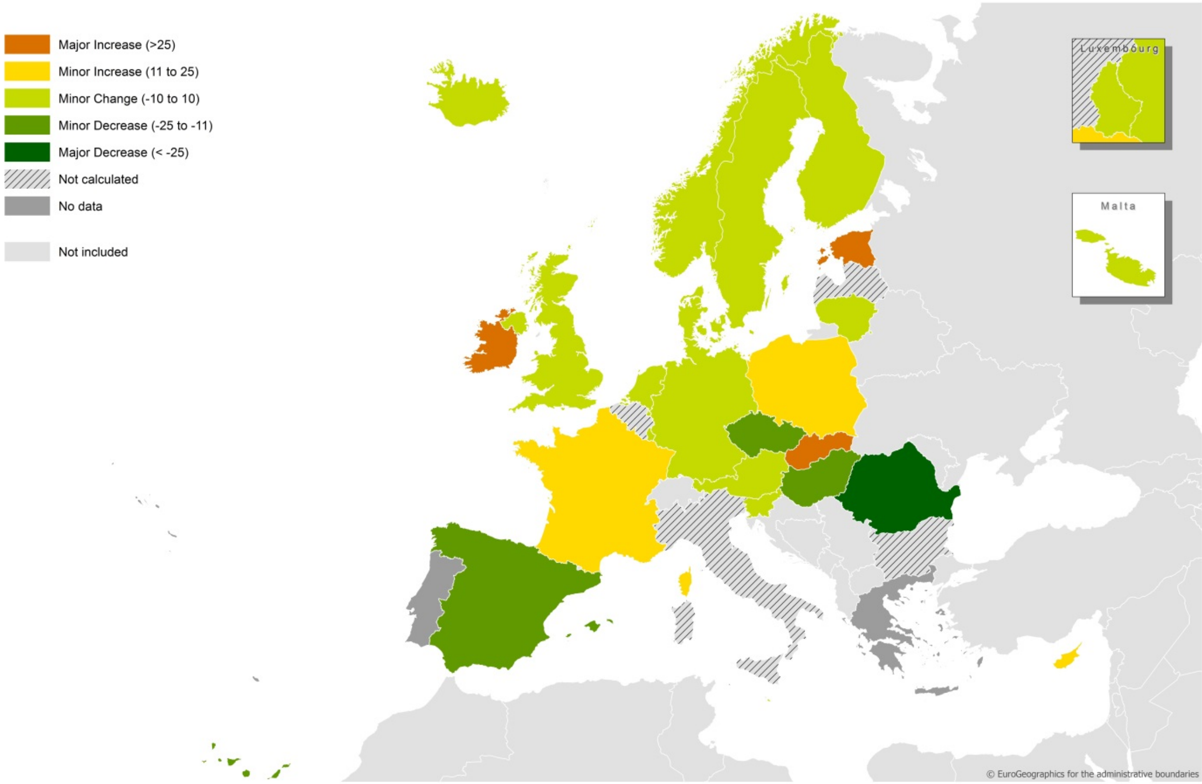
~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

*** For each year shown, notification rates were calculated, with the exception of countries with unknown population coverage. Also excluded were populations of countries which did not report data. Populations of countries which reported 0 cases were included.*

– Not reported/not calculated.

When comparing data from 2012 to 2010, notification rates nearly halved in Romania, declining from 0.8 to 0.4 cases per 100 000, however, the total number of cases reported was very low (Table 1.3, Figure 1.2). A remarkable decrease in rates was observed in the Czech Republic (from 200.6 to 174.1 cases per 100 000), Hungary (from 72.9 to 65.1 cases per 100 000) and Spain (from 55.2 to 47.5 cases per 100 000). Notification rates slightly decreased also in Germany, from 79.8 cases per 100 000 in 2010 to 76.5 cases per 100 000 in 2012 (Table 1.3, Figure 1.2). Major increases in rates were reported in Ireland (from 37.2 to 52.2 cases per 100 000), Slovakia (from 82.5 to 105.5 cases per 100 000) and Estonia (from 14.7 to 20 cases per 100 000), although in Estonia, the total number of cases reported was very low. Minor but significant increases in notification rates, ranging from 7% to 16.3%, were observed in France, Finland and Norway. The increase in the number of campylobacteriosis cases observed in Italy in 2012 was most likely due to an increase in the number of regional laboratories reporting (Table 1.3, Figure 1.2).

Figure 1.2. Percentage change in notification rates of campylobacteriosis cases in EU/EEA countries, 2010–2012



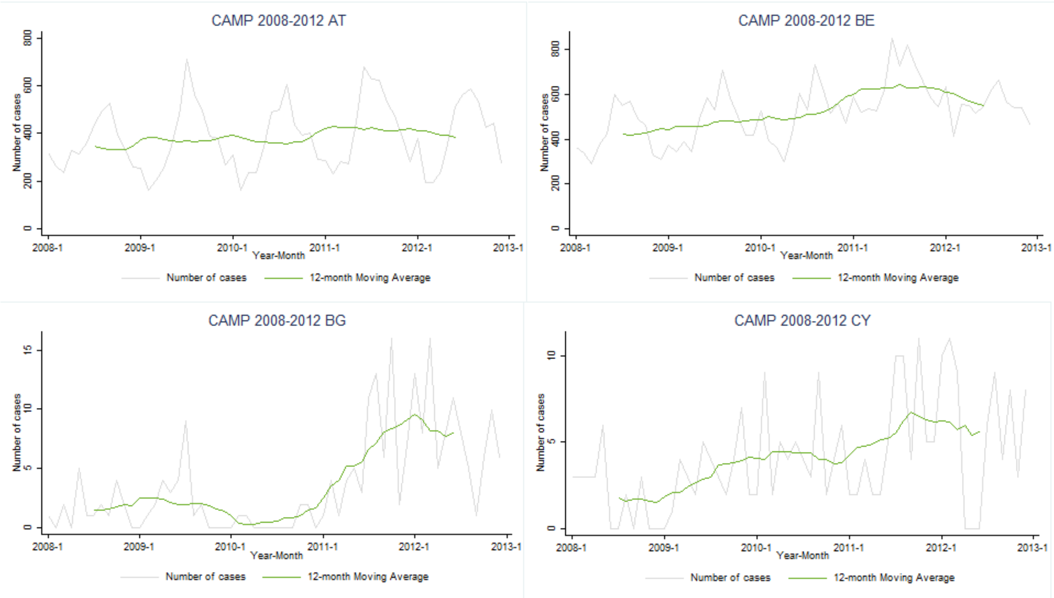
Not calculated: Country-specific percentage changes in notification rates were not calculated if the number of confirmed cases reported for one or more years during 2010–2012 was lower than 25, if sentinel surveillance systems had unknown population coverage, or if there was incomplete reporting for one of the reporting years.

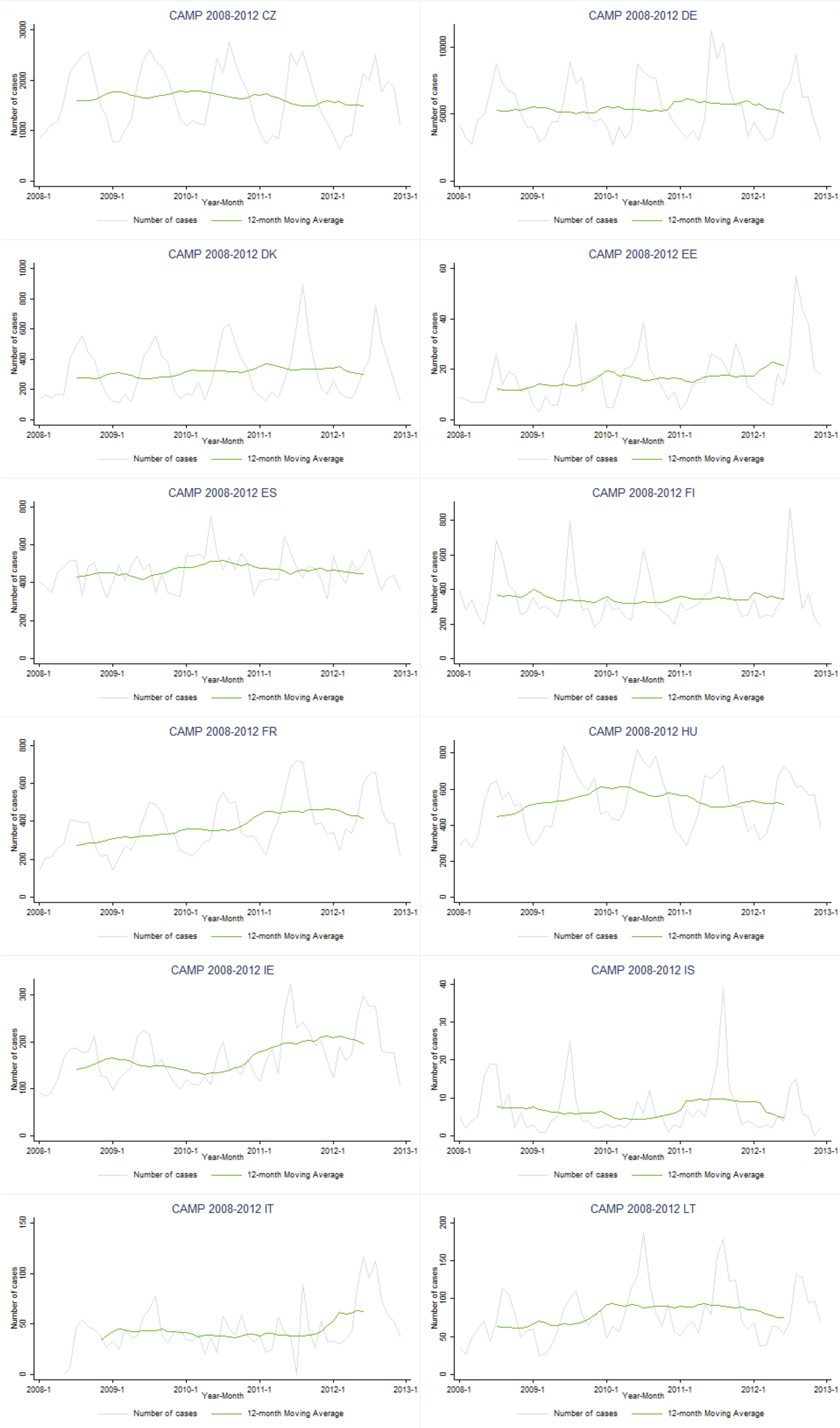
Source: The European Surveillance System (TESSy) data, 2010–2012

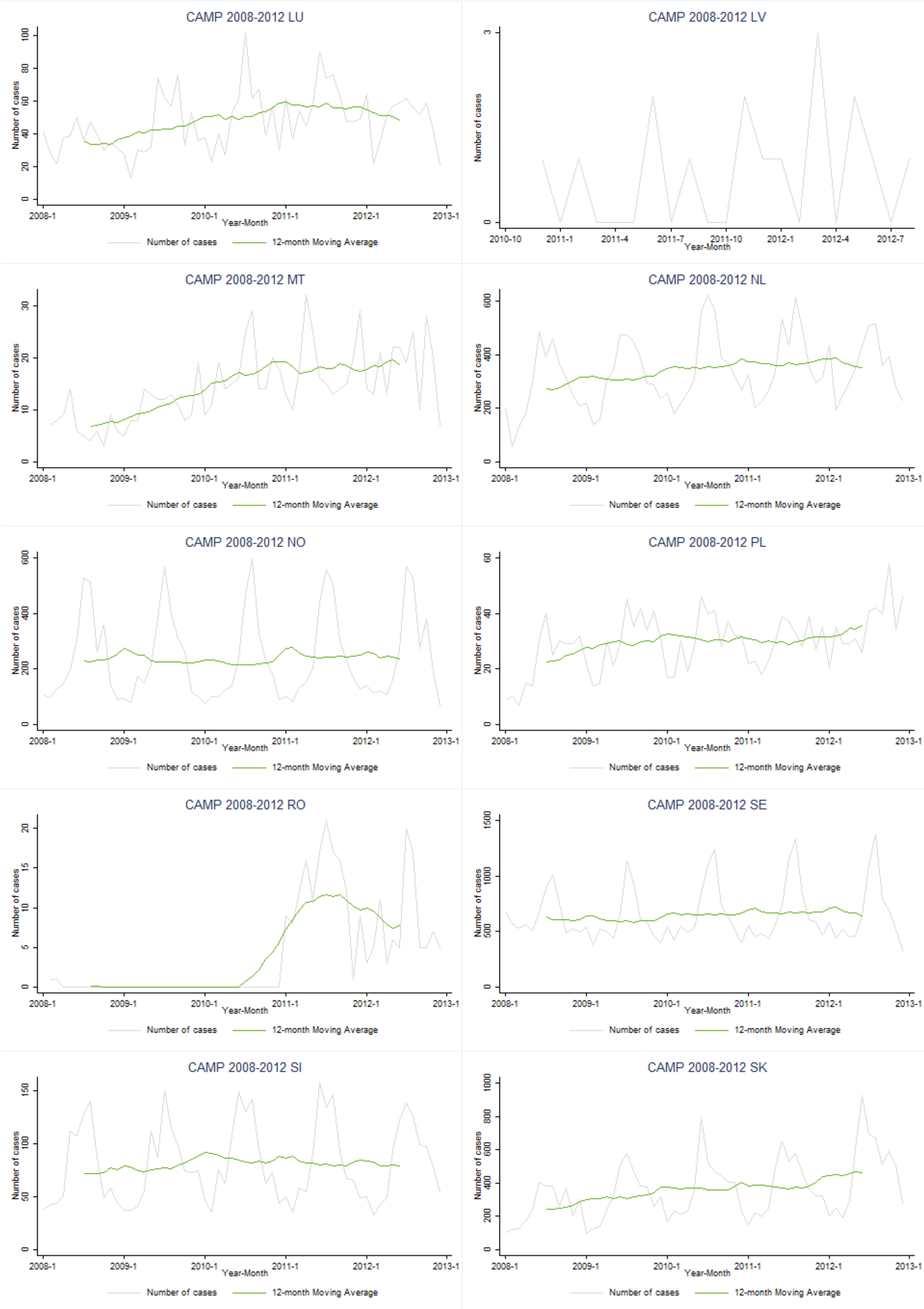
No country showed a statistically significant decrease in campylobacteriosis trends from 2008 to 2012 (significant level p<0.05). Country-specific five-year trends increased in the majority of reporting countries and the most significant rise was observed in Belgium, France, Slovakia and the United Kingdom.

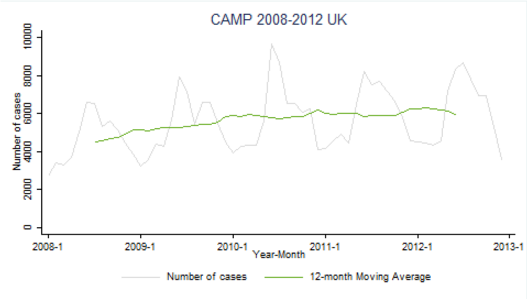
Please note that in a country with a small population, even low numbers of reported cases can lead to a relative overrepresentation.

Figure 1.3. Trend in number of confirmed campylobacteriosis cases by EU/EEA country, 2008–2012




CAMP 2008-2012 CZ
CAMP 2008-2012 DE
CAMP 2008-2012 DK
CAMP 2008-2012 EE
CAMP 2008-2012 ES
CAMP 2008-2012 FI
CAMP 2008-2012 FR
CAMP 2008-2012 HU
CAMP 2008-2012 IE
CAMP 2008-2012 IS
CAMP 2008-2012 IT
CAMP 2008-2012 LT
Number of cases
Year-Month
2008-1
2009-1
2010-1
2011-1
2012-1
2013-1
Number of cases
12-month Moving Average


CAMP 2008-2012 LU
CAMP 2008-2012 LV
CAMP 2008-2012 MT
CAMP 2008-2012 NL
CAMP 2008-2012 NO
CAMP 2008-2012 PL
CAMP 2008-2012 RO
CAMP 2008-2012 SE
CAMP 2008-2012 SI
CAMP 2008-2012 SK
Number of cases
Year-Month
Number of cases
12-month Moving Average



Country codes: see page xiv

Please note that graphs are on different scales.

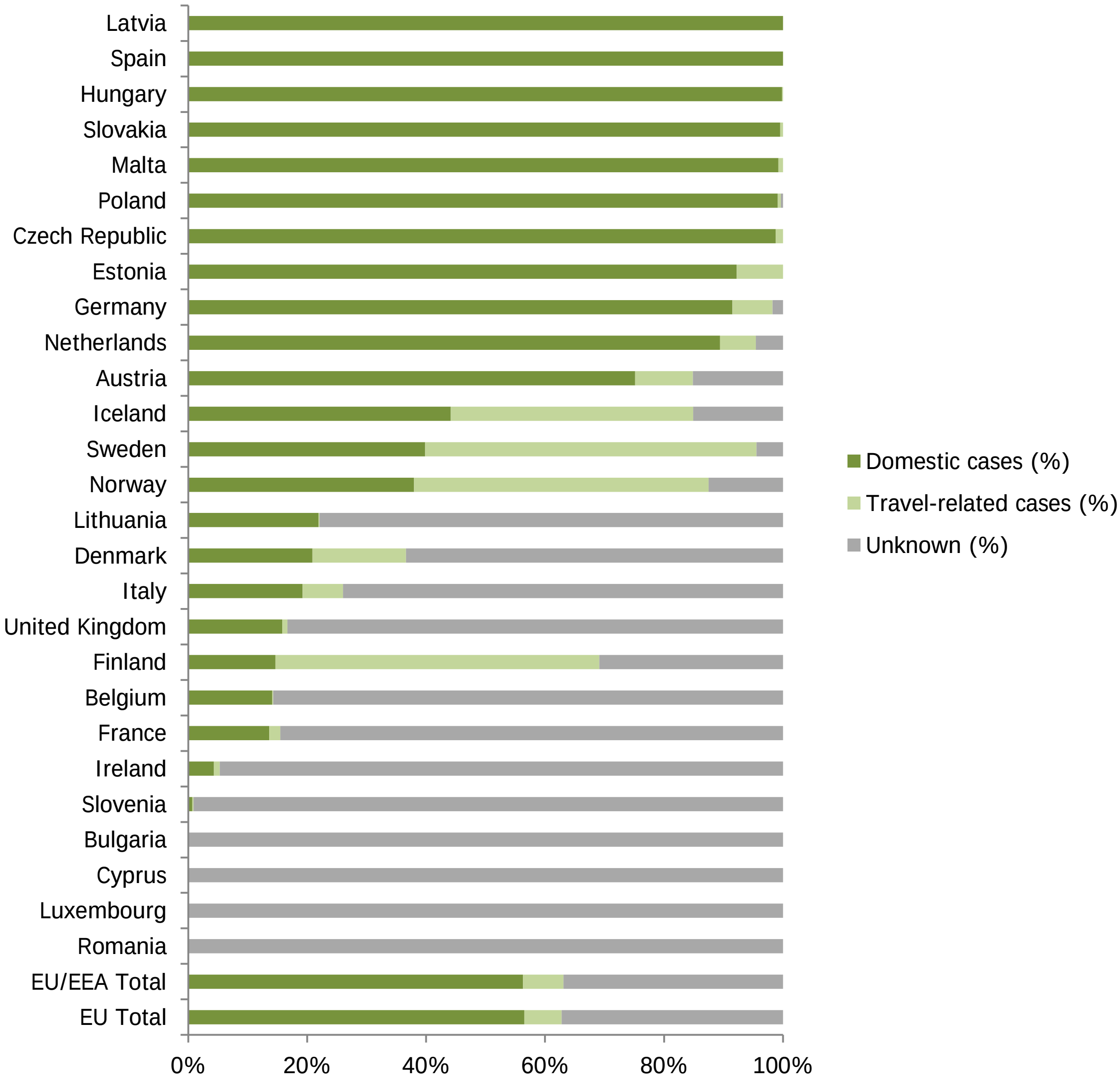
Country-specific trends were not calculated if less than five confirmed cases were reported per month during the period 2008–12.

Origin of the infection

Within the three-year period from 2010 to 2012, 23 out of 27 countries reported data on the origin of infection (domestic/travel-related) for 418 024 confirmed cases (63.1%, pooled data). Four countries reported information only for cases notified in one or two years in 2010–2012. The information on the origin of infection was reported for more than 95% of confirmed cases in 11 countries, while seven countries reported the information for less than 30% of confirmed cases (Figure 1.4; Annex A: Table A1.1).

The proportion of domestic cases versus travel-associated cases varied markedly between countries, with the highest proportion of domestic cases reported in the Czech Republic, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Spain (Figure 1.4; Annex A: Table A1.1). The Nordic countries (Denmark, Finland, Iceland, Norway and Sweden) reported the highest proportion of travel-associated infections compared with other reporting countries (Figure 1.4; Annex A: Table A1.1).

Figure 1.4. Proportion of confirmed campylobacteriosis cases by origin of infection (domestic/travel-related) as reported by EU/EEA countries, 2010–2012 (N=662 521)



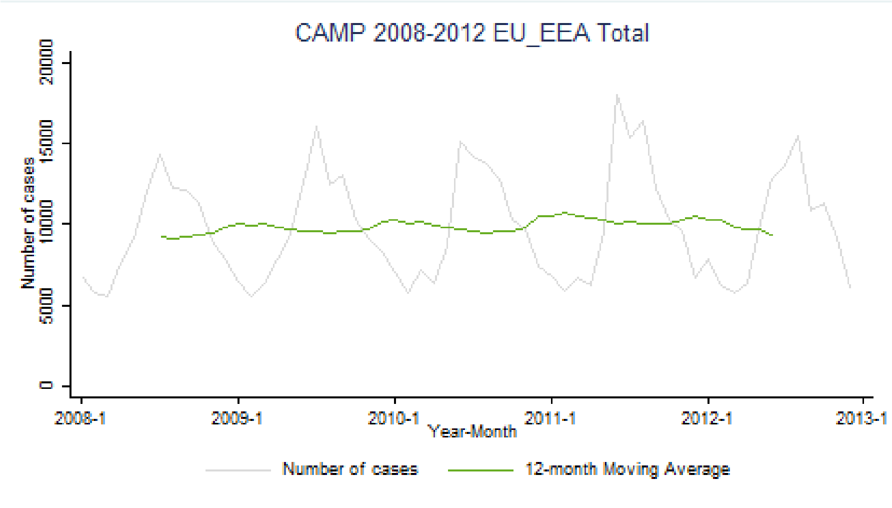
Domestic cases

Among cases for which the information was available (n=418 024, cumulative data 2010–2012), the majority of infections reported at EU/EEA level during 2010–2012 were domestically acquired (89%) (Annex A: Table A1.1), and a stable annual trend in reported domestic campylobacteriosis cases has been observed since 2008 (Figure 1.5; Annex A: Table A1.2).

During 2008–2012, significant increases in the notification of domestic cases were observed in Slovakia, Sweden and the Netherlands (p-value<0.01). Notification rates for domestically acquired *Campylobacter* infections also slightly rose in Estonia, Malta and Poland (p-value<0.01), although the total number of cases reported by those countries was low.

Over the five-year period, the number of reported domestic cases decreased in Ireland and the United Kingdom; however the completeness of the reported information on origin of infection was lower than 20%.

Figure 1.5. Trend and number of confirmed domestic campylobacteriosis cases in EU/EEA countries, 2008–2012 (N=600 711)



Source: Austria, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Italy, Latvia, Malta, the Netherlands, Poland, Slovakia, Spain, United Kingdom; EEA countries: Iceland and Norway

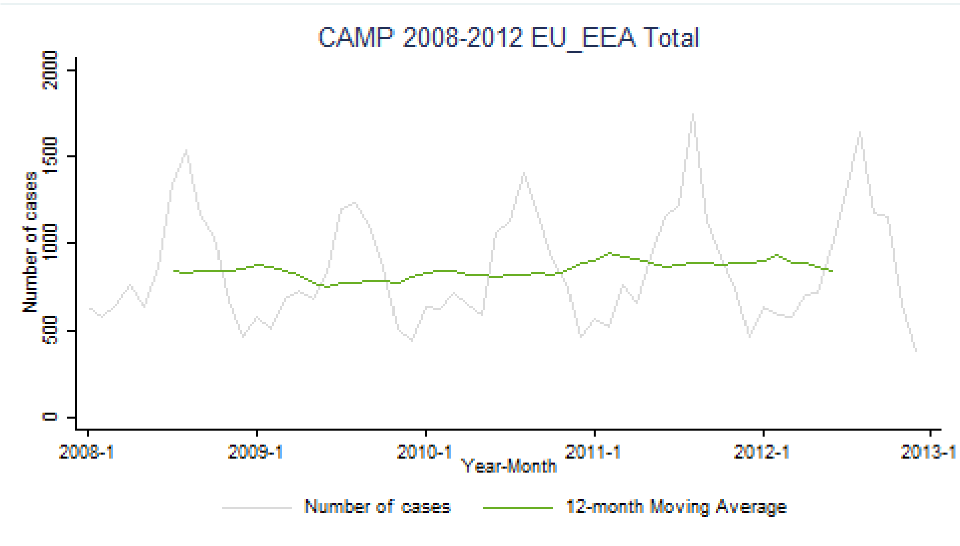
Travel-related cases

The trend in the annual number of confirmed travel-related cases remained quite stable during 2008–2012 (Figure 1.6; Annex A: Table A1.3). However, the number of reported cases decreased by 9.2 % in 2009 and by 1.7% in 2010 compared with 2008.

Over the five-year period country-specific trends in confirmed travel-related cases only decreased significantly in Finland (p-value<0.01), while an increasing trend was observed in the Netherlands (p-value<0.01). Italy and Iceland also reported a slight rise in notifications of travel-related infections, however for Italy the completeness of this variable was low and Iceland reported a low number of confirmed travel-related campylobacteriosis cases (N=128, cumulative data 2008–2012).

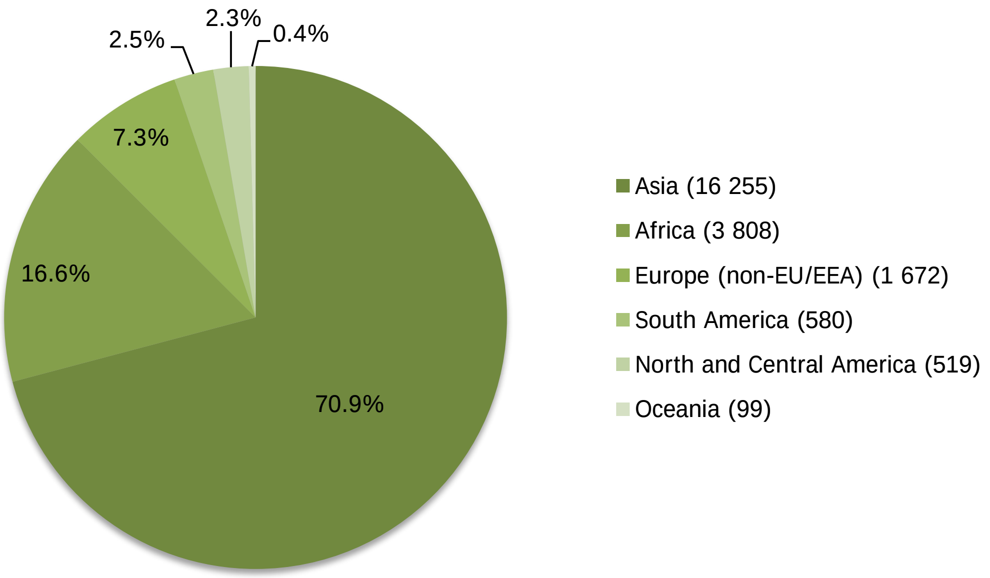
For the 45 239 travel-related infections reported between 2010 and 2012, data on suspected country of infection were available for 90% confirmed cases (N=40 719). Almost half of all travel-related infections were acquired in non-EU countries (56%), in particular in Asia (N=16 255) and Africa (N=3 808) (Figure 1.7). Overall, the most frequently reported countries of infection in travel-related campylobacteriosis cases were Spain, Thailand and Turkey (Figure 1.8).

Figure 1.6. Trend and number of confirmed travel-related campylobacteriosis cases in EU/EEA countries, 2008–2012 (N=70 044)



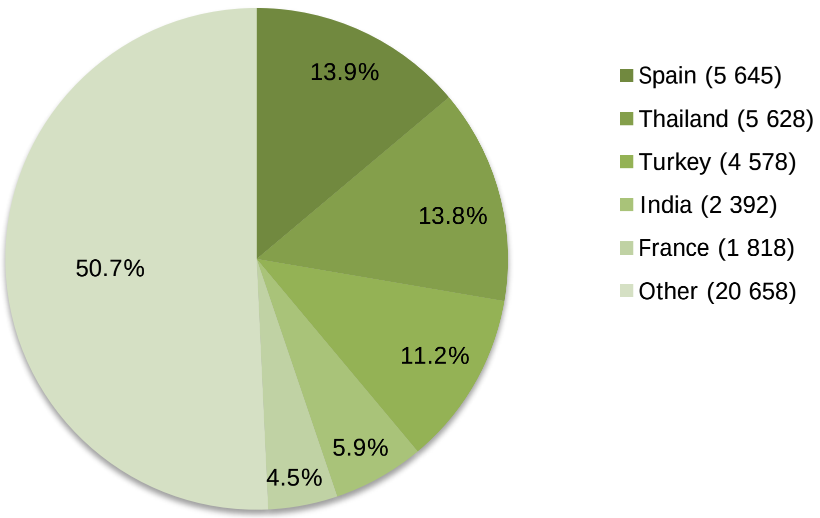
Source: Austria, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Italy, Malta, the Netherlands, Poland, Slovakia, United Kingdom; EEA countries: Iceland and Norway

Figure 1.7. Origin of travel-related campylobacteriosis infections acquired in non-EU/EEA countries by geographical regions, EU/EEA countries, 2010–2012



Source: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Italy, Lithuania, Malta, Poland, Slovakia, Slovenia, Sweden, United Kingdom; EEA countries: Iceland and Norway

Figure 1.8. Five most frequently reported countries of infection in confirmed travel-related campylobacteriosis cases as reported by EU/EEA countries, 2010–2012



Source: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Italy, Lithuania, Malta, Poland, Slovakia, Slovenia, Sweden, United Kingdom; EEA countries: Iceland and Norway

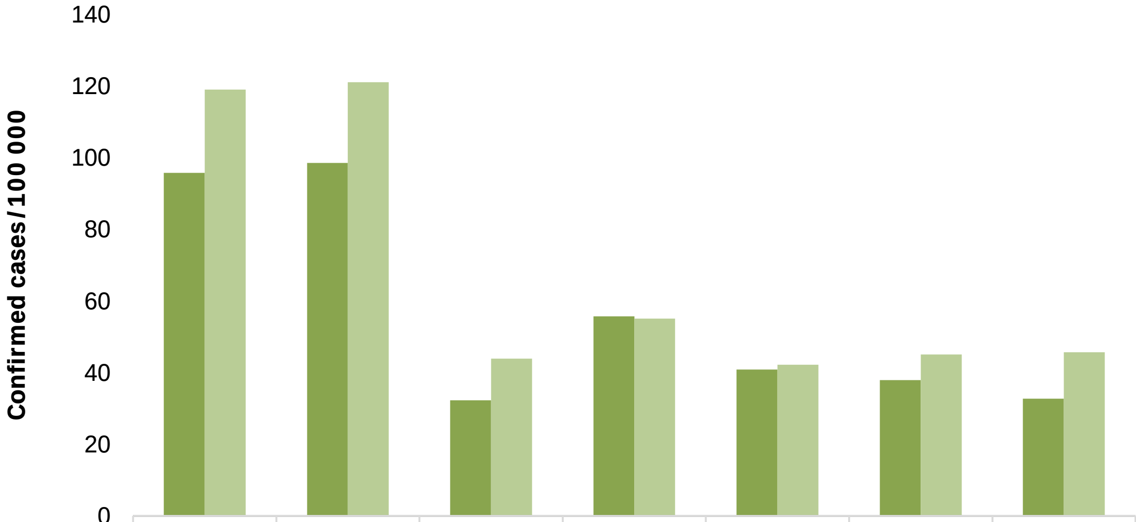
Age and sex

During 2010–2012, data on age and sex were reported for 99% of confirmed campylobacteriosis cases by 26 EU/EEA countries.

Children younger than five years showed the highest notification rate of campylobacteriosis (>95 cases per 100 000), followed by persons aged 15–24 year, while in the older age groups the notification rates were substantially lower (<50 cases per 100 000) (Figure 1.9; Annex A: Table A1.4).

There was a notable difference in notification rates between sexes. Overall, the male-to-female ratio was 1.1:1 and a male predominance was observed in the age groups younger than 15 years and 45 years or older (Figure 1.9; Annex A: Table A1.4). The highest male-to-female ratio (1.4:1) was noted for the age group 5–14 years.

Figure 1.9. Notification rates of confirmed campylobacteriosis cases by age group and sex in EU/EEA countries, 2010–2012 (N=658 210)

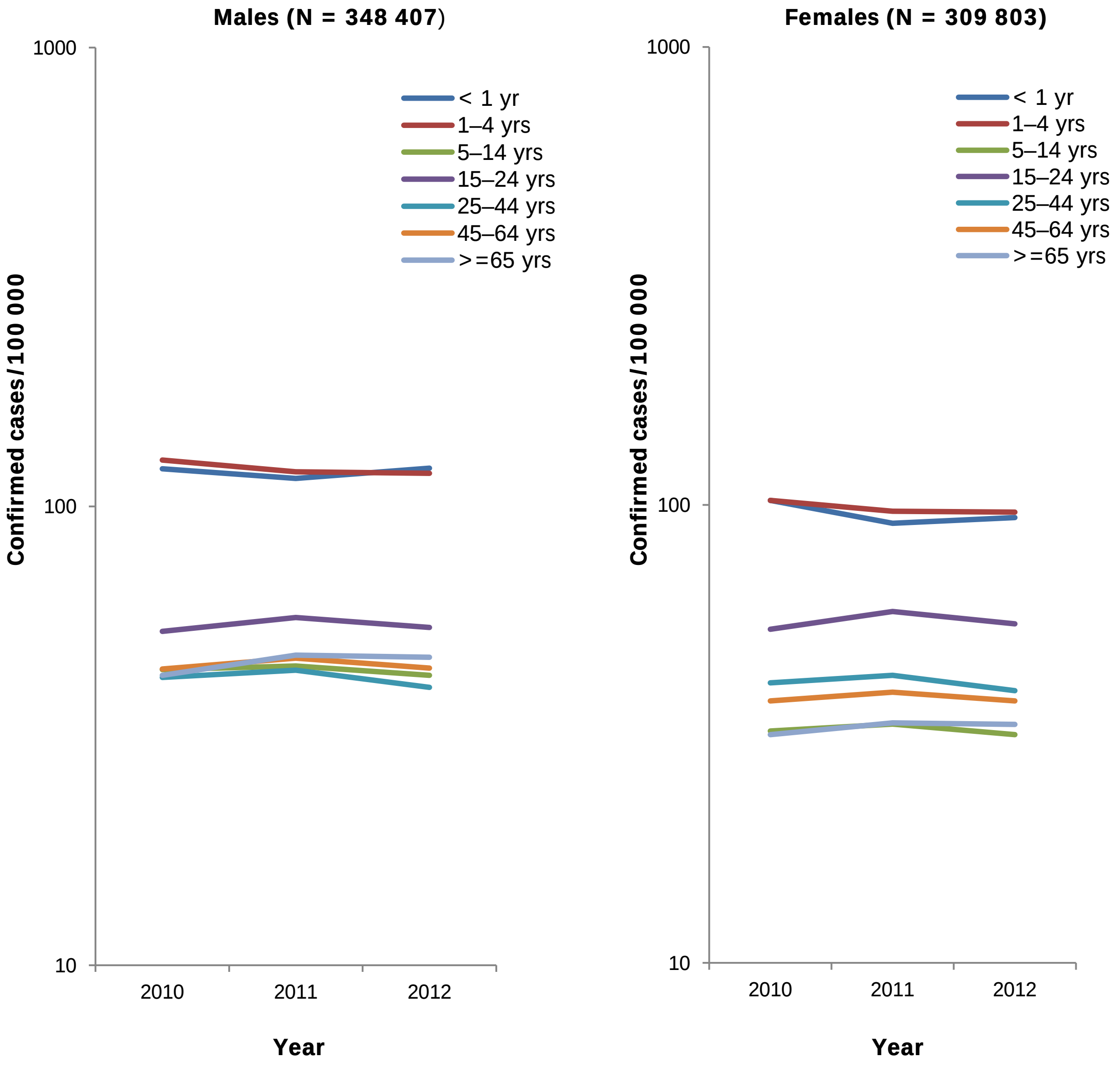


	< 1 yr	1–4 yrs	5–14 yrs	15–24 yrs	25–44 yrs	45–64 yrs	≥65 yrs
Females	95.8	98.5	32.3	55.7	40.9	37.9	32.7
Males	118.9	121.1	43.9	55.1	42.2	45.1	45.7

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Due to the differences in notification rates between age groups in males and females, three-year trends were described by sex (Figure 1.10; Annex A: Table A1.4). During 2010–2012, the notification rate was nearly stable in almost all age groups, with a slight decrease in persons aged 1–4 year, more marked in males than females, and in females younger than one year of age. A minor increase in notification rates was observed in males over 65 years of age (Figure 1.10; Annex A: Table A1.4).

Figure 1.10. Semi-logarithmic graph showing trends in notification rates of confirmed campylobacteriosis cases by age groups and sex in EU/EEA countries, 2010–2012



Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Campylobacter species

In the three-year period from 2010 to 2012, 26 EU/EEA countries reported information on *Campylobacter* species for 94% of confirmed cases, in particular 40% of all confirmed isolates (n=262 396) were reported with speciation, 46% (n=304 738) were reported as '*Campylobacter* species unspecified' and 8% (n=54 758) were reported as 'Other *Campylobacter* species'.

C. jejuni and *C. coli* were the most commonly reported species (Table 1.4). Among cases with known data on species (N=262 396), *C. jejuni* accounted for 93% and *C. coli* was responsible for 6% of reported infections.

It is noteworthy that more than half of cases were reported without speciation, as '*Campylobacter* spp.' or as '*Campylobacter* other'. The proportion of *Campylobacter* cases without speciation increased gradually from 2010 to 2012, while the number of species reported as 'other' decreased. This was due to reporting almost all cases with *Campylobacter* species unspecified as a *Campylobacter* spp. instead of *Campylobacter* other by the United Kingdom in 2012 (Table 1.4).

Trends by *Campylobacter* species were calculated over the five-year period, from 2008 to 2012, isolation of *C. jejuni* remained stable, while a significant increase was observed for *C. coli* (p-value<0.01). The trend for *C. lari* showed a slight but significant decrease (Figure 1.11).

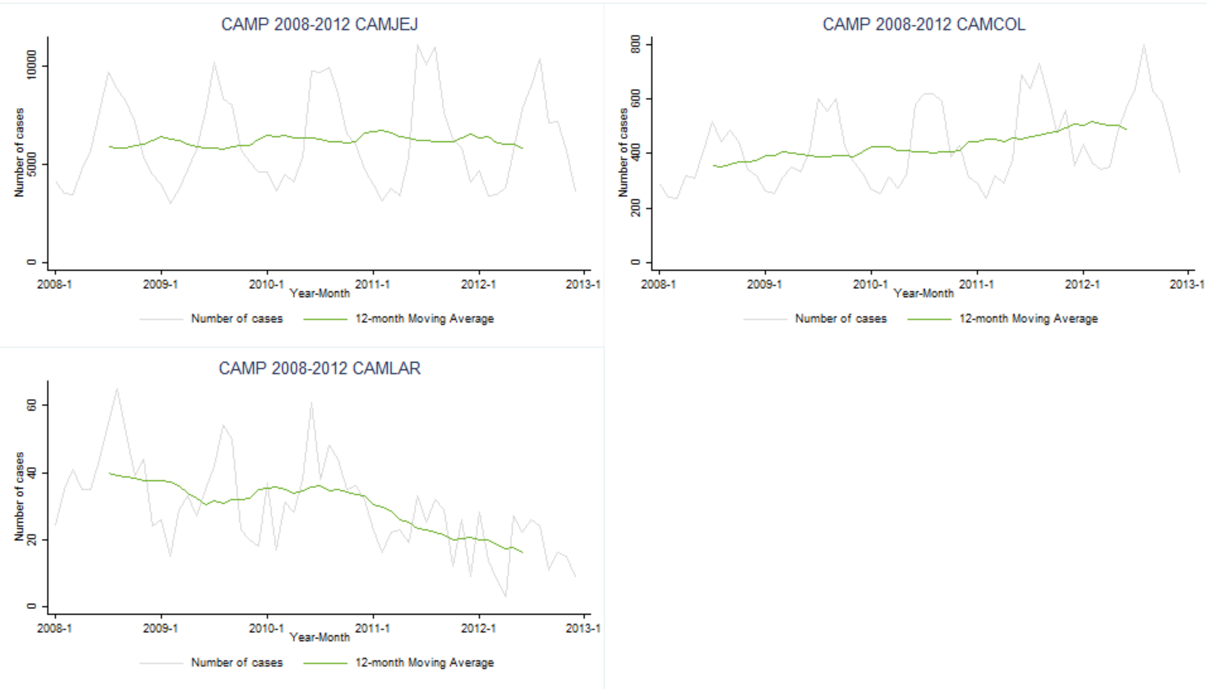
Table 1.4. ***Campylobacter*** **species in confirmed campylobacteriosis cases, EU/EEA countries, 2010–2012**

Species	2010		2011		2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
Campylobacter jejuni	77 604	39.0	85 079	39.2	81 663	39.6
Campylobacter coli	5 014	2.5	5 733	2.6	6 232	3.0
Campylobacter lari	466	0.2	269	0.1	204	0.1
Campylobacter upsaliensis	13	0.01	48	0.02	59	0.03
Campylobacter fetus	-	-	-	-	12	0.01
Campylobacter species unspecified	94 951	47.7	104 518	48.2	105 269	51.1
Other *Campylobacter* species	20 986	10.5	21 240	9.8	12 532	6.1
Total known	**199 034**	**100.0**	**216 887**	**100.0**	**205 971**	**100.0**
Unknown/missing	19100	8.8	10312	4.5	11 387	5.2
Total reported	**218 134**		**227 199**		**217 358**	

– Not reported/not calculated

Source: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Figure 1.11. **Trend and number of confirmed** ***Campylobacter jejuni*** **(N=369 626),** ***C. coli*** **(N=25 725) and** ***C. lari*** **(N=1 803) cases in EU/EEA countries, 2008–2012**



Source: Austria, Cyprus, Czech Republic, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Romania, Slovenia, Sweden, United Kingdom; EEA countries: Iceland and Norway

Species by age groups

The three most common species (*C. jejuni*, *C. coli* and *C. lari*) are spread over all age groups (Table 1.5).

With the exception of children younger than one year of age, the age distribution between the *C. coli* cases and the *C. lari* cases was very similar and no significant differences were observed (Table 1.5). Conversely, *C. jejuni* cases presented a significantly different age distribution across all groups compared to *C. coli* cases, with a higher proportion of cases in younger age groups (less than 25 years) (Table 1.5).

Table 1.5. Age distribution of confirmed campylobacteriosis cases by species, EU/EEA countries, 2010–2012 (N=620 041)

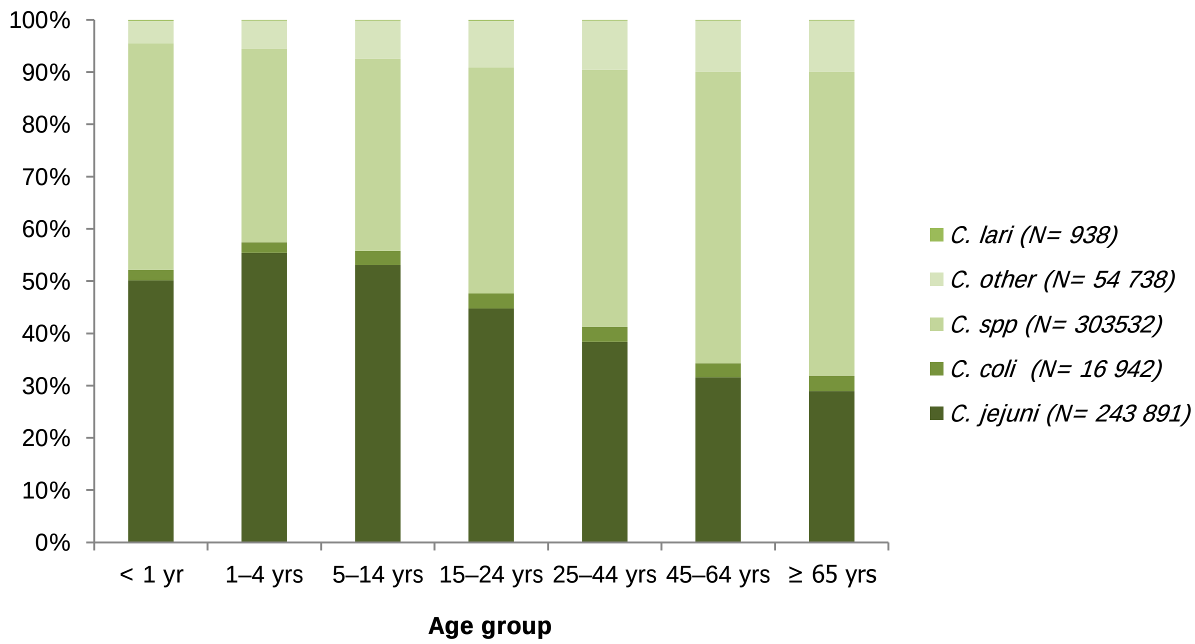
Age groups	*Campylobacter jejuni*		*Campylobacter coli*		*Campylobacter lari*		*Campylobacter* species unspecified		Other *Campylobacter* species	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
< 1 yr	7028	2.9	285	1.7	25	2.7	6 077	2.0	602	1.1
1–4 yrs	32 484	13.3	1199	7.1	70	7.5	21 717	7.2	3 191	5.8
5–14 yrs	27 574	11.3	1 401	8.3	74	7.9	19 059	6.3	3 825	7.0
15–24 yrs	40 273	16.5	2 581	15.2	162	17.3	38 893	12.8	8 093	14.8
25–44 yrs	61 635	25.3	4627	27.3	254	27.1	79 042	26.0	15 086	27.6
45–64 yrs	48 356	19.8	4 152	24.5	212	22.6	85 435	28.1	14 980	27.4
≥ 65 yrs	26 541	10.9	2 697	15.9	141	15.0	53 309	17.6	8 961	16.4
Total	**243 891**	**100.0**	**16942**	**100.0**	**938**	**100.0**	**303 532**	**100.0**	**54 738**	**100.0**

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

With regard to the relative distribution of reported *Campylobacter* species, the risk of infection by *C. jejuni* was highest in children aged 1–4 years and decreased with the increase of age. On the contrary, the risk of infection by *C. coli* increased with increasing of age (Figure 1.12; Annex A: Table A1.5). C *lari* was evenly distributed in all age groups (Figure 1.12; Annex A: Table A1.5).

The relative proportion of '*Campylobacter* spp.' and '*Campylobacter* other' also increased with increasing age (Figure 1.12; Annex A: Table A1.5).

Figure 1.12. Relative distribution of confirmed *Campylobacter* isolates by species and age groups as reported by EU/EEA countries, 2010–2012 (N=620 041)



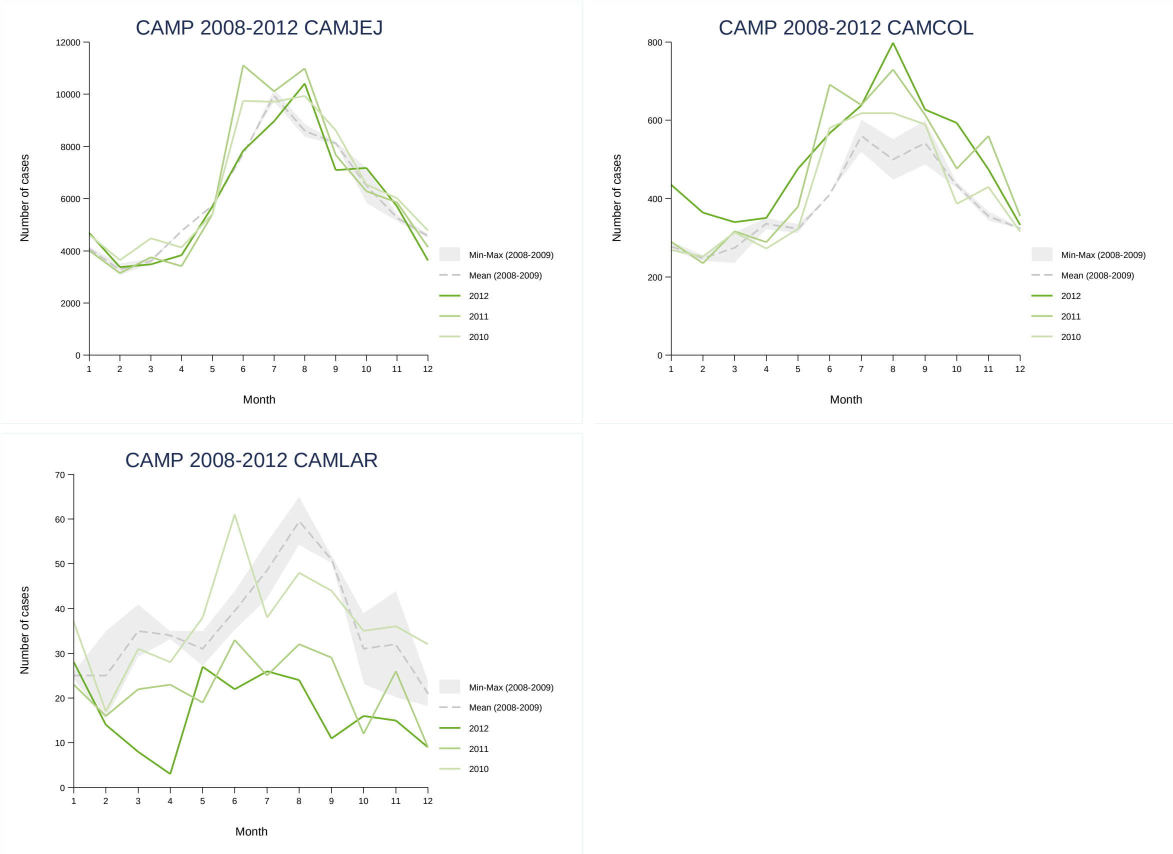
Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Seasonality by species

Seasonality was analysed for the three most common species, *C. jejuni*, *C. coli* and *C. lari*. During 2010–2012, *C. jejuni* and *C. coli* showed a clear seasonality. The number of cases started a steep increase in April, and peaking in the summer between June and August (Figure 1.13). The lowest number of cases were observed in February. Both species presented a very low variability when compared with data from the previous two years (2008–2009)

(Figure 1.13). The distribution of *C. lari* cases did not show a clear seasonal pattern during 2010–2012 and a high variability was observed when comparing data with the period 2008–2009 (Figure 1.13).

Figure 1.13. Number of confirmed *Campylobacter jejuni* (N=369 626), *C. coli* (N=25 752) and *C. lari* (N=1 803) cases by month, EU/EEA countries, 2008–2012



Source: Source: Austria, Cyprus, Czech Republic, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Romania, Slovenia, Sweden, United Kingdom; EEA countries: Iceland and Norway

Seasonality by species and age group

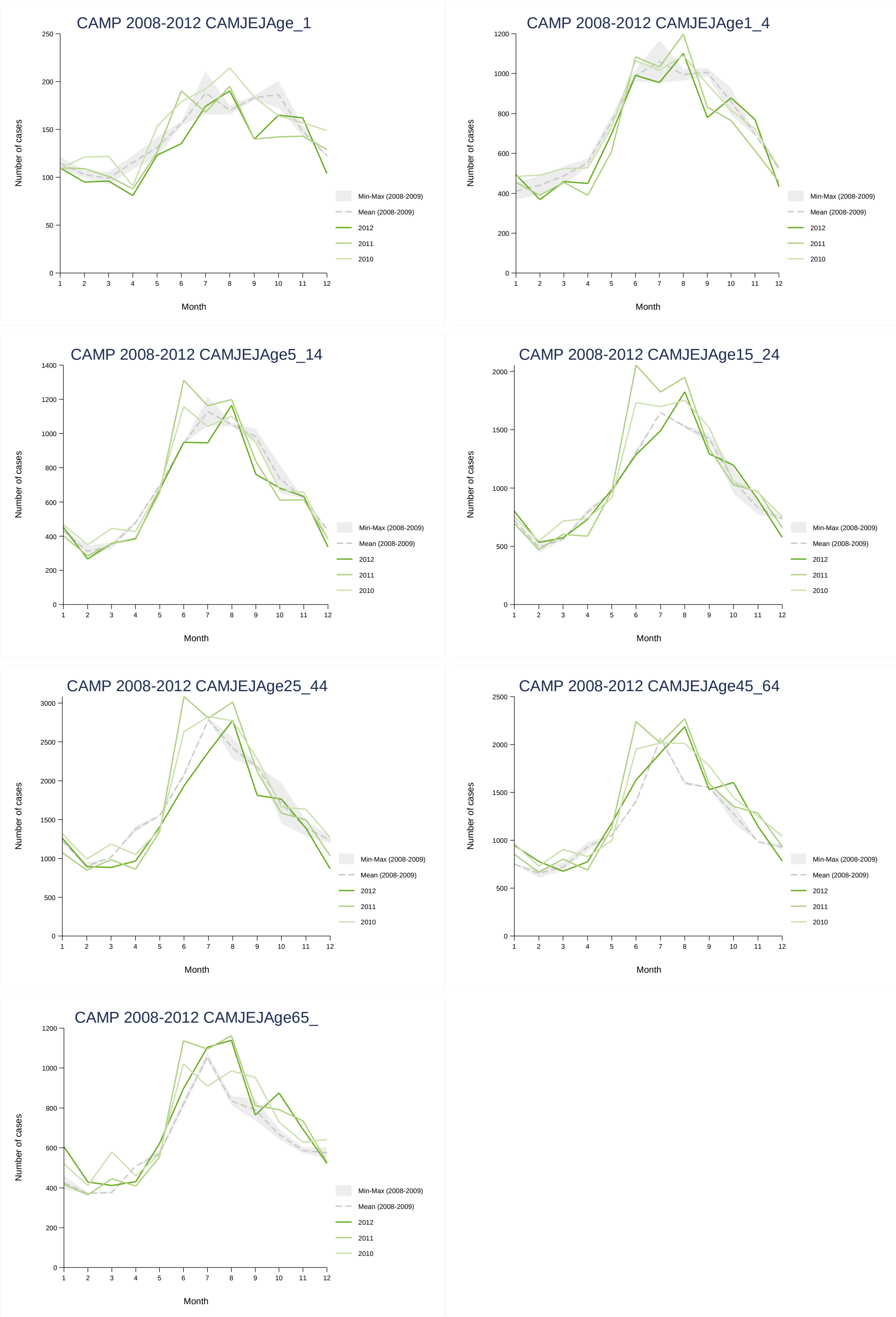
Seasonality by age group was analysed for the two most common species, *C. jejuni* and *C. coli,* and it is shown in figures 1.14 and 1.15, respectively.

A very clear seasonal pattern with a peak in summer was observed for *C. jejuni* cases aged between 5 and 64 years. The number of cases started increasing between March and April, peaked in summer between June and August, with the lowest number of cases was observed in February (Figure 1.14).

A different seasonality characterised *C. jejuni* cases younger than one year of age. Two peaks were recorded, one between June and August and the second between October and November. An increase of cases during the autumn was also observed in 2008-2009, but not in 2010 (Figure 1.14).

In cases aged between 1 and 4 years, and in the age group older than 64 year of age, additionally to the summer peak, a small autumn peak in *C. jejuni* infections was recorded. In both age groups, the increase of cases reported during September/October was more evident in 2012. In children 1–4 years old, the autumn peak was not observed in 2010 (Figure 1.14).

Figure 1.14. Distribution of confirmed *Campylobacter jejuni* (N=369 626) cases by month and age group, EU/EEA countries, 2008–2012



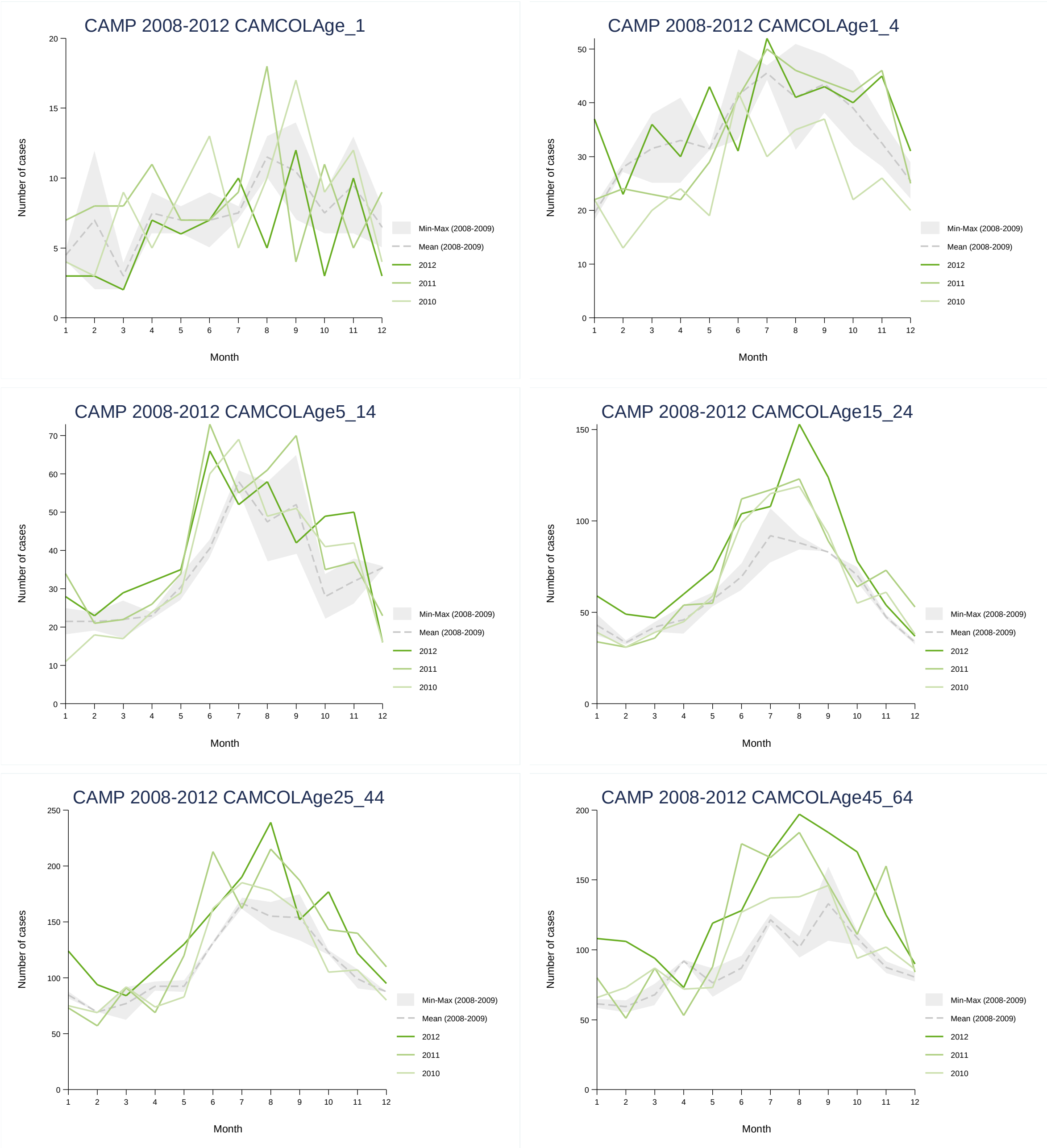
Source: Austria, Cyprus, Czech Republic, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Romania, Slovenia, Sweden, United Kingdom; EEA countries: Iceland and Norway

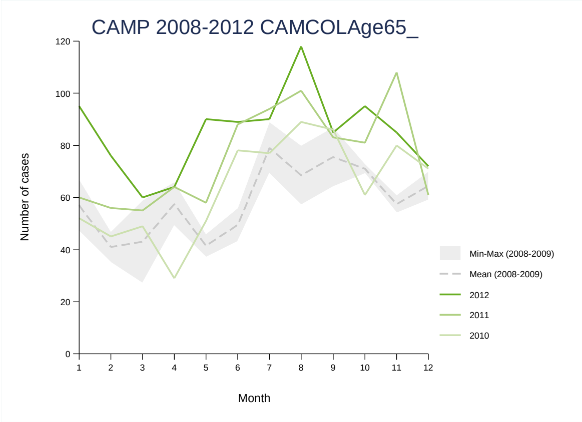
During 2010–2012, *C. coli* cases between 15 and 44 years of age showed a clear seasonality, with the highest number of cases recorded in summertime (June/August) and the lowest in winter (February/March) (Figure 1.15).

A summer seasonal pattern followed by a second increase of cases during autumn (September/November) characterized the age groups 5–14 and 45–64 years and some variability was observed when comparing winter data with the period 2008–2009 (Figure 1.15).

The seasonal distribution of *C. coli* infections in children younger than five years and adults over the age of 64 years did not show a clear pattern during 2010–2012, and a high variability was found when comparing data with the previous two years (2008-2009) (Figure 1.15).

Figure 1.15. Distribution of confirmed *Campylobacter coli* (N=25 752) cases by month and age group, EU/EEA countries, 2008–2012





Source: Austria, Cyprus, Czech Republic, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Romania, Slovenia, Sweden, United Kingdom; EEA countries: Iceland and Norway

Severity

The severity of campylobacteriosis was evaluated by analysing the hospitalisation and the proportion of deaths due to campylobacteriosis (outcome) among all confirmed cases by calculating the case–fatality ratio. Relative confidence intervals (95%CI) were calculated when analysing the hospitalisation ratio and the case–fatality ratio (CFR) and results were described on a country basis (Annex A: Table A1.6, Table A1.7).

Hospitalisation

During 2010–2012, the information on hospitalisation was reported for a very low proportion of confirmed campylobacteriosis cases (9.6%). As expected, the unknown proportion was quite high in 2010, with a slight reduction in following years (Table 1.6). The number of reporting countries increased from 8 in 2010 to 13 in 2012 (Annex A: Table A1.6).

At EU/EEA level, the proportion of hospitalised cases slightly increased in 2012 compared to 2011, from 43.2% (CI 95%: 42.5%–43.8%) to 44.5% (CI 95%: 43.9%–45.2%) (Table 1.6).The dramatic rise in hospitalisations observed between 2010 and 2011 was mainly driven by the United Kingdom, where the hospitalisation ratio rose from 21% (CI 95%: 18%–23%) in 2010 to 83% (CI 95%: 82%–84%) in 2012 (Annex A: Table A1.6), though the proportion of cases with known information on hospitalisation was still very low, only 7.5 %.

The highest hospitalisation ratios (74%–88% of cases hospitalised) were reported in Cyprus, Latvia, Lithuania, Romania and the United Kingdom. Three of these countries also reported among the lowest notification rates of campylobacteriosis, which indicates that the surveillance systems in these countries primarily capture the more severe cases (Annex A: Table A1.6).

Table 1.6. Hospitalisation ratio of confirmed campylobacteriosis cases in EU/EEA countries, 2010–2012

Hospitalisation	Year		
	2010	2011	2012
Number of confirmed cases	218 134	227 126	217 261
Confirmed cases covered (%)[1]	7.6	10.2	10.9
Hospitalised cases	4 575	10 040	10 582
Hospitalisation ratio (%)[2] (confidence interval 95%)	27.5 (26.8-28.2)	43.2 (42.5-43.8)	44.5 (43.9-45.2)

[1] The proportion (%) of confirmed cases for which information on hospitalisation was available.

[2] Calculated as number of hospitalised cases of the confirmed cases for which this information was available.

Source: Austria, Cyprus (from 2012), Estonia, Hungary, Ireland, Latvia (from 2012), Lithuania (from 2012), Malta (from 2011), Poland, Slovenia (from 2011) and United Kingdom; EEA country: Norway

Outcome

Fourteen countries provided data on outcome (alive/dead) since 2010, and one country started reporting the information in 2012 (Annex A: Table A1.7). The proportion of confirmed cases with the information on outcome remained stable during the period 2010–2012, ranging between 54% and 52% (Table 1.7).To estimate the case–fatality ratios, only countries that reported information on outcome for at least one case were included. Only cases with known outcome were considered. Case–fatality ratio was calculated as the number of deaths/number of cases with known outcome.

Based on known data only, the case fatality ratio associated with campylobacteriosis cases at EU/EEA level was low and stable during the three-year period, ranging between 0.03%–0.04% (Table 1.7). During the whole period, only five countries reported deaths among campylobacteriosis cases (Annex A: Table A1.7).

Table 1.7. Number of deaths and case–fatality ratio of confirmed campylobacteriosis cases by year in EU/EEA countries, 2010–2012

Outcome	Year		
	2010	2011	2012
Number of confirmed cases	218 134	227 126	217 261
Confirmed cases covered (%)[1]	53.8	53.1	52.2
Number of deaths	30	45	31
Case–fatality ratio (%)[2] (confidence interval 95%)	0.03 (0.02–0.04)	0.04 (0.03–0.05)	0.03 (0.02–0.04)

[1] The proportion (%) of confirmed cases for which information on death was available.

[2] Calculated as number of fatal cases of the confirmed cases for which this information was available.

Source: Austria, Cyprus, Czech Republic, Estonia, Germany, Hungary, Ireland, Latvia, Lithuania (from 2012), Malta, Poland, Romania, Slovakia and United Kingdom; EEA country: Norway

Discussion

During 2010–2012, *Campylobacter* infections have been the most frequently reported bacterial cause of human gastroenteritis in EU/EEA countries, confirming the steady increasing trend observed in Europe since 2005 [2-5]. However, in 2012, the number of notified cases of *Campylobacter* infection in the EU/EEA decreased by 4.3 % compared with 2011. This was mainly attributable to decrease of reported cases in two countries in 2012. Due to the complex epidemiology of *Campylobacter* species, the reasons for the increasing trend in human cases have not been fully understood yet.

Substantial differences between countries have been observed across Europe (notification rates ranged between <2 cases and >110 cases per 100 000), it may reflect differences in the degree of contamination across the food-chain (pre- and/or post-harvest), in healthcare-seeking, in laboratory practices, in healthcare systems, in completeness of surveillance reporting or differences in humans behaviours and activities. Some country to country variation may also reflect true frequency differences.

Travelling abroad is considered one of the risk factors associated with *Campylobacter* infections in humans [6]. In 2010–2012, the majority of infections reported at the EU/EEA level were acquired domestically and only about 10% of cases had a travel-related origin. Imported infections were mainly acquired in non-EU countries, especially in Asia and Africa. The five year trend of travel-related *Campylobacter* infections in the EU/EEA showed a decrease in 2009–2010. This might reflect the drop of tourism trips of EU residents in 2009 as a result of the worldwide economic recession [7].The proportion of domestic versus imported cases varied across EU/EEA countries, with the highest proportion of travel-associated infections reported by the Nordic countries (>40%). Differences in the proportion of travel-related campylobacteriosis across European countries have also been described in other studies [8–10]. However, it should be taken into account that at the European level, standardisation of the definition of travel-related campylobacteriosis infections is limited.

The highest risk for *Campylobacter* infection was observed in children younger than five years, followed by young adults. The risk of infection was generally higher in men, and it was especially true for those aged under 15 and over 45 years, that presented about 25% higher rates in men compared with women. These findings are consistent with previous years [2–5] and analogous results have been reported in several studies [10–13]. Currently, it remains unclear why there are more cases in men than in women. During 2010–2012, trends in age-specific notification rates were nearly stable in almost all age groups, with a slight decrease in those aged 1-4 year and a minor increase in persons older than 65 year of age. The increase notified in older patients may be linked to the use of proton pump inhibitors as well as reflect the ageing of populations [11, 14].

The severity of campylobacteriosis was evaluated by looking at the hospitalisation and the case–fatality ratio. Hospitalisation data collected for the first time in 2009 and, as expected, the proportion of cases where the information about hospitalisation was unknown was quite high, with a slight reduction in 2011 and 2012. The highest hospitalisation ratio was observed in 2012 (44.5%). The dramatic rise observed between 2010 and 2011 is explained by the increase in hospitalised cases reported by the United Kingdom, although the completeness of reporting remained low in this country.

At the EU/EEA level, the case fatality ratio for campylobacteriosis cases was generally low, ranging between 0.03% and 0.04%. These figures should be interpreted cautiously as there is no common definition of the point in time at which a fatal outcome is determined. Many Member States have surveillance systems for campylobacteriosis which are based on laboratory notifications and where information on hospitalisation or outcome is not available. In literature, differences in the severity of campylobacteriosis have been reported in association with the age, presence of comorbidity and the isolated species or strain [11, 15-16].

C. jejuni (93.1%) and *C. coli* (6.5%) were the most commonly reported species throughout the three-year period 2010–12. Both species showed a seasonal peak in summer (June–August), with *C. jejuni* showing a more marked seasonality. The relationship of climatic factors with campylobacteriosis is not clearly assessed yet and diverse results are described in the literature [10-12,17-18]. Apparently, the increase in the number of notified cases during the summer may be more reasonably related to changes in human behaviours or activities and in pathogen-host interactions than to meteorological factors [11, 17]. In contrast to *C. jejuni* and *C. coli*, *C. lari* did not present a clear seasonal pattern and the comparison with previous data (2008–2009 data) was characterised by high variability. This may be due to the low number of reported cases, the presence of medium- and long-term trends or indicate different transmission routes for this species.

A difference between *C. jejuni* and *C. coli* was observed in the age distribution of cases. The risk of infection by *C. jejuni* was highest in children aged 1–4 years and decreased with the increase of age. In contrast, the risk of infection by *C. coli* increased with increasing age. These observations are in line with another study [16]. The increase described for *C. coli* during 2008–2012 may result from an improvement in the reporting or may be a true raise in number of *C. coli* infections. The relative proportion of '*Campylobacter* spp.' and '*Campylobacter* other' increased with increasing age; the decreasing in speciation with increasing age may indicate that more thorough investigations are performed in child patients.

Most campylobacteriosis cases are sporadic with only a small proportion of cases reported in relation to outbreaks, however food-borne outbreaks due to *Campylobacter* are not commonly recorded and there is evidence that outbreaks are more common than thought [10, 19].Fresh poultry meat and products are considered the most important food-borne source of *Campylobacter* and the handling and consumption of contaminated broiler meat causes about 20–30% of human *Campylobacter* infections [2-5]. All Nordic countries that reported low notification rate of domestic campylobacteriosis cases generally had a low prevalence of *Campylobacter* in broilers, while countries reporting high notification rates for domestic human cases also reported high prevalence of *Campylobacter* in broilers or broiler meat (at retail and slaughter) [3].

Campylobacter is also prone to cause waterborne outbreaks, and water seems to play an important role in the transmission chain [20].Although consumption of contaminated chicken products, raw milk and unpasteurised dairy products, and drinking water are the most common sources of *Campylobacter* outbreaks, other sources, such as consumption of raw beef products, undercooked seafood, unintentional ingestion of contaminated mud or muddy water and direct contact with animals have also been described [6, 20-22]. Moreover, the person-to-person transmission may play a role in household outbreaks of *Campylobacter* [20].

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2 Listeriosis in the EU/EEA, 2010–2012

Listeriosis

Listeriosis is a disease caused by an infection with the bacterium *Listeria monocytogenes*. The severe form of the disease is relatively rare but may result in life-threatening symptoms, primarily in elderly people, immunocompromised individuals, pregnant women and new-born children. In healthy individuals, the infection can be asymptomatic or might present as a mild febrile illness or mild diarrhoea. In high-risk groups, the most common and severe clinical presentations include septicaemia, meningitis, and pregnancy-associated infections. Maternal infection with *L. monocytogenes* may result in infection of the foetus and subsequent spontaneous abortion, stillbirth or meningitis in a newborn child.

Listeria infection is primarily acquired through consumption of contaminated food. Vertical mother-to-foetus transmission is another possible transmission route. The incubation period usually is about three weeks but may range from 1 to 67 days [1].

Listeriosis is one of the main causes of death in foodborne infections and remains a public health concern because of its high case–fatality (15–30%) and hospitalisation rate (>90%). Foodborne *L. monocytogenes* infection is primarily acquired from ready-to-eat food.

More information can be found at the ECDC website [25].

Surveillance of listeriosis in the EU/EEA in 2010–2012

Since 2008, ECDC has been coordinating European surveillance of listeriosis infection, in close collaboration with a network of nominated experts, epidemiologists and microbiologists from EU/EEA countries as part of the Food- and Waterborne Diseases and Zoonoses (FWD) Network.

The surveillance of listeriosis at EU level differs from other food- and waterborne diseases in that it focuses solely on invasive infections resulting in severe symptoms or outcomes, such as meningitis, septicaemia or abortion. The scope of the surveillance is defined by the general surveillance objectives for food- and waterborne diseases (see Introduction) and the EU case definition for listeriosis (see Annex H).

The aims and purposes of the disease-specific surveillance have been discussed with the European Food- and Waterborne Diseases and Zoonoses Network. For listeriosis, the specific surveillance objectives are:

- to improve the detection of dispersed clusters and outbreaks of listeriosis by setting up real-time molecular surveillance for human cases and to connect/harmonise the typing methods for food, feed and animal strains; and
- to monitor the severity of disease (hospitalisation, outcome, specimens, pregnancy association).

Listeriosis surveillance through The European Surveillance System (TESSy) consists of standard reporting of cases and the collection of data on serotypes. In 2012, PCR serogrouping was added for enhanced data set collection in relation to listeriosis [2,3]. A standardised collection of molecular typing data for human *Listeria monocytogenes* infections in the TESSy started in 2012.

In 2010–2012, the reporting of listeriosis covered 25 variables, 21 of which were common variables for all food- and waterborne diseases and four were specific to *L. monocytogenes.* The common variables are presented in Table 1 in the chapter on 'Data collection and analyses'. Additional *L. monocytogenes* -specific variables are presented below in Table 2.1. In 2012, 24 EU/EEA countries had a compulsory reporting system with full population coverage for listeriosis. Four countries had a voluntary system and two countries did not report *L. monocytogenes* infections to TESSy (Table 2.2).

Table 2.1. Enhanced dataset collected for listeriosis cases, EU/EEA, 2010–2012

Variable	Description in TESSy
PregnancyAssociated	Abortion or miscarriage associated with confirmation of *Listeria* infection in the foetus, stillborn or newborn child up to one week of age.
PCR Serogroup[a]	Serogroup of *L. monocytogenes* based on molecular serotyping
Serotype	Serotype of the pathogen which is the cause of the reported disease
Specimen[a]	The relevant specimen type used for diagnosis of the case.

[a] *Variable added for 2012 reporting*

National surveillance systems for listeriosis

Table 2.2. Notification systems for listeriosis cases in EU/EEA countries, 2012

Country	Reported since	Legal character[a]	Case-based/ aggregated[b]	National coverage[c]	Changes in surveillance system 2010–2012
Austria	1947	Cp	C	Y	
Belgium	<1999	V	C	Y	
Bulgaria	2004	Cp	A	Y	No changes
Cyprus	2005	Cp	C	Y	
Czech Republic	2008	Cp	C	Y	
Denmark	1993	Cp	C	Y	No changes
Estonia	2004	Cp	C	Y	
Finland	1995	Cp	C	Y	
France	1998	Cp	C	Y	No changes
Germany	2001	Cp	C	Y	No changes
Greece	Yes	Cp	C	Y	
Hungary	1998	Cp	C	Y	
Ireland	2004	Cp	C	Y	
Italy	1990	Cp	C	-	Incomplete reporting for 2012
Latvia	1997	Cp	C	Y	No changes
Lithuania	1998	Cp	C	Y	
Luxembourg	2004	V	-	Y	
Malta	Yes	Cp	C	Y	
Netherlands	2008	Cp	C	Y	No changes
Poland	1966	Cp	C	Y	
Portugal	-	-	-	-	-[d]
Romania	Yes	Cp	C	Y	
Slovakia	1985	Cp	C	Y	
Slovenia	1977	Cp	C	Y	No changes
Spain	1982	V	C	N (population coverage 25%)	
Sweden	1969	Cp	C	Y	
United Kingdom	Yes	V	C	Y	
Iceland	Yes	Cp	C	Y	
Liechtenstein	Yes	-	-	-	-
Norway	1975	Cp	C	Y	

[a] *Legal character: Cp=compulsory, V=voluntary*

[b] *C=case based, A=aggregated*

[c] *National coverage: Y=yes, N=no*

[d] *Not reported/no data provided*

Epidemiological situation in 2010–2012

Major findings

- A significant increase in domestically-acquired listeriosis cases was observed at EU/EEA level between 2008 and 2012.
- In spite of the increasing trend in domestic cases, listeriosis is still relatively uncommon in Europe and the average notification rate during 2010–2012 was 0.35 cases per 100 000 population.
- Listeriosis is an EU/EEA problem: 99% of reported listeriosis infections in 2010–2012 were domestically acquired or acquired in another EU country.
- An increase in notification rates for listeriosis was observed in the over-65 age group. The highest notification rates were reported in those over 85 years.
- Male cases were predominant in groups over 45 years of age: their risk of infection was twice as high as the risk of women in the same age groups.

- The four most commonly reported *L. monocytogenes* serotypes (serogroups) at EU/EEA level in 2010–2012 were 4b (IVb) and 1/2a (IIa) representing 70% (>80%) of the reported serotypes (serogroups), respectively.
- In total, 94% of the cases for which hospitalisation data was available were hospitalised; the high hospitalisation rate is due to a focus on invasive cases (as described in the EU case definition).
- The overall case fatality ratio for listeriosis was 16% (517 cases) at EU/EEA level in 2010–2012.
- The majority of deaths (>80%) reported in 2010–2012 were linked to serotypes (serogroups) 4b (IVb) and 1/2a (IIa), although relatively high case fatality ratios were reported for a rare serotype 1/2b (IIb) and 1/2c (IIc).

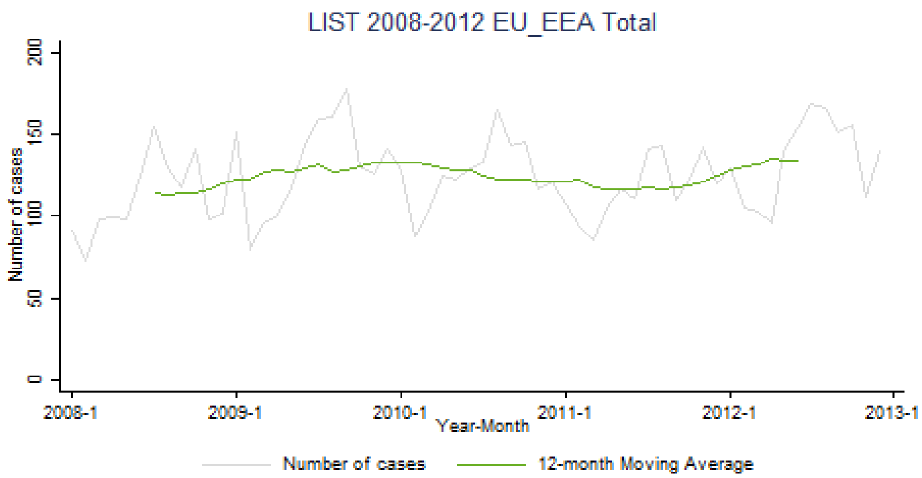
Overview of trends

From 2010 to 2012, a total of 4 851 confirmed cases of listeriosis were reported to TESSy by 26 EU Member States and two EEA countries, excluding Portugal and Liechtenstein.

At EU/EEA level, a stable trend has been observed in the total number of reported confirmed cases since 2008 (Figure 2.1). The average notification rate in 2010–2012 was 0.35 cases per 100 000 population. The number of confirmed listeriosis cases in the EU/EEA countries declined by 9% between 2010 and 2011, from 1 666 cases to 1 509 cases (Table 2.3). In 2012, the number of listeriosis cases returned to the same level as in 2010, with 1 676 confirmed cases reported (Table 2.3).

Between 2010 and 2012, the highest number of listeriosis cases was reported from Germany (cumulative N=1 119), accounting for 23% of all reported cases, followed by France with 19% (cumulative N=942) and the United Kingdom with 11% (cumulative N=523) of all reported cases (Table 2.3). Overall, the highest country-specific notification rates were observed in Finland, followed by Denmark and Spain (>0.8 cases per 100 000), while the lowest rates were reported in Romania and Bulgaria (<0.08 cases per 100 000) (Table 2.3).

Figure 2.1. Trend in number of confirmed listeriosis cases in EU/EEA countries, 2008–2012 (N=7 457)



Source: Austria, Belgium, Czech Republic, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Latvia, Luxembourg, Malta, the Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Table 2.3. Confirmed listeriosis cases and notification rates (per 100 000 population) by country in the EU and EEA, 2010–2012

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	34	0.41	26	0.31	36	0.43
Belgium	40	0.37	70	0.64	83	0.75
Bulgaria^	4	0.05	4	0.05	10	0.14
Cyprus	1	0.12	2	0.24	1	0.12
Czech Republic	26	0.25	35	0.33	32	0.30
Denmark	62	1.12	49	0.88	50	0.90
Estonia	5	0.37	3	0.22	3	0.22
Finland	71	1.33	43	0.80	61	1.13
France	312	0.48	282	0.43	348	0.53

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Germany	377	0.46	330	0.40	412	0.50
Greece	10	0.09	10	0.09	11	0.10
Hungary	20	0.20	11	0.11	13	0.13
Ireland	10	0.22	7	0.15	11	0.24
Italy*	137	0.23	100	0.16	36	-
Latvia	7	0.31	7	0.34	6	0.29
Lithuania	5	0.15	6	0.20	8	0.27
Luxembourg	-	-	2	0.39	2	0.38
Malta	1	0.24	2	0.48	1	0.24
Netherlands	72	0.43	87	0.52	73	0.44
Poland	59	0.15	62	0.16	54	0.14
Portugal	-	-	-	-	-	-
Romania	6	0.03	1	0.00	11	0.05
Slovakia	5	0.09	31	0.57	11	0.20
Slovenia	11	0.54	5	0.24	7	0.34
Spain[a]	129	1.12	91	0.79	107	0.93
Sweden	63	0.67	56	0.59	72	0.76
United Kingdom ~	176	0.29	164	0.26	183	0.29
EU total* **	**1 643**	**0.36**	**1 486**	**0.33**	**1 642**	**0.36**
Iceland	1	0.31	2	0.63	4	1.25
Liechtenstein	-	-	-	-	-	-
Norway	22	0.45	21	0.43	30	0.60
EU/EEA total* **	**1 666**	**0.36**	**1 509**	**0.33**	**1 676**	**0.36**

^ Aggregated reporting

** Incomplete reporting for 2012*

[a] Population coverage 25%

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

*** For each year shown, notification rates were calculated, with the exception of countries with unknown population coverage. Also excluded were populations of countries which did not report data. Populations of countries which reported 0 cases were included.*

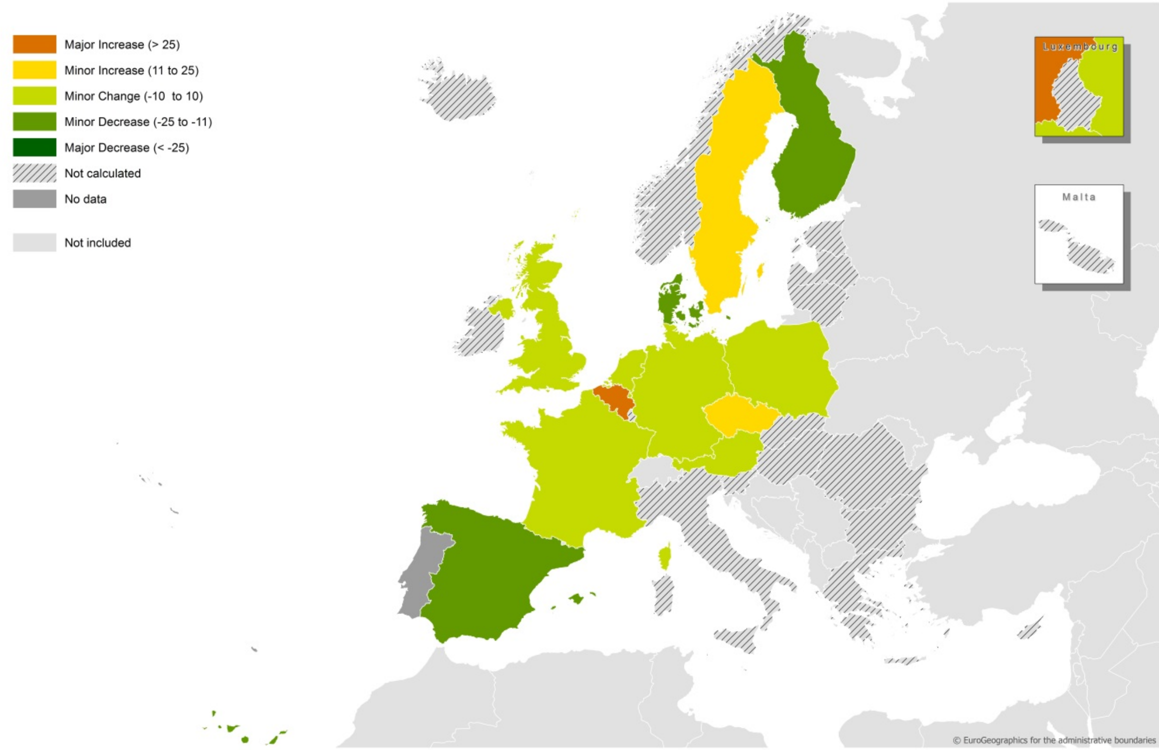
– Not reported/not calculated

When comparing 2012 to 2010, the highest increase in rates was reported in Belgium (from 0.4 to 0.7 cases per 100 000) (Table 2.3, Figure 2.2), whereas minor decreases in rates were observed in Denmark (from 1.1 to 0.9 cases per 100 000), Finland (from 1.3 to 1.1 cases per 100 000) and Spain (from 1.1 to 0.9 cases per 100 000) (Table 2.3, Figure 2.2).

Country-specific trends in the number of confirmed listeriosis cases were calculated from 2008 to 2012. In the majority of reporting countries the number of cases remained stable during the five-year surveillance period and a significant increase was observed in the Netherlands and Poland (p-value <0.01) (Figure 2.3). The increase in the Netherlands was probably due to the transition from voluntarily reporting to notifiable disease at the end of 2008.

Please note that in a country with a small population even low numbers of reported cases can lead to a relative overrepresentation.

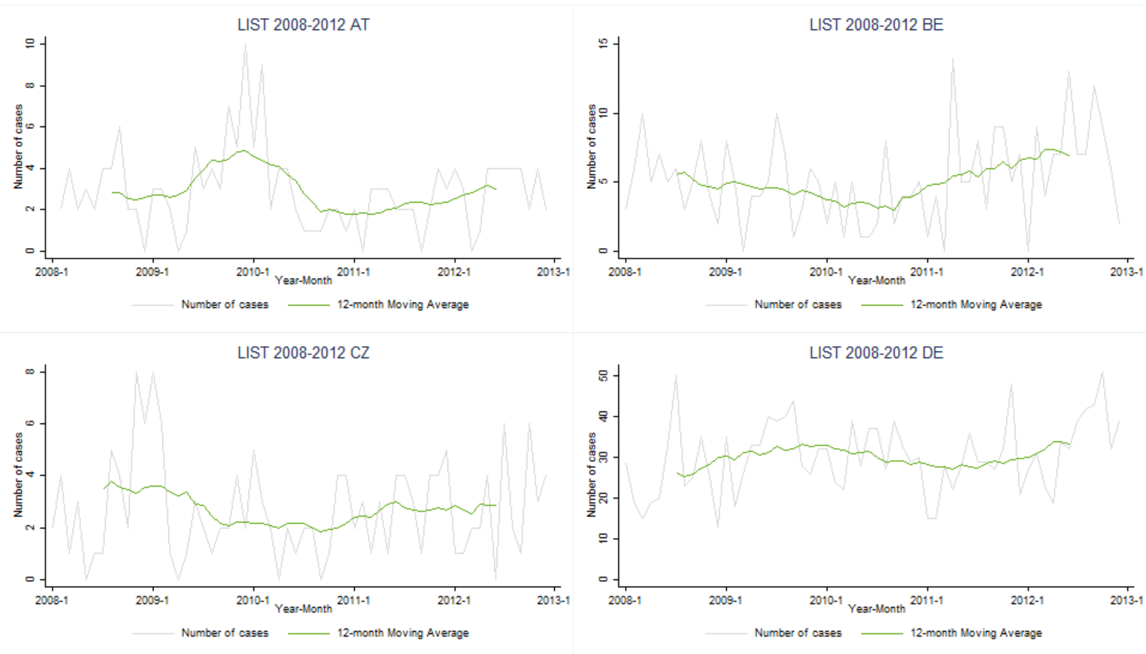
Figure 2.2. Percentage change in notification rates of listeriosis cases in EU/EEA countries, 2010–2012

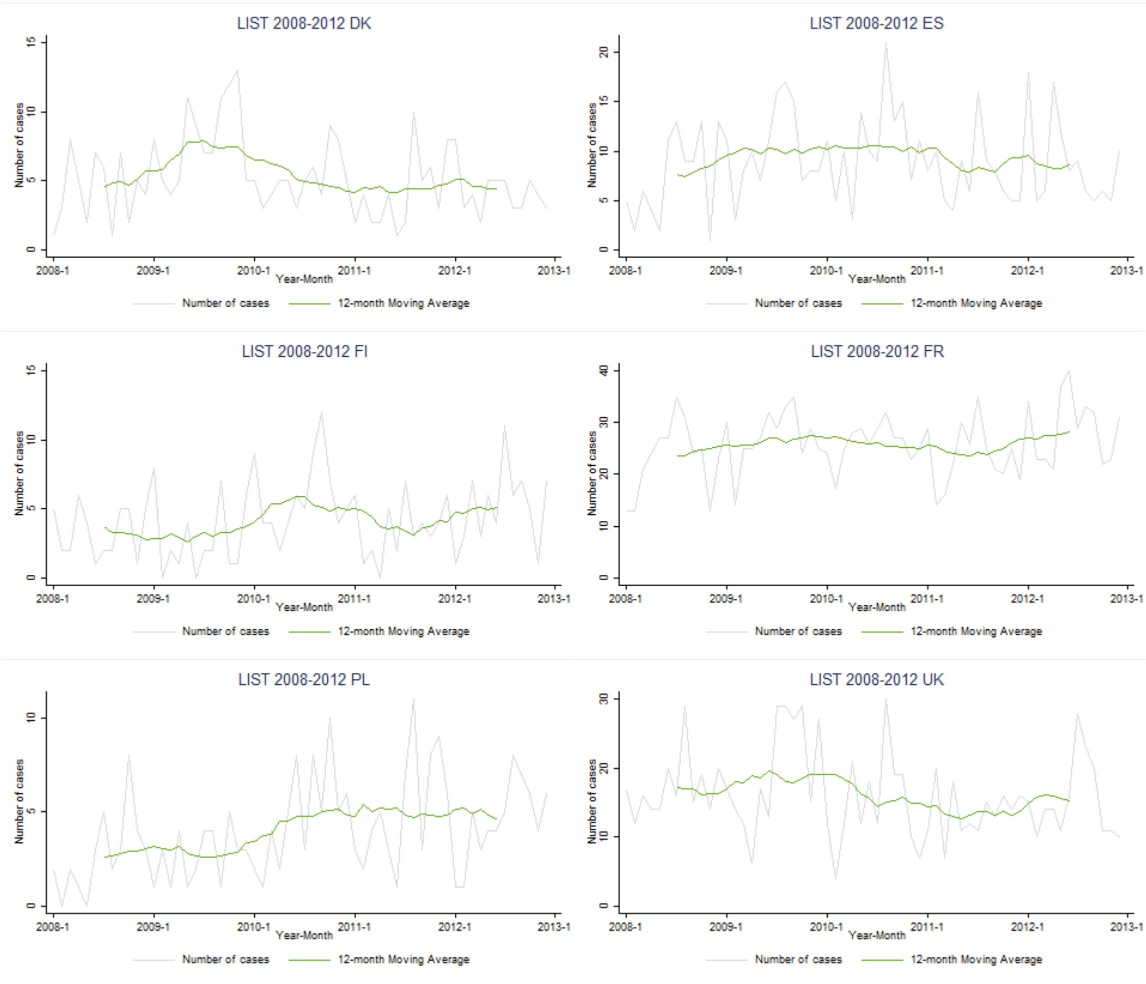


Not calculated: Country-specific percentage changes in notification rates were not calculated if the number of confirmed cases reported for one or more years during 2010–2012 was lower than 25, if sentinel surveillance systems had unknown population coverage, or if there was incomplete reporting for one of the reporting years.

Source: The European Surveillance System (TESSy) data, 2010–2012

Figure 2.3. Trend in number of confirmed listeriosis cases by EU/EEA country, 2008–2012





Country codes: see page xiv

Please note that graphs are on different scales.

Country-specific trends were not calculated if less than five confirmed cases were reported per month during the period 2008–12.

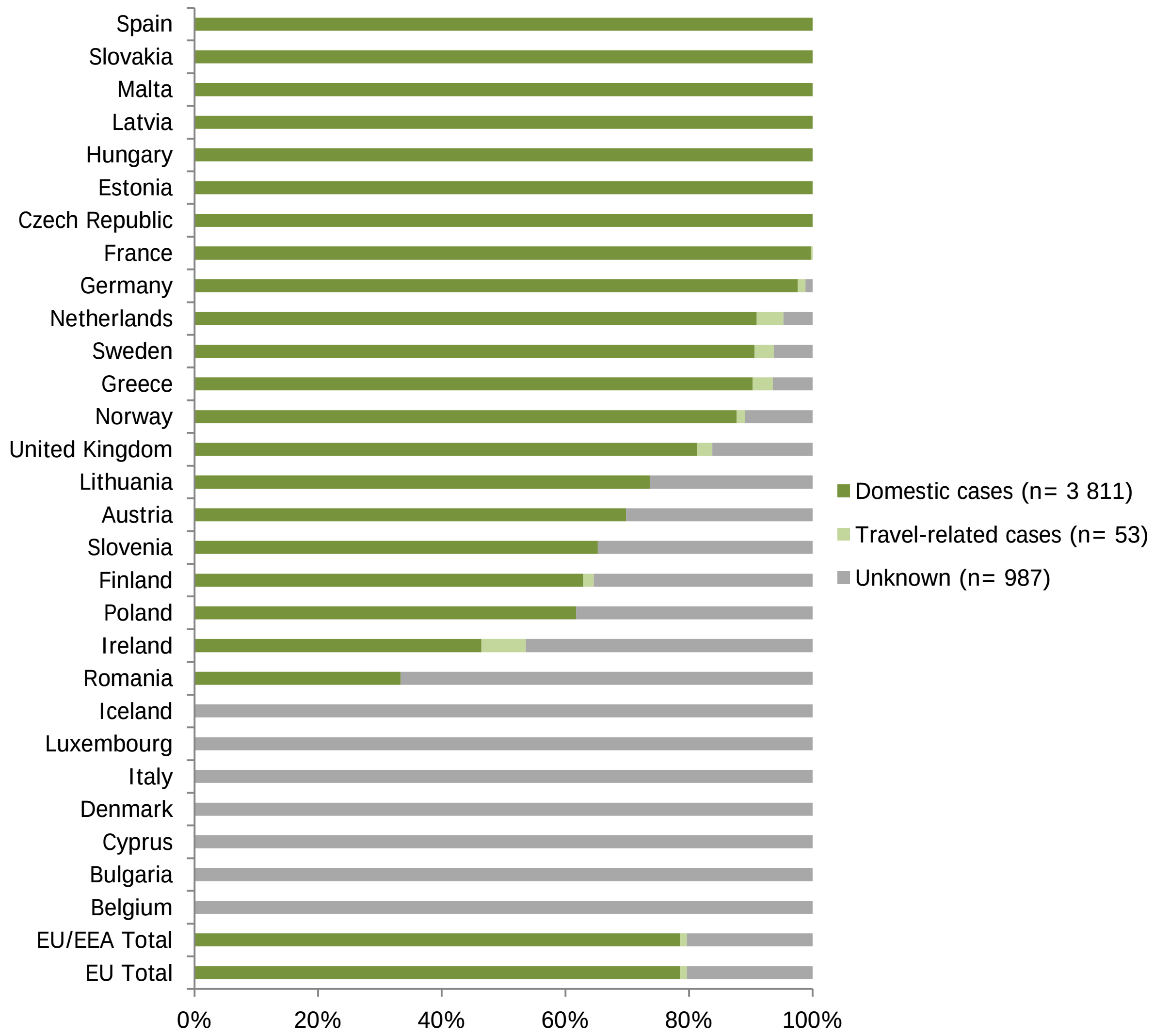
Origin of the infection

By definition, cases of listeriosis are recorded as imported for the purpose of data collection if a case stayed outside the country of notification during the incubation period. Since listeriosis may have a long incubation period (2–88 days), any assumption regarding the country of origin of the infection should be made with caution.

Within the three-year period from 2010 to 2012, 20 EU countries plus Norway reported data on the origin of infection for 3 864 confirmed cases (79.7%, pooled data) (Annex B: Table B2.1). One country reported information only for cases notified in one or two years during the period 2010–2012. The information on the origin of infection was reported for more than 90% of confirmed cases in 12 countries and only two countries reported the information for less than 55% of confirmed cases (Figure 2.4; Annex B: Table B2.1).

The proportion of domestic versus travel-associated cases was quite similar among countries, with a clear predominance of domestic cases (Figure 2.4; Annex B: Table B2.1). Only nine countries reported travel-associated *Listeria* infections during the three-year surveillance period (2010–2012). The proportion of travel-related cases was always below 10% and the majority of infections were acquired travelling to another European country (Figure 2.4; Annex B: Table B2.1).

Figure 2.4. Proportion of confirmed listeriosis infections cases by origin of infection (domestic/travel-related), as reported by EU/EEA countries, 2010–2012 (N=4 851)

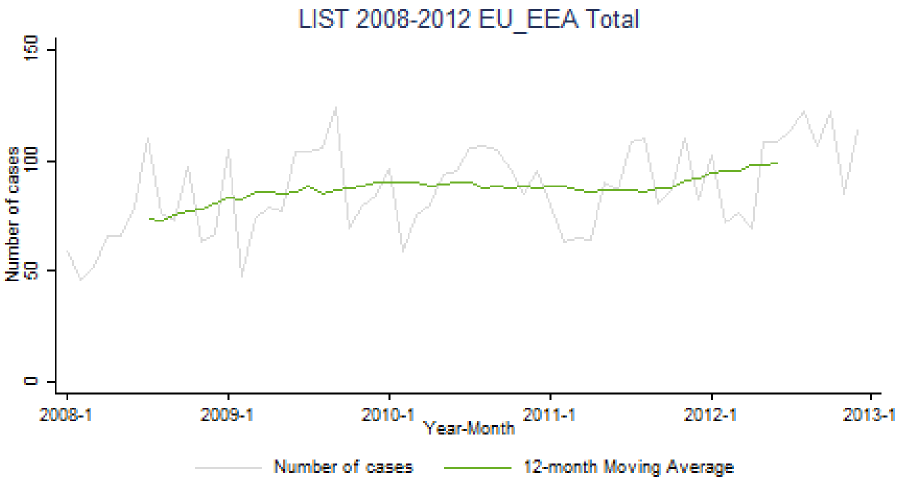


Domestic cases

Among cases for which information was available (n=3 864, cumulative data 2010–2012), the majority of listeriosis cases (99%) reported at EU/EEA level during 2010–2012 were domestically acquired (Annex B: Table B2.1).

During the period 2008–2012, a significantly increasing trend in domestic listeriosis cases was reported at EU/EEA level (p-value<0.01) (Figure 2.5; Annex B: Table B2.2). Over the five-year period, Germany reported the most significant increase in the number of domestic cases, followed by Poland and the Netherlands (p-value<0.01) and no country showed a statistically significant decrease in domestic listeriosis cases from 2008 to 2012.

Figure 2.5. Trend in number of confirmed domestic listeriosis cases, EU/EEA country, 2008–2012 (N=5 228)



Source: Czech Republic, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Latvia, the Netherlands, Poland, Romania, Slovakia, Slovenia, Spain and Sweden; EEA country: Norway

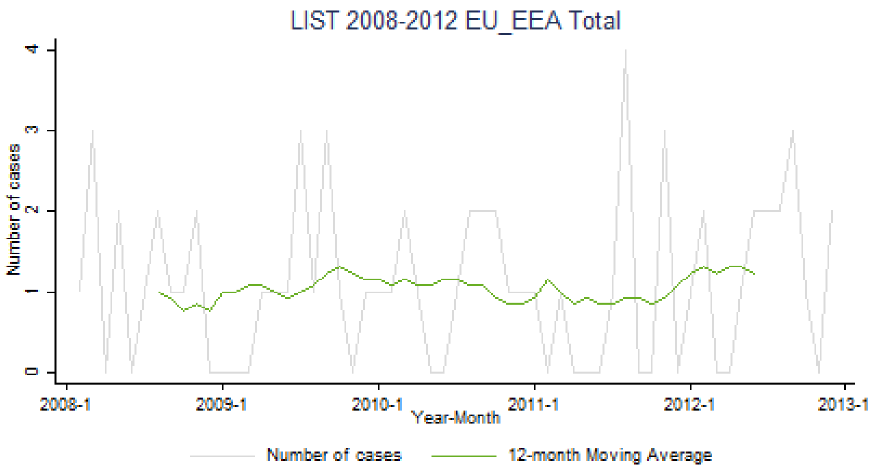
Travel-related cases

Among cases for which information was available (n=3 864, cumulative data 2010–2012), only 53 confirmed travel-related listeriosis cases were reported by nine EU/EEA countries (Finland, France, Germany, Greece, Ireland, the Netherlands, Norway, Sweden and the United Kingdom) during the three-year surveillance period 2010–2012 (Annex B: Table B2.1, Table B2.3).

The trend in the number of confirmed travel-related listeriosis cases at EU/EEA level remained stable during the period 2008–2012 (Figure 2.6; Annex B: Table B2.3). Due to the low number of confirmed cases reported per year, country-specific trends were not calculated.

The probable country of infection was indicated for 49 cases. EU countries were noted as the country of infection twice as often (33 cases, 67%) as non-EU countries (16 cases, 33%). Overall, the most frequently reported destinations in travel-related listeriosis cases were Spain (10 cases, 20%), France (seven cases, 14%) and Italy (seven cases, 14%). The geographical region mostly associated with the *Listeria* infection acquired in non-EU countries was Asia (five cases, 31%).

Figure 2.6. Trend and number of confirmed travel-related listeriosis cases in EU/EEA countries, 2008–2012 (N=65)



Source: Finland, France, Germany, Greece, Ireland, the Netherlands, Poland, Slovakia and Sweden; EEA country: Norway

Age and sex

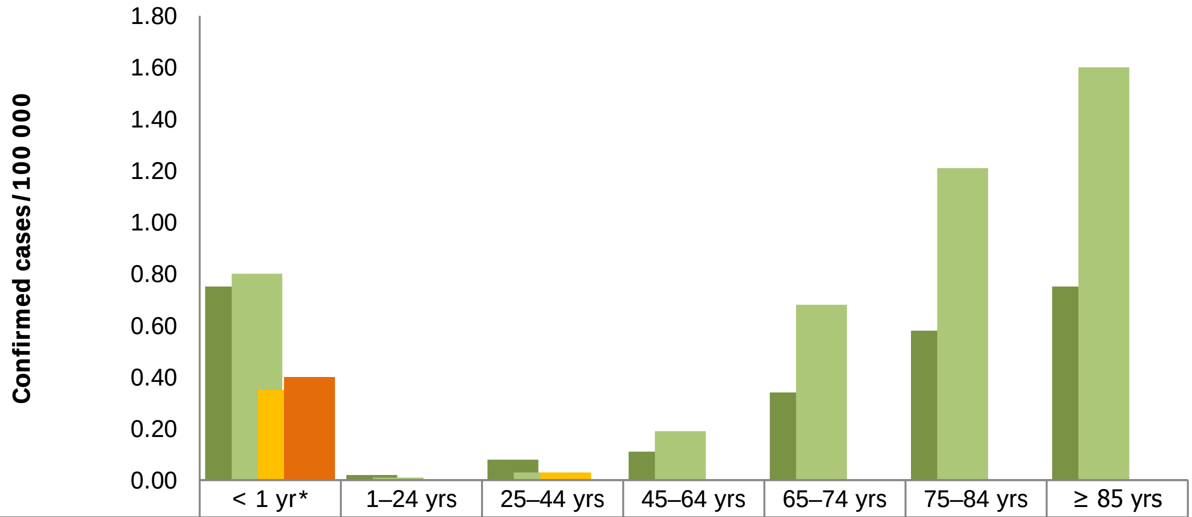
During 2010–2012, data on age and sex were reported for 99% of confirmed listeriosis cases by 27 EU/EEA countries (N=4 782). Among confirmed cases with known data for sex and age, cases aged 45 years or older accounted for 83% of the total reported in 2010–2012 (Annex B: Table B2.4).

Overall, the notification rates increase rapidly in older age groups (over 65 years). The notification rate was highest in both sexes for those aged 85 years (males: 1.6 per 100 000; females: 0.8 per 100 000), followed by infants (0.8 per 100 000) and those aged 75–84 years (males: 1.2 per 100 000; females: 0.6 per 100 000) (Figure 2.7; Annex B: Table B2.4). The age group 1–44 years presented the lowest risk of infection for listeriosis, with notification rates below 0.1 cases per 100 000 population (Figure 2.7; Annex B: Table B 2.4). In children under one year, 50% (N=114) of the cases were pregnancy-associated (notification rate in males: 0.4 per 100 000; in females: 0.35 per 100 000). In the age group 25–44 years, 23% (N=117) of female cases with known data (notification rate 0.03 per 100 000) were associated with pregnancy (Figure 2.7).

There was a notable difference in notification rates between sexes. Overall, the male-to-female ratio was 1.3:1. In the age groups 65 years and older, notifications rates were about twice as high in males as in females, whereas in the age groups 1–44 years, notification rates were higher in females than in males (male-to-female ratio: 0.4:1) (Figure 2.7; Annex B: Table B 2.4). The male-to-female ratio was balanced only among children under one year (Figure 2.7; Annex B: Table B 2.4).

Due to the differences in notification rates between the age groups in males and females, three-year trends from 2010 to 2012 were described by sex (Figure 2.8; Annex B: Table B 2.4). During 2010–2012, the age-specific rates remained stable in all age groups (Figure 2.8; Annex B: Table B 2.4).

Figure 2.7. Notification rates of confirmed listeriosis cases by age group, sex and pregnancy-associated cases in EU/EEA countries, 2010–2012 (N=4 511)



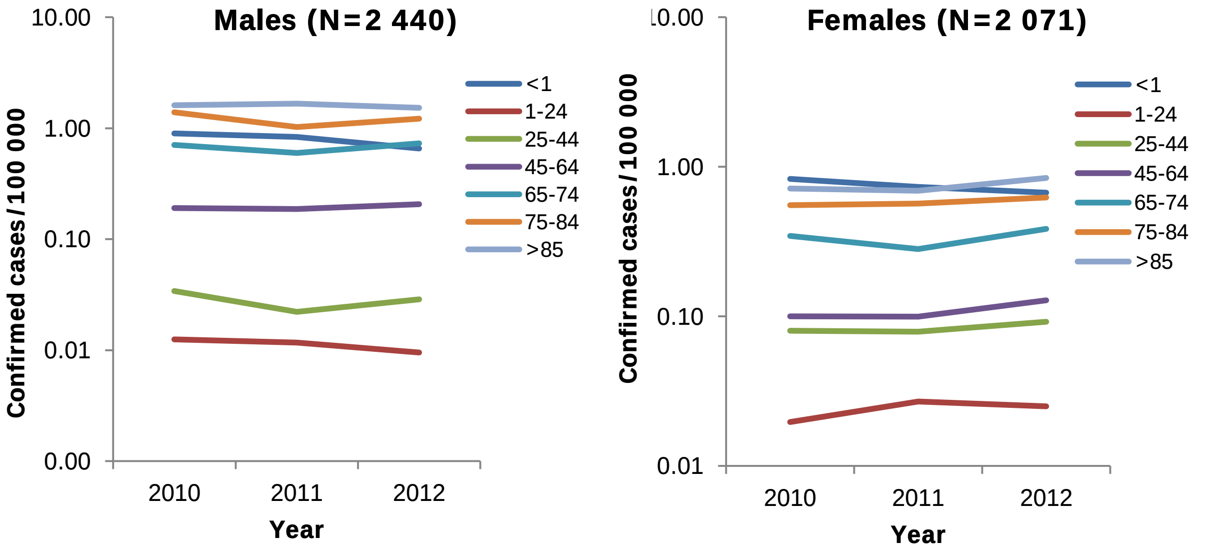
	< 1 yr*	1–24 yrs	25–44 yrs	45–64 yrs	65–74 yrs	75–84 yrs	≥ 85 yrs
Females (all)	0.75	0.02	0.08	0.11	0.34	0.58	0.75
Males (all)	0.80	0.01	0.03	0.19	0.68	1.21	1.60
Females (PA**)	0.35	0.001	0.03	0.001	-	-	-
Males (PA**)	0.40	-	-	-	-	-	-

** From ≥ 20 weeks gestation to <12 months*

*** PA: Pregnancy-associated; abortion or miscarriage associated with confirmation of Listeria infection in the foetus, stillborn or newborn child up to one week of age.*

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Luxembourg, the Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Figure 2.8. **Semi-logarithmic graph showing trends in notification rates for confirmed listeriosis cases by age group and sex in EU/EEA countries, 2010–2012**



Listeria monocytogenes serotypes/serogroups

After identification, the first step towards microbiological characterisation of *L. monocytogenes* is the typing, either using the classical serotyping method or a molecular method known as PCR serogrouping. Classical serotyping (traditional agglutination method) is based on the determination of somatic (O) and flagellar (H) antigens and it distinguishes 13 serotypes for *L. monocytogenes*, whereas PCR-based methods classify *L. monocytogenes* isolates with less discriminatory power into four major groups: IIa (corresponding to conventional serotypes 1/2a and 3a), IIb (corresponding to conventional serotypes 1/2b, 3b and 7), IIc corresponding to conventional serotype 1/2c and 3c), IVb with IVb-v1 (corresponding to conventional serotype 4b, 4d, and 4e), and *Listeria* species (corresponding to conventional serotypes 4a, 4ab, 4c) [2,3] (Table 2.4).

PCR serogroups were included in the EU/EEA-level surveillance for listeriosis for the first time in 2012. In this report, summary of classic agglutination tests and PCR serogroups is presented in Table 2.4 and further serotype data based on traditional typing and molecular PCR-based methods are described separately. Detailed information on data reporting at country level is shown in Annex B: Table B 2.5.

During 2010–2011, 12 EU/EEA countries reported data on characterisation of *L. monocytogenes* by traditional serotyping for 1 635 reported confirmed listeriosis cases. In 2012, when the PCR-serogroup variable was added for EU/EEA level reporting, three countries (France, Sweden and the United Kingdom) provided only PCR-serogroup data for 522 confirmed listeriosis cases (Table 2.5).

The four most commonly reported *L. monocytogenes* serotypes in the EU/EEA in the three-year period 2010–2012 were 4b, 1/2a, 1/2b and 1/2c (Table 2.5). Overall, in 2010–2012, serotypes 4b and 1/2a accounted for 33% and 34% of all reported serotypes in this period, respectively. Incomplete serotyping data (serogroup 1/2 and 4) were reported for 22% of the confirmed cases during 2010–2011, whereas no isolates were reported with incomplete serotyping (serotype 1/2 and/or 4) in 2012 (Table 2.6).

Table 2.4. ***Listeria monocytogenes*** **serotypes/serogroups (traditional serotyping and PCR serogrouping) in confirmed cases, EU/EEA countries, 2012 (N=2 157)**

Serogroup	Serotypes included	2010		2011		2012	
		Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
IVb	4b, 4d, 4e	236	30.9	206	32.0	385	51.5
IIa	1/2a, 3a	284	37.1	187	29.0	255	34.1
IIb	1/2b, 3b, 7	69	9.0	69	10.7	83	11.1
IIc	1/2c, 3c	12	1.6	10	1.6	25	3.3
Other	1/2, 4, other	164	21.4	172	26.7	0	0.0
Total		**765**	**100.0**	**644**	**100.0**	**748**	**100.0**

Source: Austria, Belgium, Denmark, France, Germany, Hungary, Ireland, the Netherlands, Romania, Slovenia, Sweden, United Kingdom; EEA country: Norway

Table 2.5. ***Listeria monocytogenes*** **serotypes (traditional serotyping) in confirmed cases, EU/EEA countries, 2010–2012 (N=712)**

Serotype	2010		2011		2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
4b	71	27.5	57	24.8	107	47.8
1/2a	82	31.8	66	28.7	94	42.0
1/2b	14	5.4	14	6.1	19	8.5
1/2c	4	1.6	1	0.4	3	1.3
3a	0	0.0	0	0.0	1	0.4
Other*	87	33.7	92	40.0	0	0.0
Total	**258**	**100.0**	**230**	**100.0**	**224**	**100.0**

** 'Other' includes serotypes reported as 'other' and incomplete serotypes 1/2 or 4.*

Source: Austria, Belgium, Denmark, Germany, Hungary, Ireland, the Netherlands, Romania, Slovenia; EEA country: Norway

The most frequently reported PCR serogroup in 2012 was the IVb, including serotypes 4b, 4d and 4e, that accounted for 53% of all reported isolated. The second most commonly reported PCR serogroup was IIa, including serotypes 1/2a and 3a (31% of all reported isolates) (Table 2.6).

Over the five-year period 2008–2012, few countries reported complete data on serotypes. As a result, trends in the number of confirmed listeriosis cases by *L. monocytogenes* serotypes (traditional serotyping methods) were not calculated.

Table 2.6. ***Listeria monocytogenes*** **PCR serogroups in confirmed cases, EU/EEA countries, 2012 (N=522)**

PCR serogroups	2012	
	Cases	Percentage (%)
IVb	277	53.1
IIa	160	30.7
IIb	63	12.1
IIc	22	4.2
Total	**522**	**100.0**

Source: France, Sweden, United Kingdom

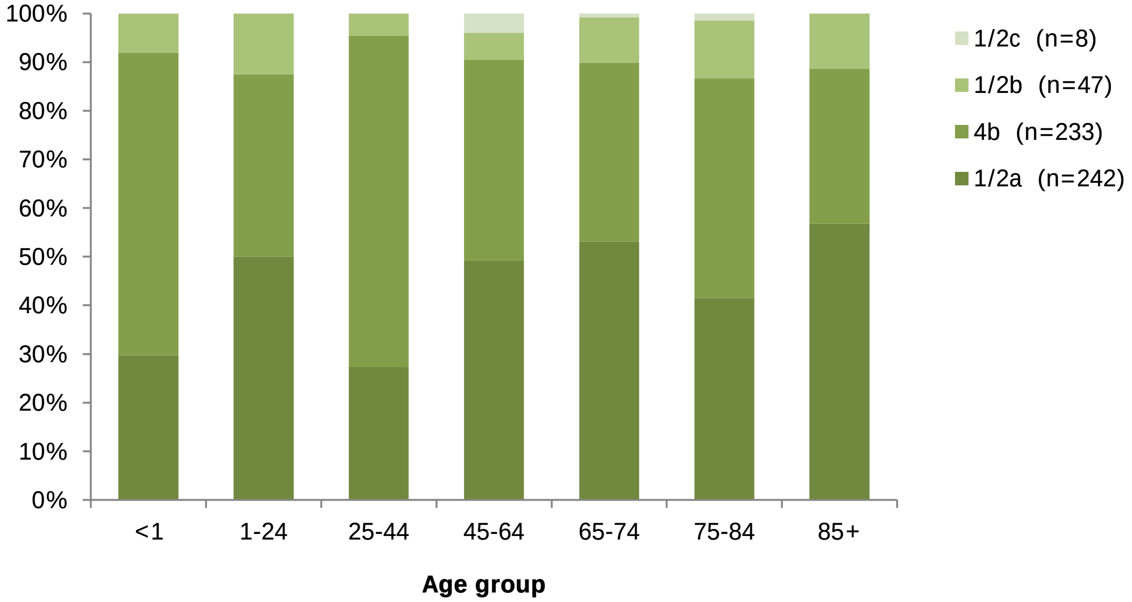
Serotypes/serogroups by age group

The age distribution of confirmed *L. monocytogenes* cases reported in 2010–2012 is described for the traditional serotypes and the PCR serogroup (Figure 2.9 and 2.10; Annex B: Table B 2.6a, 6b).

Complete data on traditional serotypes and age were provided by ten EU/EEA countries for 530 confirmed cases in 2010–2012. The two most commonly reported *L. monocytogenes* serotypes in the EU/EEA (1/2a, 4b) were reported for all age groups, although showing a different age distribution (Figure 2.9; Annex B: Table B 2.6a). Serotype 1/2a was the most frequent in persons aged 45 years or older and serotype 4b was mainly reported in those under 45 years (Figure 2.9; Annex B: Table B 2.6a). Serotype 1/2b occurred mainly in the age group 1–24 years and in cases aged 75 years or above. Serotype 1/2c was mostly reported in the age group 45–64 years (Figure 2.9; Annex B: Table B 2.6a). However, the proportion of 'other', incomplete serotyping (4, 1/2) and 'unknown' serotypes was high (about 82%) and any interpretation must be made with caution.

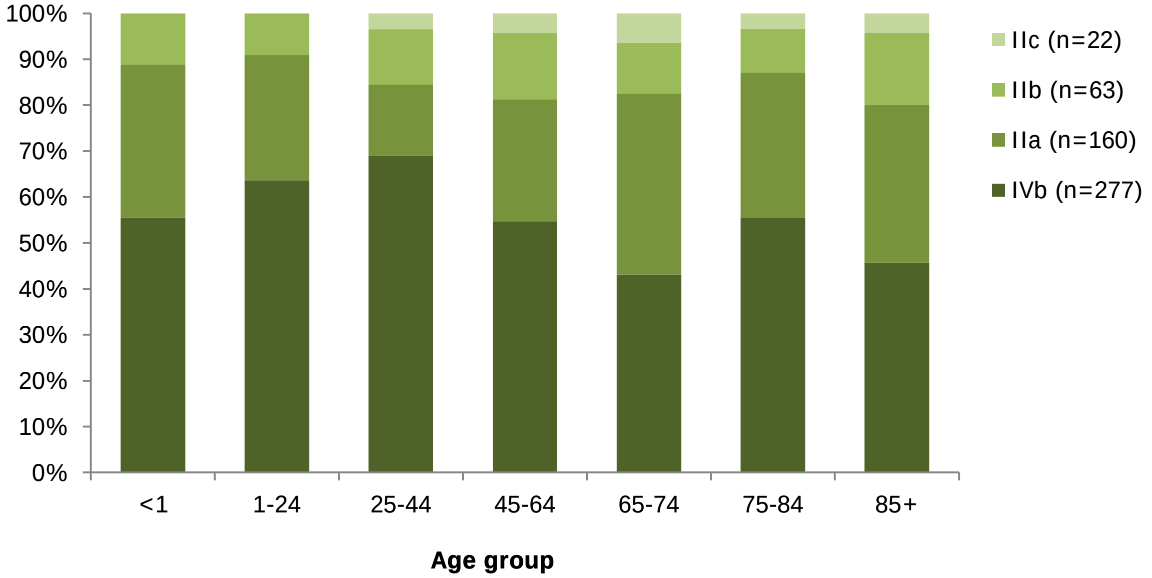
Data on PCR serogroups and age were provided by three EU/EEA countries for 100% of reported *L. monocytogenes* isolates (Annex B: Table B 2.6b). The two most commonly reported PCR-profiles, IVb and IIa, occurred in all age groups (Figure 2.10; Annex B: Table B 2.6b) and their age distribution was very similar, with the exception of cases aged between 25 and 44 years, where the serogroup IVb was significantly more frequent, and those aged between 65 and 74 years where serogroup IIa was the most prevalent (Figure 2.10). A lower proportion of unknowns (33%) was reported among countries reporting PCR serogrouping than among those using traditional serotyping.

Figure 2.9. Relative distribution of most commonly reported *Listeria monocytogenes* serotypes (traditional serotyping) isolated in confirmed cases by age groups, EU/EEA countries, 2010–2012 (N=530)



Source: Austria, Belgium, Denmark, Germany, Hungary, Ireland, the Netherlands, Romania and Slovenia; EEA country: Norway

Figure 2.10. Relative distribution of most commonly reported *Listeria monocytogenes* PCR serogroups isolated in confirmed cases by age groups, EU/EEA countries, 2010–2012 (N=522)



Source: France, Sweden, United Kingdom

Severity

The severity of listeriosis was evaluated by analysing the hospitalisation ratio and the proportion of deaths due to the disease (outcome) among all confirmed cases by calculating the case–fatality ratio (by all cases, age-group and serotype); the occurrence of pregnancy-associated infections with adverse outcomes and the specimen type used for diagnosis of the infection. Relative confidence intervals (95% CI) were calculated for the hospitalisation and the case fatality ratios (CFR). Results are presented by country in the annexes (Annex B: Table B 2.7, Annex B: Table B 2.8).

Hospitalisation

Hospitalisation data were included in the EU/EEA-level surveillance for the first time in 2009. During 2010–2012, the information on hospitalisation was reported for 1 969 confirmed listeriosis cases by seventeen countries (Annex B: Table B 2.7). The completeness of reported information increased slightly from 39% in 2010 to 42.4% in 2012 (Table 2.7).

At EU/EEA level, the proportion of hospitalised cases decreased slightly in 2011 compared to 2010 (from 97.7% to 93.3%) and then remained stable between 2011 and 2012 (Table 2.7, Annex B: Table B 2.7). The observed decrease in hospitalisations was mainly driven by the United Kingdom, where the proportion of hospitalisations among confirmed listeriosis cases significantly decreased from 94% in 2010 (CI 95%: 89–97%) to 70% in 2012 (CI 95%: 62–77%) (Annex B: Table B 2.7). The high hospitalisation rate is due to surveillance focusing on invasive cases, in accordance with the EU case definition (Annex B: Table B2.7).

Table 2.7. Hospitalisation ratio of confirmed listeriosis cases as reported by EU/EEA countries, 2010–2012

Hospitalisation	Year		
	2010	2011	2012
Number of confirmed cases	1 666	1 509	1 676
Confirmed cases covered (%)[1]	39.0	40.4	42.4
Hospitalised cases	634	568	654
Hospitalisation ratio (%)[2] (confidence interval 95%)	97.7 (96.2-98.7)	93.3 (91.0-95.1)	92.0 (89.7-93.9)

[1] The proportion (%) of confirmed cases for which information on hospitalisation was available.

[2] Calculated as number of hospitalised cases of the confirmed cases for which this information was available.

Source: Austria, Cyprus, Estonia, France, Greece, Hungary, Ireland, Latvia, Lithuania, Luxembourg (only 2010–2011), Malta, Poland, Romania, Slovenia and United Kingdom; EEA countries: Iceland and Norway

Outcome

Overall, twenty countries (18 EU countries plus Iceland and Norway) provided data on outcome (alive/dead) in 2010–2012, with two countries (Greece and Iceland) reporting the information for one or two years in 2010–2012 (Annex B: Table B 2.8). The proportion of confirmed cases with data on outcome increased from 65% in 2010 to 68% in 2012 (Table 2.8).

The lowest CFR was reported in 2011 (12.7%) and the highest in 2012 (17.9%), although the rise in number of deaths observed in 2012 was not significant when compared with 2010 (Table 2.8, Annex B: Table B 2.8). The increase in CFR observed at EU/EEA level was mainly driven by increases in several countries: the United Kingdom (from 19% in 2011 to 34% in 2012), France (from 16% in 2011 to 20% in 2012), the Netherlands (from 2% in 2011 to 10% in 2012) and Poland (from 26% in 2011 to 40% in 2012), although in the two latter countries the number of reported cases was low (Annex B: Table B 2.8).

Table 2.8. Number of deaths and case-fatality ratio due to *Listeria monocytogenes* infections, EU/EEA countries, 2010–2012

Outcome	Year		
	2010	2011	2012
Number of confirmed cases	1 666	1 509	1 676
Confirmed cases covered (%)[1]	64.9	68.5	67.7
Number of deaths	183	131	203
Case fatality ratio (%)[2] (confidence interval 95%)	16.9 (14.7–19.3)	12.7 (10.7–14.9)	17.9 (15.7–20.2)

[1] The proportion (%) of confirmed cases for which information on death was available.

[2] Calculated as number of hospitalised cases of the confirmed cases for which this information was available.

Source: Austria, Cyprus, Czech Republic, Estonia, France, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Malta, the Netherlands, Poland, Romania, Slovakia, Slovenia and United Kingdom; EEA countries: Iceland and Norway

Age-specific case fatality ratio varied significant according to the age groups (Table 2.9). In 2010–2012, the lowest number of deaths was reported among cases aged between one and 44 years (25 deaths in the three-year period). In 2010–2012, the over-85 age group showed the highest CFR (24%), followed by infants under one year (19%) and cases aged between 75 and 84 years (18%) (Table 2.9).

Table 2.9 Number of deaths and case–fatality ratio due to *Listeria monocytogenes* infections by age group, EU/EEA, 2010–2012 (N=3 249)

Age group	2010			2011			2012		
	Confirmed cases	No. of deaths	Case fatality ratio (%)[1]	Confirmed cases	No. of deaths	Case fatality ratio (%)[1]	Confirmed cases	No. of deaths	Case fatality ratio (%)[1]
< 1 yrs	80	19	23.8	69	9	13.0	50	9	18.0
1–24 yrs	28	1	3.6	35	2	5.7	27	2	7.4
25–44 yrs	88	8	9.1	95	6	6.3	87	6	6.9
45–64 yrs	231	44	19.0	231	28	12.1	286	43	15.0
65–74 yrs	273	38	13.9	232	28	12.1	267	46	17.2
75–84 yrs	287	53	18.5	270	37	13.7	303	63	20.8
≥ 85 yrs	95	20	21.1	100	21	21.0	115	34	29.6
Total	**1 082**	183	16.9	1 032	131	12.7	1 135	**203**	**17.9**

[1] *Calculated as the number of fatal cases among confirmed cases for which this information was provided.*

Source: Austria, Cyprus, Czech Republic, Estonia, France, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Malta, the Netherlands, Poland, Romania, Slovakia, Slovenia and United Kingdom; EEA countries: Iceland and Norway

During 2010–2012, the majority of deaths were linked to the two most common serotypes 1/2a and 4b (64 and 72 cases, respectively) (Table 2.10). Serotype 1/2c was also associated with a high CFR, though the number of confirmed cases reported was very low (Table 2.10). The decrease in the number of deaths observed between 2010 and 2012 when analysing data by serotypes was due to a change in data reporting, since in 2012 two countries provided only PCR serogroups.

Table 2.10. Number of deaths and case–fatality ratio due to *Listeria monocytogenes* infections by serotypes (traditional serotyping), EU/EEA, 2010–2012 (N=1 270)

Serotypes	2010			2011			2012		
	Cases	No. of deaths	Case fatality ratio (%)	Cases	No. of deaths	Case fatality ratio (%)	Cases	No. of deaths	Case fatality ratio (%)
1/2a	215	39	18.1	161	18	11.2	72	7	9.7
4b	206	35	17.0	191	31	16.2	74	6	8.1
1/2b	60	14	23.3	63	11	17.5	15	2	13.3
1/2c	11	7	63.6	8	2	25.0	0	0	0.00
Other*	83	13	15.7	110	20	18.2	0	0	0.00
Total	**575**	**108**	**18.8**	**533**	**82**	**15.4**	**162**	**15**	**9.3**

*'Other' includes serotypes reported as 'other' and incomplete serotypes 1/2 or 4.

Source: Austria, France, Germany, Hungary, Ireland, the Netherlands, Romania, Slovenia and United Kingdom; EEA country: Norway

Data on PCR serogroups and outcome were provided by two EU countries (France and the United Kingdom). The highest number of deaths was associated with the PCR-profile IVb (60 deaths; CFR 26.4%) and the highest CFR with the PCR-profile IIc (26.7%), although the number of confirmed cases reported was low (Table 2.11).

Table 2.11. Number of deaths and case–fatality ratio due to *Listeria monocytogenes* infections by PCR serogroups, EU/EEA, 2012 (N=431)

Serogroups (PCR)	2012		
	Confirmed cases	No. of deaths	Case fatality ratio (%)
IVb	227	60	26.4
IIa	132	28	21.2
IIb	57	14	24.6
IIc	15	4	26.7

Source: France and United Kingdom

Pregnancy-associated infections

A pregnancy-associated case is reported as two separate cases (mother and child) when *Listeria* infection is confirmed in a foetus (>20 weeks of gestation), stillborn or newborn child up to one week of age. Abortion or miscarriage associated with confirmation of *Listeria* infection in the foetus or stillborn child at less than 20 weeks of gestation is only considered to be one case (mother). In 2010–2012, 23 EU countries provided data on the occurrence of pregnancy-associated infections with adverse outcomes. The proportion of unknown and missing data was 19% in 2010–2012. During the three-year surveillance period the information was reported for a total of 2 298 cases, 11% (n=243) of which were reported as associated with pregnancy (Table 2.12). The number of reported cases remained stable in 2010–2012. Most cases were reported in the age group under one year (52%; n=126), and 40% of cases were in females in age group 25–44 years (n=98) (Figure 2.7).

Table 2.12. Pregnancy-associated *Listeria monocytogenes* infections, EU/EEA countries, 2010–2012 (N=2 298)

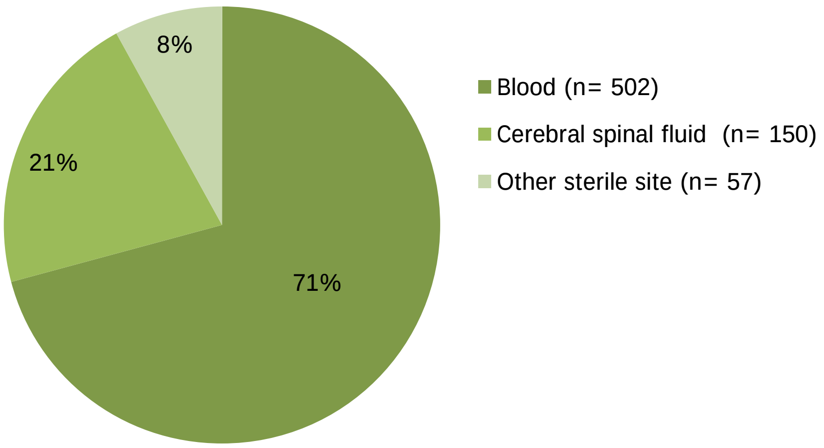
Pregnancy-associated	2010		2011		2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
Yes	87	10.0	81	13.1	75	9.3
No	591	67.6	499	80.6	533	66.2
Total known	**678**	**100.0**	**580**	**100.0**	**608**	**100.0**
Unknown/missing	196	22.4	39	6.3	197	
Total reported	**874**		**619**		**805**	

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Malta, the Netherlands, Poland, Romania, Slovakia, Spain, Sweden, United Kingdom; EEA country: Iceland

Isolation by specimen type

Information on specimen type was available only in 2012 and it was reported by 10 EU/EEA countries for a total of 709 confirmed listeriosis cases (Annex B: Table B 2.9). The most commonly reported diagnostic specimen was blood, representing 71% of all specimen types reported, followed by cerebral spinal fluid (21%) (Figure 2.11; Annex B: Table B 2.9). Information on distribution of specimen types in 2012 is presented in Figure 2.11.

Figure 2.11. Distribution of confirmed listeriosis cases diagnosed from different specimen types, as reported by EU/EEA countries in 2012 (N=709)



Source: Austria, Estonia, France, Hungary, Luxembourg, the Netherlands, Poland, Romania and United Kingdom; EEA country: Norway

Discussion

Listeriosis is a foodborne disease which, in its invasive form, is relatively uncommon in Europe. Listeriosis may cause serious illness in vulnerable populations, such as pregnant women, elderly people, and immunocompromised individuals [4-9].

During the three-year surveillance period, from 2010 to 2012, a total of 4 851 confirmed cases of listeriosis were reported at EU/EEA level and the average notification rate was 0.35 cases per 100 000 population. The highest country-specific notification rates were observed in Finland, Denmark and Spain (>0.8 cases per 100 000), while the lowest rates were reported in Romania and Bulgaria (<0.08 cases per 100 000). The high notification rates observed in certain countries may reflect some changes in food consumption habits, such as an increase in consumption of ready-to-eat (RTE) food products, especially by older age groups, as seen in Denmark [10].

Listeriosis is mainly acquired domestically or within another EU/EEA country. In the period 2010–2012, 99% of all reported listeriosis infections were acquired in Europe, either domestically or travelling within another EU/EEA country. Moreover, an increasing trend in domestic cases was noted at EU/EEA level during the period 2008–2012. During the five-year surveillance period, significant increases in the number of domestic cases were observed in Germany, the Netherlands and Poland.

Listeriosis is one of the most severe zoonotic diseases under surveillance in Europe [4-6, 7]. During the three-year surveillance period (2010–2012), 94% of the cases were hospitalised and the case fatality ratio was 16%. However, high hospitalisation rates are expected as the surveillance focuses on invasive cases.

In 2010–2012, the highest notification rates of listeriosis were reported in the age group 65 years and above, followed by that of infants under one year. Half of the cases in infants were pregnancy-associated. Cases aged one to 44 years had the lowest notification rates. These findings reflected results reported in other studies, describing an increase in listeriosis cases among people over 65 years with no significant underlying diseases and highlighting listeriosis as an emerging health problem among pregnant women, infants and the elderly in particular [9-11]. Major differences in rates were also observed in terms of sex. Risk of infection was twice as high in men aged over 65 years as for women in the same age group. This could potentially be due to differences in food consumption habits between men and women and should be investigated further.

Human cases of listeriosis are almost exclusively caused by the species *L. monocytogenes* [4-9]. In the three-year period 2010–2012, the four most commonly reported serotypes of *L. monocytogenes* at the EU/EEA level were 1/2a, 4b, 1/2b and 1/2c, with serotypes 1/2a and 4b accounting for about 70% of all reported serotypes. The results reflected findings described in other studies [8, 12, 13]. Reporting of the two most common serotypes increased in 2012, which is explained by an improvement in data reporting. No isolate with incomplete serotyping was reported in 2012 after the introduction of PCR serogroup reporting at the EU/EEA-level. Serotypes 1/2a and 4b dominated across all age groups and were responsible for the majority of reported deaths, although relatively high case–fatality ratios were associated with rare serotypes 1/2b and 1/2c. Serotype 3a was rarely reported in Europe: only one case (in the 75-84 year age group) was reported by Belgium in 2012. PCR serogrouping was introduced in 2012 reporting and three countries provided PCR serogroup data, therefore no conclusion can be drawn from this indicator at the EU/EEA level.

Listeria bacteria are ubiquitous organisms that are widely distributed in the environment. The principal reservoirs of *Listeria* bacteria are soil, forage and water. Domestic animals, such as cattle, sheep and goats can represent other sources of infection. Very rarely, infection can be transmitted directly from infected animals to humans, as well as between infected humans. Usually human infections are the result of *Listeria* bacteria being transmitted from food products [4-6, 9, 14, 20]. Due to the ability of *Listeria* to survive food-processing technologies that rely on acidic or salty conditions and to grow slowly, even in properly refrigerated foods, industrially processed and ready-to-eat (RTE) food items with prolonged shelf-life are usually linked to listeriosis. Changes in food production, distribution and storage have increased the risk of diffuse and widespread outbreaks, involving several countries through possible contaminated food products [21, 22].

According to Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January2002, laying down the procedures in matters of food safety, all food placed on the market must be safe to eat. For a healthy human population, foods containing less than 100 cfu/g *L. monocytogenes* are considered to pose a negligible risk. Therefore the EU microbiological criterion[1] for *L. monocytogenes* in ready-to-eat (RTE) food items is set as ≤100 cfu/g for RTE products on the market during their shelf-life. Limits are set to 'absence in 25 g' in ready-to-eat food intended for infants and for special medical purposes [4-6].

Overall, *L. monocytogenes* has seldom been detected above the legal safety limit in RTE on sale in the EU/EEA. The highest level of non-compliance is usually reported in fishery products, followed by RTE products of meat origin, cheeses and fermented sausages [4-6]. In 2010–2011, EU Member States were asked to assess the prevalence of *L. monocytogenes* in a range of RTE foods. The study targeted RTE food products, such as soft and semi-soft cheeses, hot and cold smoked and cured fish, and heat-treated meat products handled after heat treatment, which have previously been shown to be a public health risk in the EU [15-16]. *L. monocytogenes* was found in 10.3% of fish, 2.1% of meat and 0.5% of cheese samples collected from supermarkets and shops. However, the EU food safety limit (100 bacteria per gram) was exceeded only in 1.7% of the fish, 0.4% of the meat and 0.06% of the cheese samples [15]. Although the proportion of food samples exceeding the legal food safety limit was low, considering that RTE are intended to be consumed without any further heat treatment and given the popularity of these food items, the possible presence of the bacteria in food may still be a concern for public health.

Food-borne outbreaks due to *Listeria* are relatively rare; most of the cases are sporadic. *L. monocytogenes* infections have a long incubation period making the identification of specific food vehicles difficult in many cases.

[1] Commission Regulation (EC) No 2073/2005 of 15 November 2005 on microbiological criteria for foodstuffs

Further efforts are needed to improve the timely linkage of comparable data, including molecular typing data from both human and food isolates.

In 2010, three *Listeria* outbreaks were reported, with strong evidence that they were foodborne –one by Germany and two by the United Kingdom. Overall, 26 cases were involved, 22 were hospitalised and four died. Identified food vehicles were fish, mixed meat and an unspecified source. In all the outbreaks the implicated food was of domestic origin. Moreover, two outbreaks with weak evidence regarding the association between illness and food items were reported by Austria and Denmark, causing 12 human cases, one of which was hospitalised [4]. There was also one multinational outbreak with a total of 34 cases (Austria 25 cases; Germany 8; Czech Republic 1) reported in 2009–2010. In this instance, the consumption of 'Quargel' cheese was identified as the only significant risk factor [17-18].

In 2011, three outbreaks were reported with strong evidence of *L. monocytogenes;* two were general and one was a household outbreak. One general *Listeria* outbreak occurred in Belgium and accounted for 11 human cases, all admitted to hospital, and four fatalities [23]. The food vehicle identified was cheese produced domestically. The other two *Listeria* outbreaks, involving a total of five persons, were reported by Finland and the United Kingdom. In Finland, the infection was linked to bakery products and mixed food. In England, the consumption of hospital-supplied pre-packed sandwiches and salads were identified as a common source of exposure. Breaches in cold chain and shelf-life controls at hospital level were identified as key contributing factors [5].

In 2012, five food-borne outbreaks caused by *L. monocytogenes* with strong evidence were reported, four of which were general and one was a household outbreak. Overall, the five outbreaks resulted in 55 cases, 47 hospitalisations and nine deaths. The household outbreak was reported by Spain (11 cases, three hospitalisations and one death) and cheese was the implicated food vehicle. Three general outbreaks were reported by the United Kingdom (24 cases all hospitalised and five deaths). In one outbreak, the implicated food was bakery products (pork pies) and cross-contamination was reported as a contributory factor. Bovine meat and associated products were implicated in another outbreak and cross- contamination was also reported as a contributory factor. One of these outbreaks took place in a hospital/care home setting and mixed food (sandwiches) was implicated. The outbreak in Finland accounted for 20 cases and three deaths and occurred in a municipal hospital. Meat jelly was considered to be the probable source of the infection since the outbreak was limited to the wards where this product had been served [6].

The occurrence of listeriosis may be reduced by application of consistently high standards of hygiene during food manufacture and handling. The EU Regulation on microbiological criteria for foodstuffs should be followed strictly and levels of *L. monocytogenes* should stay well within the levels considered safe. However, even a low-level of *L. monocytogenes* contamination can cause listeriosis in compromised patients, the elderly and pregnant women. More awareness is needed about the *Listeria* risk posed by certain RTE foods to specific groups. Hospital-related outbreaks remain a significant patient safety concern and underline the risk related to processed RTE foods in settings where vulnerable population groups are served food, such as hospitals and elderly homes [19, 24].

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3 Non-typhoidal salmonellosis in the EU/EEA, 2010–2012

Salmonellosis

Salmonellosis is an infection caused by *Salmonella* (*S.* enterica) bacteria. *Salmonella* species are divided into more than 2 500 serovars. Non-typhoidal *Salmonella* (*Salmonella spp*. other than *S. Typhi* and *S. Paratyphi*) usually cause gastroenteritis. *Salmonella* is the most frequently reported cause of foodborne outbreaks and the second most commonly reported enteric infection in the EU/EEA. However, a statistically significant decrease of cases has been observed across the EU/EEA since 2006. The two most common *Salmonella* serovars causing human infections in the EU/EEA are *S.* Enteritidis (40%) and *S.* Typhimurium (30%).

Symptoms in *Salmonella* infection include diarrhoea (sometimes bloody), fever, abdominal cramps and vomiting. Symptoms are often mild and most infections are self-limiting. However, sometimes, the infection may lead to septicaemia or more severe diarrhoea with associated dehydration that can be life-threatening. The elderly, infants, and those with impaired immune systems are more likely to develop severe illness. Salmonellosis can also be associated with long-term and sometimes chronic post-infectious symptoms, e.g. reactive arthritis. Some infected people can be asymptomatic carriers and excrete *Salmonella* bacteria in their faeces for several months.

The main reservoirs are domestic and wild animals, which often carry and excrete *Salmonella* bacteria without any clinical symptoms. Eggs and egg products as well as poultry meat are the most common source of foodborne *Salmonella* outbreaks in the EU/EEA. A wide variety of food products of animal and plant origin are reported as the vehicles or sources of infections. Direct contact with infected animals or persons may also transmit the infection.

More information can be found at the ECDC website [].

Surveillance of non-typhoidal salmonellosis in the EU/EEA in 2010–2012

ECDC coordinates the European surveillance of salmonellosis, in close collaboration with a network of nominated experts, epidemiologists and microbiologists from EU/EEA countries as part of the Food- and Waterborne Diseases and Zoonoses (FWD) Network.

The scope of salmonellosis surveillance is defined by the general surveillance objectives for food- and waterborne diseases (see Introduction) and the EU case definition for non-typhoidal salmonellosis (see Annex H).

A list of suggested specific surveillance objectives for *Salmonella* infections in humans has been discussed with the Food- and Waterborne Diseases and Zoonoses Network. Surveillance objectives are to:

- monitor travel-related cases from non-EU countries
- improve the detection and verification of dispersed clusters and outbreaks of non-typhoidal salmonellosis by setting up real-time molecular surveillance for human cases and link up and harmonise these typing methods with food, feed, and animal strains
- monitor the severity of disease (hospitalisation, blood stream infections)
- monitor antimicrobial resistance (AMR) development.

The reporting of salmonellosis to The European Surveillance System (TESSy) currently features the standard reporting of cases, including data on serotypes. The monitoring of antimicrobial resistance (AMR) has been reviewed and ECDC has launched a new protocol for harmonised monitoring of AMR in human *Campylobacter* and *Salmonella* infections [1]. The human AMR data are published annually together with European Food Safety Agency (EFSA) in a European Summary report and thus no AMR data for *Salmonella* is included in this report.

The European Surveillance System (TESSy) allows the standard reporting of cases of *Salmonella* infections with an agreed set of variables. In 2010–2012, the reporting of salmonellosis covered 46 variables, 27 of which were common variables for all diseases, while 19 were specific for *Salmonella*. The common variables are presented in Table 1 in the Introduction. Additional *Salmonella*-specific variables are presented below in Table 1.1. In 2012, 24 EU/EEA countries had a compulsory reporting system with full population coverage for non-typhoidal salmonellosis, five countries had a voluntary system and one country did not report *Salmonella* infections to TESSy (Table 1.2).

Table 3.1. Enhanced epidemiological dataset collected for non-typhoidal salmonellosis cases, EU/EEA, 2010–2012

Variable	Description in TESSy
AntigenH1	Flagellar (H) antigen –phase 1 –of the antigenic formula of the pathogen which is the cause of the reported disease
AntigenH2	Flagellar (H) antigen –phase 2 –of the antigenic formula of the pathogen which is the cause of the reported disease
AntigenO	Somatic (O) antigen of the antigenic formula of the pathogen which is the cause of the reported disease
IsolateReferenceNumber	The reference number currently used by the reference laboratory
Pathogen	Species or genus of the pathogen which is the cause of the reported disease
Phagetype	Name/number of phage type of the pathogen which is the cause of the reported disease
Serotype	Serotype of the pathogen which is the cause of the reported disease
SIR_AMP, SIR_CHL, SIR_CIP, SIR_CTX, SIR_GEN, SIR_KAN, SIR_NAL, SIR_SSS, SIR_STR, SIR_SXT, SIR_TCY	Susceptibility to 11 different antibiotics (ampicillin, chloramphenicol, ciprofloxacin, cefotaxime, gentamicin, kanamycin, nalidixic acid, sulphonamides, streptomycin, trimethoprim (co-trimoxazole), tetracyclines)
Specimen	The relevant specimen type used for diagnosis of the case

National surveillance systems for salmonellosis

Table 3.2. Notification systems for non-typhoidal salmonellosis cases in EU/EEA countries, 2012

Country	Reported since	Legal character[a]	Case based/ aggregated[b]	National coverage[c]	Changes in surveillance system in 2010–2012
Austria	1947	Cp	C	Y	
Belgium	1999	V	C	N	
Bulgaria	1966	Cp	A	Y	No changes
Cyprus	Yes	Cp	C	Y	
Czech Republic	2008	Cp	C	Y	
Denmark	1979	Cp	C	Y	No changes
Estonia	1958	Cp	C	Y	
Finland	1995	Cp	C	Y	
France	1986	V	C	Y	
Germany	2001	Cp	C	Y	
Greece	Yes	Cp	C	Y	
Hungary	1959	Cp	C	Y	
Ireland	1948	Cp	C	Y	
Italy	1990	Cp	C	Y	
Latvia	1959	Cp	C	Y	No changes
Lithuania	1962	Cp	C	Y	
Luxembourg	2004	V	C	Y	
Malta	Yes	Cp	C	Y	
Netherlands	No	V	C	N (population coverage 64%)	
Poland	1961	Cp	A	Y	
Portugal	Yes	Cp	C	Y	
Romania	Yes	Cp	C	Y	
Slovakia	1958	Cp	C	Y	
Slovenia	1949	Cp	C	Y	No changes
Spain	1982	V	C	N (population coverage 25%)	
Sweden	1969	Cp	C	Y	
United Kingdom	No	O	C	Y	
Iceland	Yes	Cp	C	Y	

Country	Reported since	Legal character[a]	Case based/aggregated[b]	National coverage[c]	Changes in surveillance system in 2010–2012
Liechtenstein	Yes	-	-	-	-[d]
Norway	1975	Cp	C	Y	

[a] *Legal character, Cp=compulsory, V=voluntary, O=other*

[b] *C=case based, A=aggregated*

[c] *National coverage Y=yes, N=no*

[d] *Not reported/no data provided*

Epidemiological situation in 2010–2012

Major findings

- Salmonellosis showed a significant decreasing trend between 2008 and 2012 in EU/EEA countries.
- The overall notification rate in 2010–2012 was 21.5 cases per 100 000 population. The number of reported cases decreased by 10% from 2010 to 2012.
- 83% of *Salmonella* infections acquired during 2010–2012 were of domestic origin.
- 80% of travel-related infections were acquired in non-EU/EEA countries, mainly in Asia and Africa.
- The top ten serotypes in 2010–2012 were: *S.* Enteritidis, *S.* Typhimurium, monophasic *S.* Typhimurium 1,4,[5],12:i:-, *S.* Infantis, *S.* Newport, *S.* Derby, *S.* Kentucky, *S.* Stanley, *S.* Virchow and *S.* Thompson.
- *Salmonella* Enteritidis and *S.* Typhimurium accounted for 67% of all reported cases with known serotype.
- The trend in number of confirmed domestic cases has decreased significantly for *S.* Enteritidis and *S.* Typhimurium since 2008.
- The highest notification rate was reported in children aged 1–4 years (> 90 cases per 100 000) and the lowest in the age group 25–44 years (< 12 cases per 100 000). Notification rates decreased in all age groups between 2010 and 2012.
- 43% of *Salmonella* cases with known data on hospitalisation (11% of total cases) required hospital care in 2012.
- The case–fatality ratio associated with salmonellosis cases at EU/EEA level was low and stable during the three-year period, ranging between 0.12%–0.13%, but the risk of death due to *Salmonella* infection increased with the increase of age.

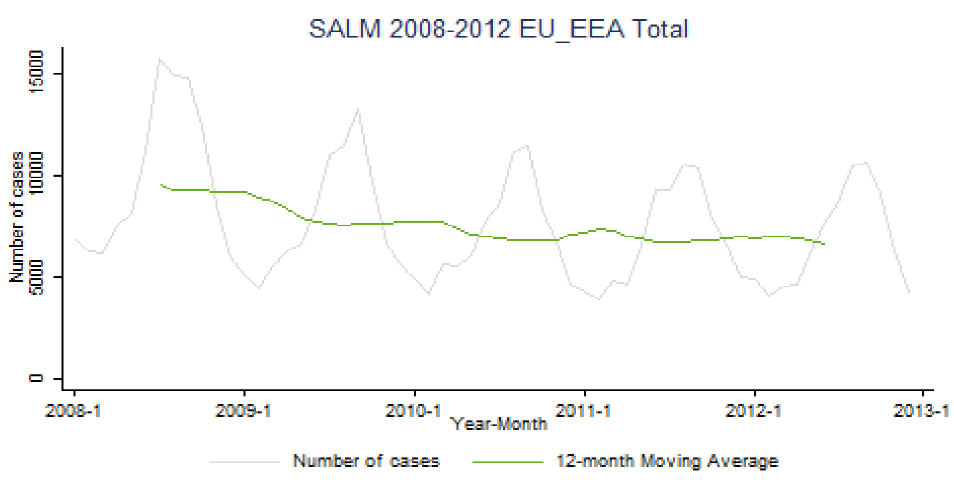
Overview of trends

During 2010–2012, 27 EU Member States and two EEA countries, excluding Liechtenstein, reported 291 806 cases of non-typhoidal salmonellosis.

In the EU/EEA, a significant decreasing trend in notifications of non-typhoidal salmonellosis has been observed since 2008 (Figure 3.1). The decline has been steady and consistent during 2010–2012, and the number of reported cases has been reduced by 10%, from 102 456 cases in 2010 to 92 443 cases in 2012 (Table 3.3).

Between 2010 and 2012, the highest country-specific notification rates were observed in the Czech Republic and Slovakia (> 70 cases per 100 000), followed by Hungary and Lithuania (> 55 cases per 100 000), while the lowest rates were reported in Portugal (< 2 cases per 100 000), followed by Greece and Romania (< 5 cases per 100 000)(Table 3.3).

Figure 3.1. **Trend in number of confirmed non-typhoidal salmonellosis cases in EU/EEA countries, 2008–2012 (N=464 327)**



Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Table 3.3. **Confirmed non-typhoidal salmonellosis cases and notification rates (per 100 000 population) by country in the EU and EEA, 2010–2012**

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	2 179	26.0	1 432	17.0	1 773	21.0
Belgium*	3 169	-	3 177	-	3 101	-
Bulgaria^	1 154	15.3	924	12.5	839	11.5
Cyprus	136	16.6	110	13.1	90	10.4
Czech Republic	8 209	78.1	8 499	81.0	10 245	97.5
Denmark	1 608	29.1	1 170	21.0	1 207	21.6
Estonia	381	28.4	375	28.0	249	18.6
Finland	2 437	45.5	2 108	39.2	2 204	40.8
France	7 184	11.1	8 685	13.4	8 705	13.3
Germany	24 833	30.4	23 982	29.4	20 493	25.1
Greece	297	2.6	471	4.2	404	3.6
Hungary	5 953	60.4	6169	62.8	5 462	55.8
Ireland	349	7.8	311	6.8	309	6.7
Italy[§]	4 752	7.9	3 344	5.5	1 453	-
Latvia	877	39.0	995	48.0	547	26.8
Lithuania	1 962	58.9	2 294	75.2	1 762	58.6
Luxembourg	211	42.0	125	24.4	136	25.9
Malta	160	38.6	129	31.0	88	21.1
Netherlands[a]	1 447	13.6	1 284	12.0	2 198	20.5
Poland^	9 257	24.3	8 400	21.8	7 952	20.6
Portugal	205	2.0	174	1.7	185	1.8
Romania	1 285	6.0	989	4.6	698	3.3
Slovakia	4 942	91.1	3 897	72.3	4 627	85.6
Slovenia	363	17.7	400	19.5	392	19.1
Spain[b]	4 420	38.4	3 786	32.8	4 181	36.2
Sweden	3 612	38.7	2 887	30.7	2 922	30.8
United Kingdom~	9 670	15.7	9 455	15.2	8 812	14.0
EU total**	**101 052**	**21.8**	**95 572**	**20.5**	**91 034**	**22.2**
Iceland	34	10.7	45	14.1	38	11.9

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Liechtenstein	-	-	-	-	-	-
Norway	1 370	28.2	1 290	26.2	1 371	27.5
EU/EEA total**	**102 456**	**21.9**	**96 907**	**20.6**	**92 443**	**22.2**

** Sentinel surveillance. Population coverage unknown so notification rate not calculated*

^ Aggregated reporting

§ Incomplete reporting for 2012

a Population coverage 64%

b Population coverage 25%

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

*** For each year shown, notification rates were calculated, with the exception of countries with unknown population coverage. Also excluded were populations of countries which did not report data. Populations of countries which reported 0 cases were included.*

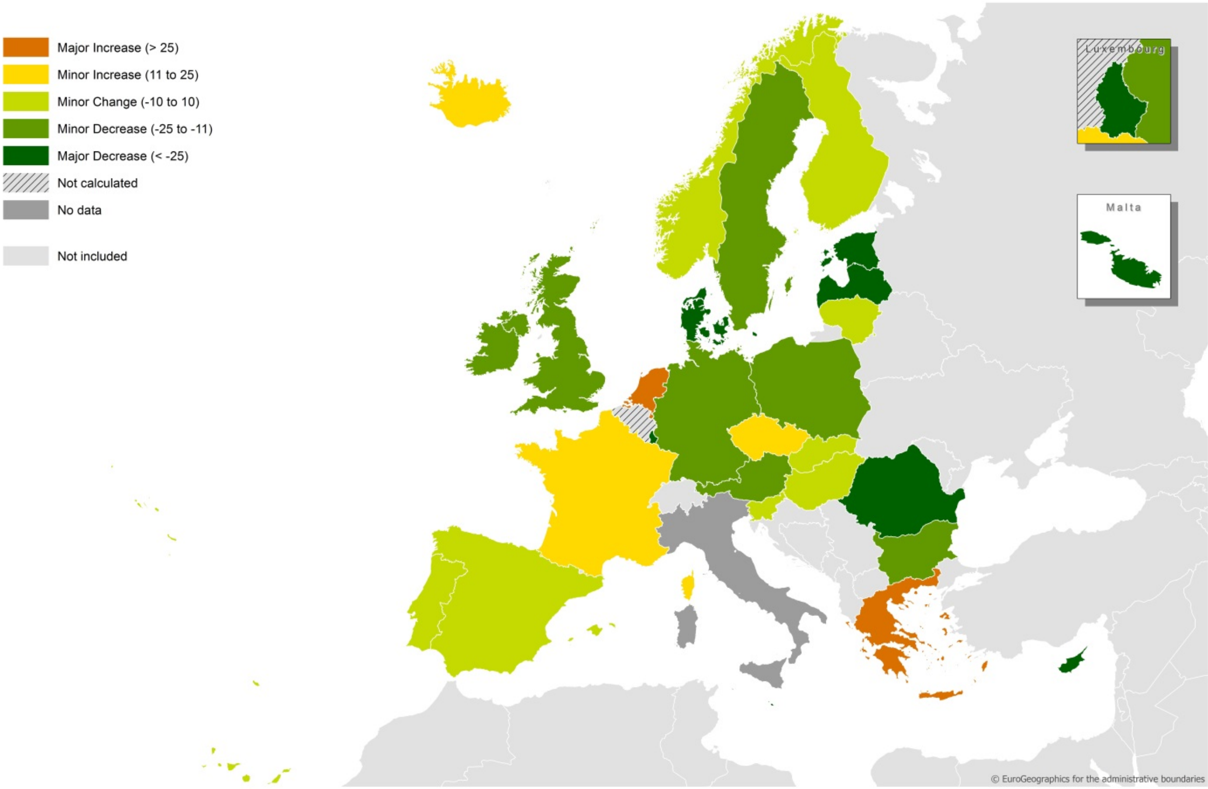
– Not reported/not calculated

Between 2010 and 2012, major decreases were reported by Denmark (from 29 to 22 cases per 100 000), Latvia (from 39 to 27 cases per 100 000) and Romania (from 6 to 3 cases per 100 000). Reductions in notification rates were also observed in Estonia (from 28 to 17 cases per 100 000), Luxemburg (from 42 to 26 cases per 100 000) and Malta (from 39 to 21 cases per 100 000), though the number of reported cases in these countries was low. The highest increases in rates were reported in the Netherlands (from 14 to 21 cases per 100 000), followed by Greece (from 2.6 to 3.6 cases per 100 000) (Table 1.3, Figure 1.2).

From 2008 to 2012, country-specific trends decreased in the majority of reporting countries. The most dramatic reduction in rates was observed in Germany, followed by Denmark (Figure 3.3). Increasing trends were observed only in France and the Netherlands (significant level α=0.05). The increase in trend observed in France could be explained by a change in the national surveillance system and, in particular, by an increased proportion of *Salmonella* isolates sent to the national reference centre for *Salmonella* from 2008 onwards. The increasing trend in the Netherlands can be explained by a very large outbreak of *S.* Thompson in 2012.

Please note that in a country with a small population, even low numbers of reported cases can lead to a relative overrepresentation.

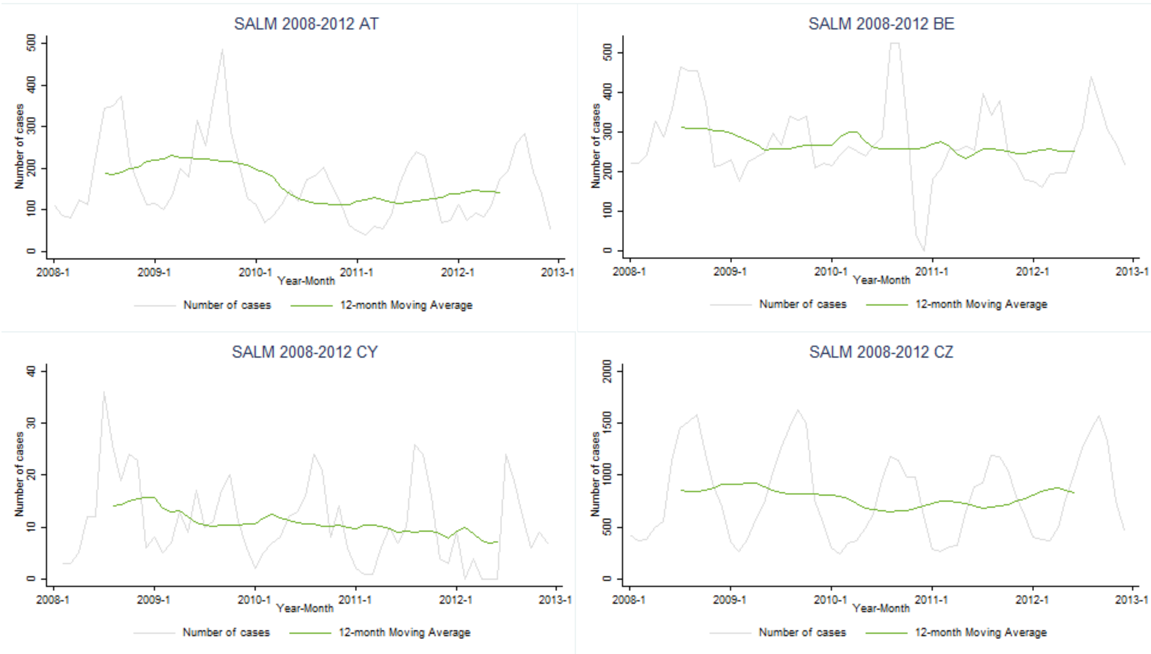
Figure 3.2. Percentage change in notification rates of non-typhoidal salmonellosis cases in EU/EEA countries, 2010–2012

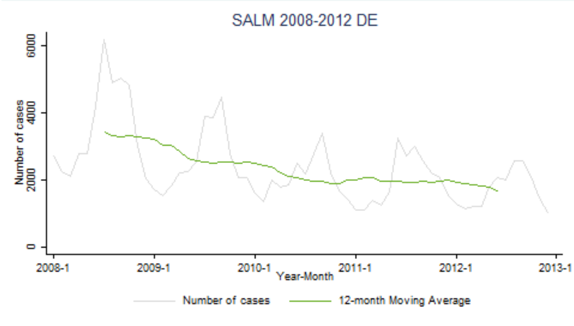


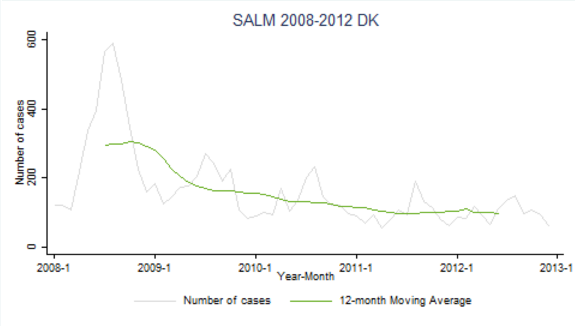
Not calculated: Country-specific percentage changes in notification rates were not calculated if the number of confirmed cases reported for one or more years during 2010–2012 was lower than 25, if sentinel surveillance systems had unknown population coverage, or if there was incomplete reporting for one of the reporting years.

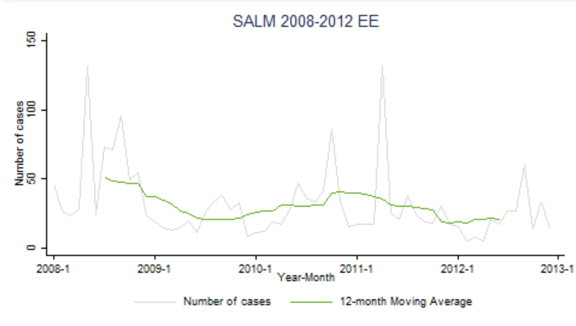
Source: The European Surveillance System (TESSy) data, 2010–2012

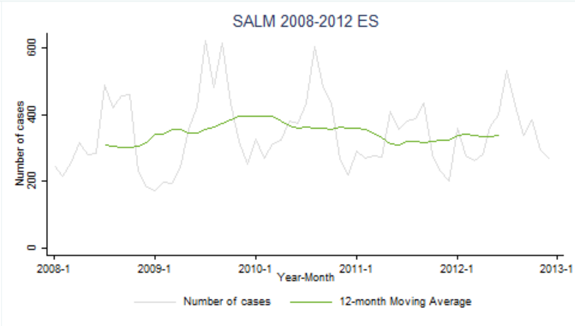
Figure 3.3. Trend in number of confirmed non-typhoidal salmonellosis cases by EU/EEA country, 2008–2012

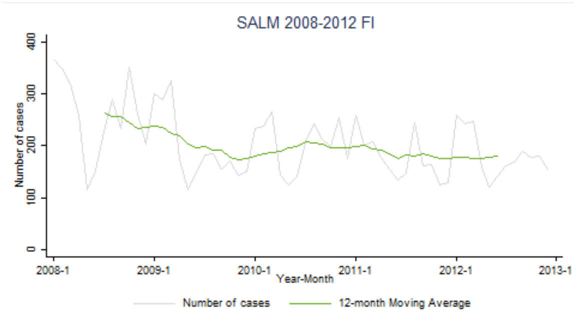


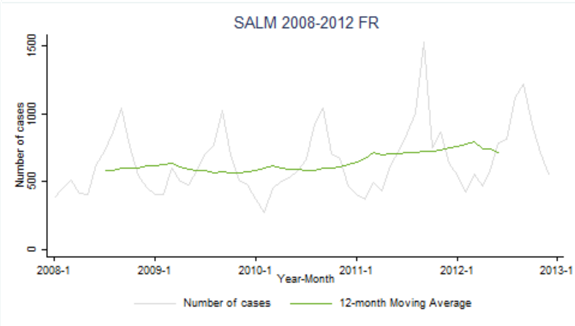

SALM 2008-2012 DE
Number of cases
0
2000
4000
6000
2008-1
2009-1
2010-1
2011-1
2012-1
2013-1
Year-Month
Number of cases
12-month Moving Average

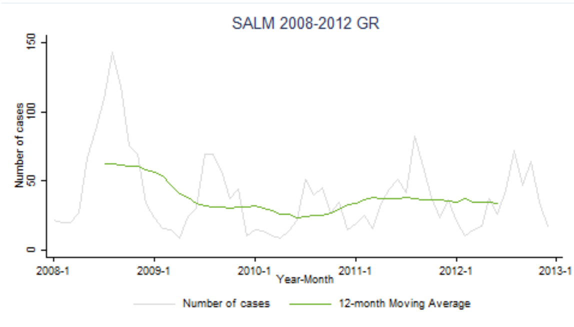

SALM 2008-2012 DK
Number of cases
0
200
400
600
2008-1
2009-1
2010-1
2011-1
2012-1
2013-1
Year-Month
Number of cases
12-month Moving Average

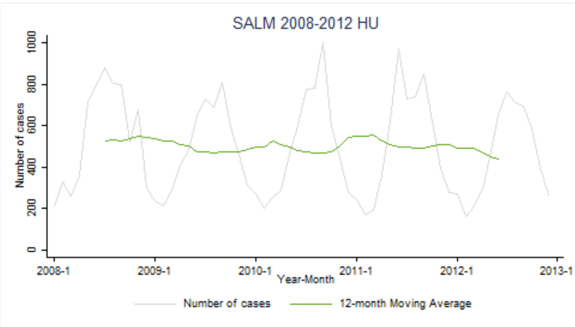

SALM 2008-2012 EE
Number of cases
0
50
100
150
2008-1
2009-1
2010-1
2011-1
2012-1
2013-1
Year-Month
Number of cases
12-month Moving Average

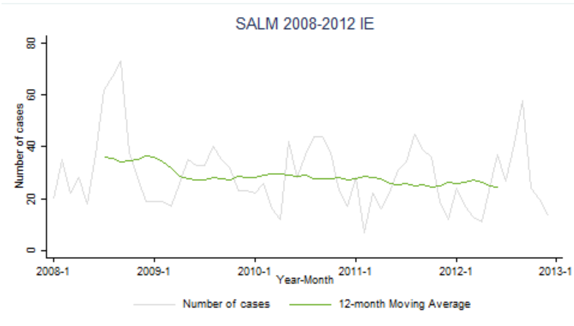

SALM 2008-2012 ES
Number of cases
0
200
400
600
2008-1
2009-1
2010-1
2011-1
2012-1
2013-1
Year-Month
Number of cases
12-month Moving Average

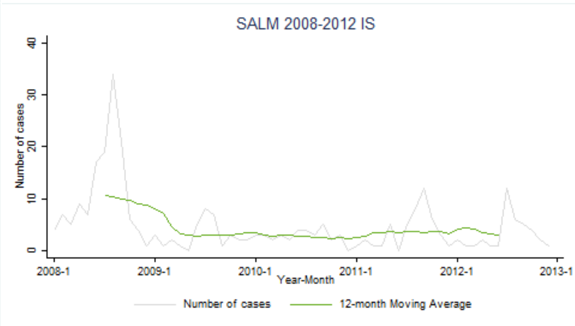

SALM 2008-2012 FI
Number of cases
0
100
200
300
400
2008-1
2009-1
2010-1
2011-1
2012-1
2013-1
Year-Month
Number of cases
12-month Moving Average

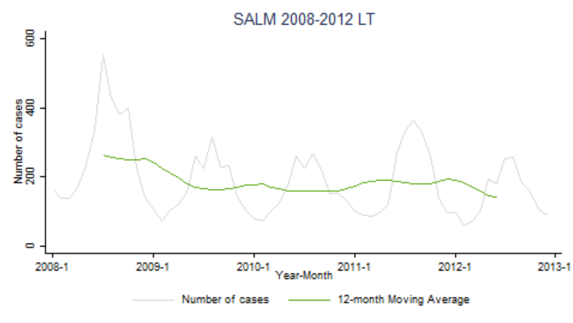

SALM 2008-2012 FR
Number of cases
0
500
1000
1500
2008-1
2009-1
2010-1
2011-1
2012-1
2013-1
Year-Month
Number of cases
12-month Moving Average

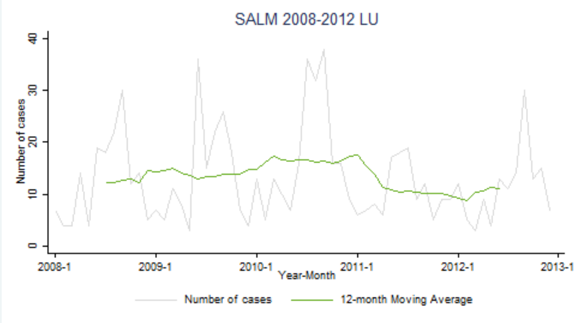

SALM 2008-2012 GR
Number of cases
0
50
100
150
2008-1
2009-1
2010-1
2011-1
2012-1
2013-1
Year-Month
Number of cases
12-month Moving Average

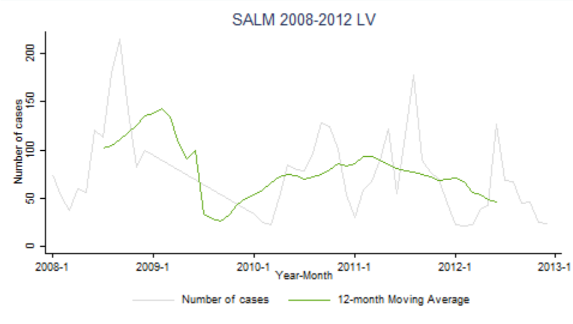

SALM 2008-2012 HU
Number of cases
0
200
400
600
800
1000
2008-1
2009-1
2010-1
2011-1
2012-1
2013-1
Year-Month
Number of cases
12-month Moving Average

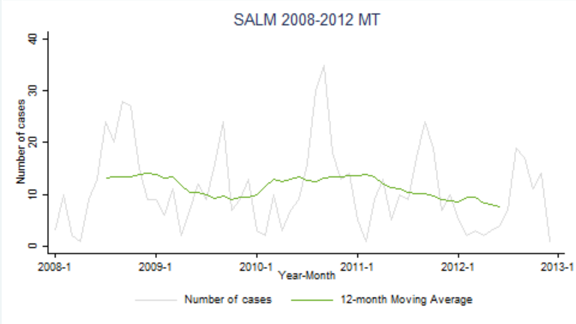

SALM 2008-2012 IE
Number of cases
0
20
40
60
80
2008-1
2009-1
2010-1
2011-1
2012-1
2013-1
Year-Month
Number of cases
12-month Moving Average

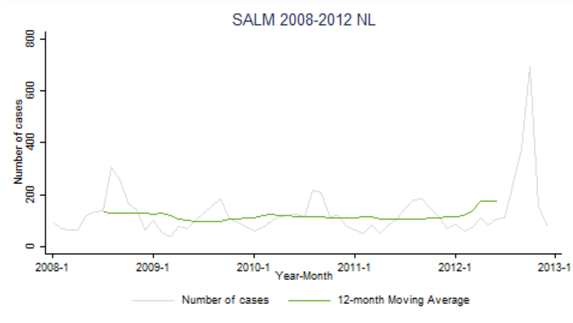

SALM 2008-2012 IS
Number of cases
0
10
20
30
40
2008-1
2009-1
2010-1
2011-1
2012-1
2013-1
Year-Month
Number of cases
12-month Moving Average

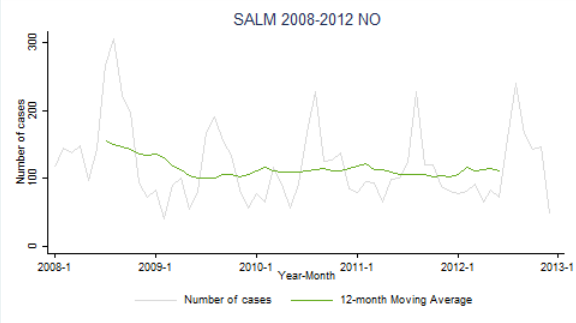

SALM 2008-2012 LT
Number of cases
Year-Month
Number of cases
12-month Moving Average

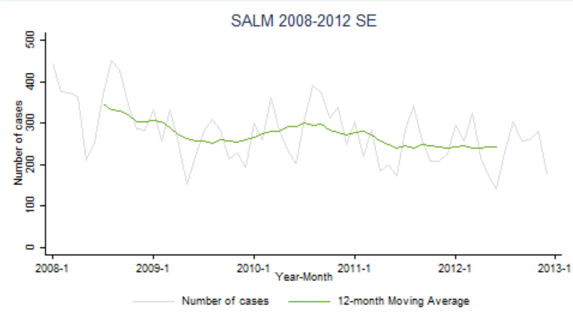

SALM 2008-2012 LU
Number of cases
Year-Month
Number of cases
12-month Moving Average

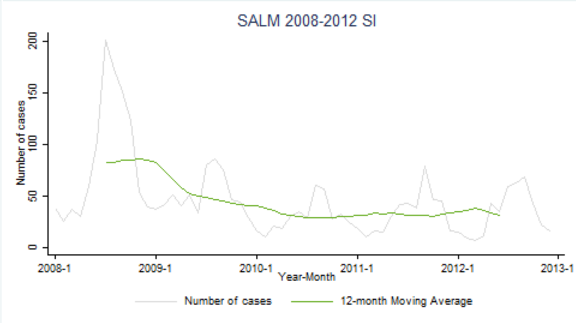

SALM 2008-2012 LV
Number of cases
Year-Month
Number of cases
12-month Moving Average

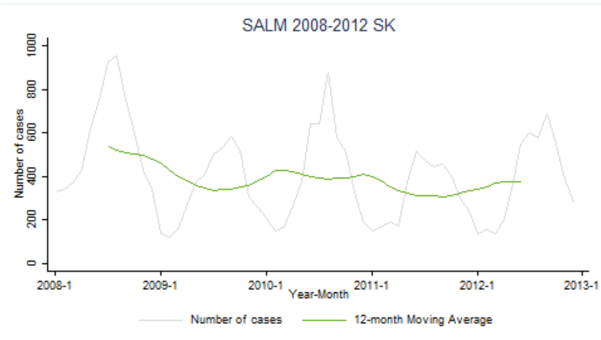

SALM 2008-2012 MT
Number of cases
Year-Month
Number of cases
12-month Moving Average

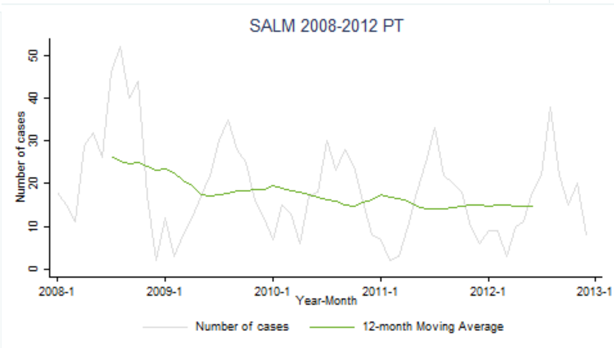

SALM 2008-2012 NL
Number of cases
Year-Month
Number of cases
12-month Moving Average

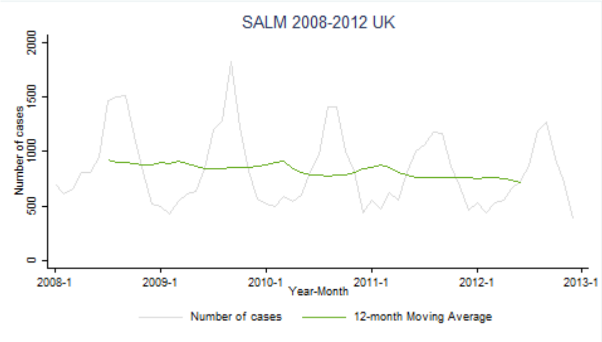

SALM 2008-2012 NO
Number of cases
Year-Month
Number of cases
12-month Moving Average


SALM 2008-2012 SE
Number of cases
Year-Month
Number of cases
12-month Moving Average


SALM 2008-2012 SI
Number of cases
Year-Month
Number of cases
12-month Moving Average


SALM 2008-2012 SK
Number of cases
Year-Month
Number of cases
12-month Moving Average


SALM 2008-2012 PT
Number of cases
Year-Month
Number of cases
12-month Moving Average



Country codes: see page xiv

Please note that graphs are on different scales.

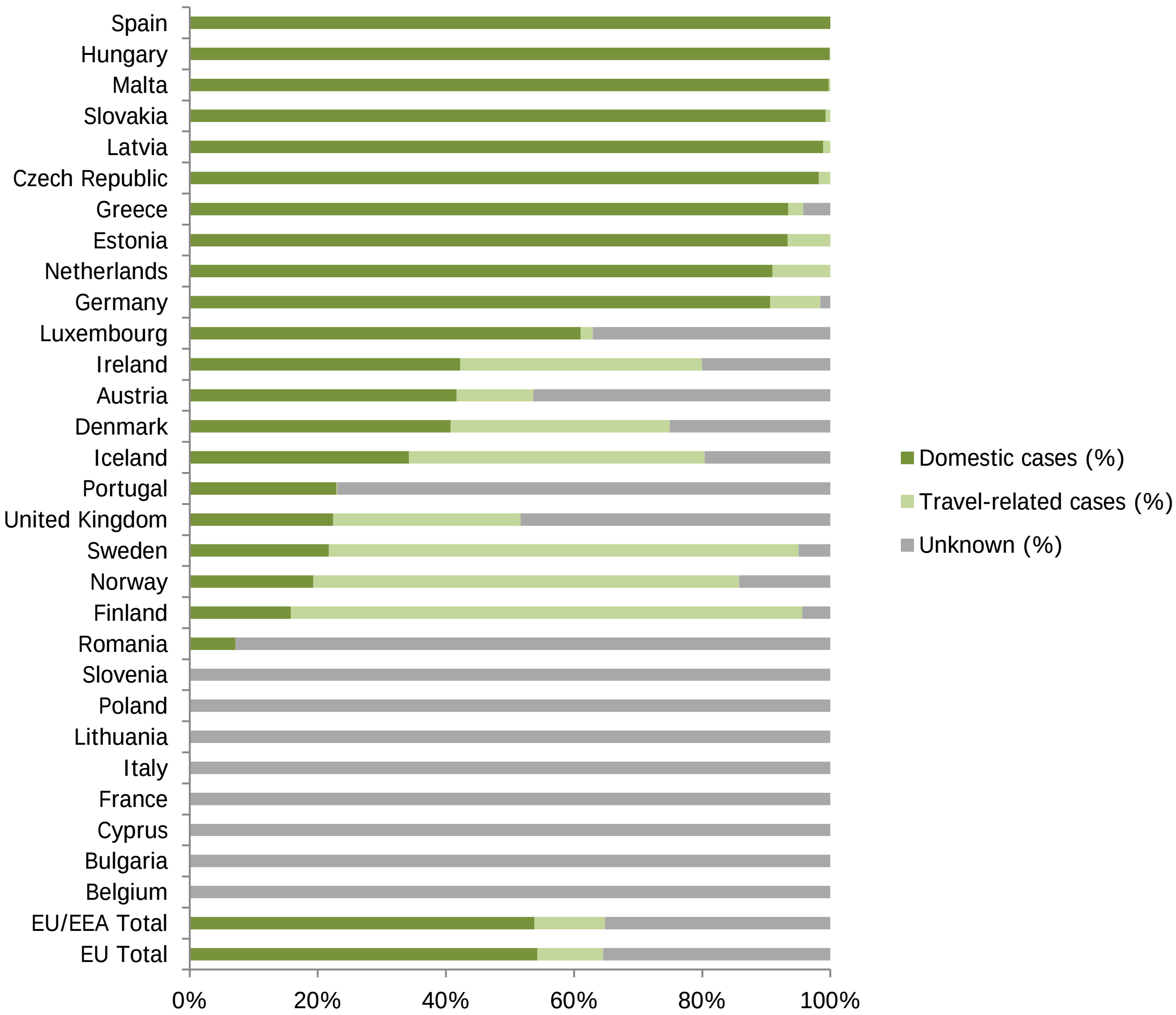
Country-specific trends were not calculated if less than five confirmed cases were reported per month during the period 2008–12.

Origin of the infection

Within the three-year surveillance period from 2010 to 2012, 21 out of 29 EU/EEA countries reported data on the origin of infection (domestic/travel-related) for 189 125 confirmed cases (68%, pooled data). Among reporting countries, 12 reported data on the origin of infection for more than 95% of confirmed cases. Only one country reported data for less than 50% of cases. Romania reported the information only for cases notified in 2010 (Figure 3.4; Annex C: Table 3.1).

The proportion of domestic versus travel-associated cases varied markedly between countries, with a proportion of domestic cases higher than 90% reported by Czech Republic, Estonia, Germany, Greece, Hungary, Latvia, Malta, the Netherlands, Slovakia and Spain (Figure 3.4; Annex 3.1). The Nordic countries (Finland, Iceland, Norway and Sweden) reported the highest proportion of travel-associated infections compared with other reporting countries (Figure 1.4; Annex 3.1.1).

Figure 3.4. Proportion of confirmed non-typhoidal salmonellosis cases by origin of infection (domestic/travel- related) as reported by EU/EEA countries, 2010–2012 (N=291 806)

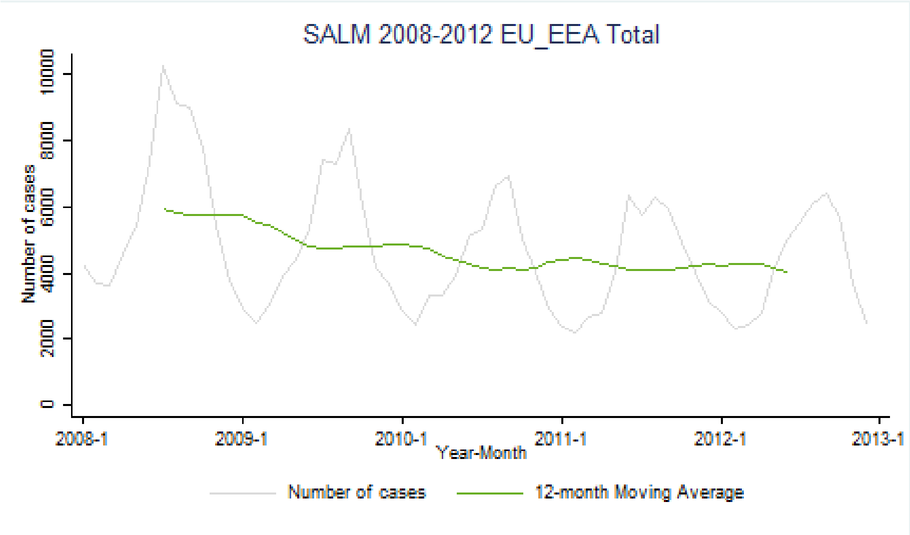


Domestic cases

Among cases for which the information was available (n=198 382, cumulative data 2010–2012), the majority of infections reported at EU/EEA level during 2010–2012 were domestically acquired (83%) (Annex 3.1; Annex 3.2). A decreasing trend in the annual number of cases has been observed since 2008 (p-value<0.05) (Figure 3.5; Annex 3.2), and from 2010 to 2012, the number of domestically-acquired infections decreased by 3.8%, from 53 154 confirmed domestic cases in 2010 to 51 132 cases in 2010 (Annex 3.2).

Over the five-year period, country-specific trend in confirmed non-typhoidal domestic salmonellosis cases reduced in Denmark, Germany and Estonia (p-value<0.05) and none of the countries reported significant increase.

Figure 3.5. Trend in number of confirmed domestic non-typhoidal salmonellosis cases by EU/EEA country, 2008–2012 (N=285 146)



Source: Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Ireland, Malta, the Netherlands, Slovakia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Travel-related cases

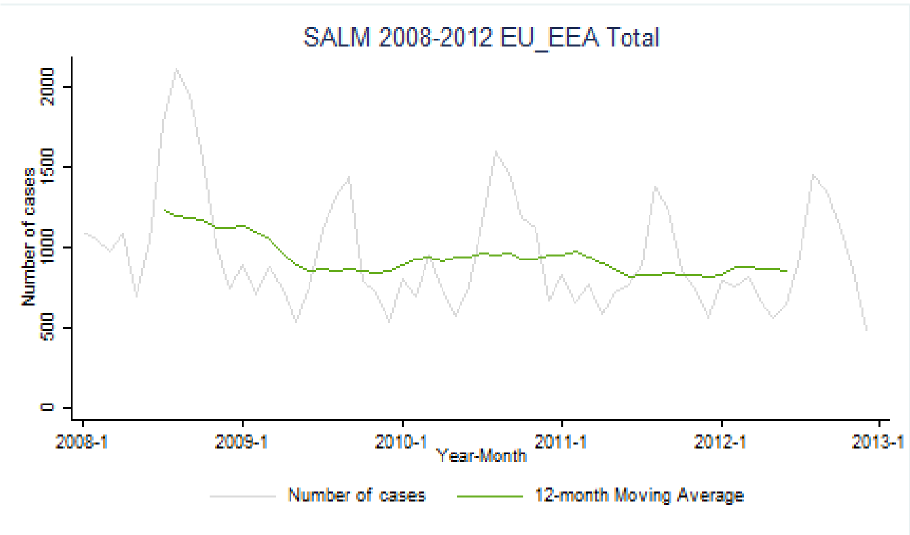
During 2010–2012, among confirmed non-typhoidal salmonellosis cases for which the information was available (n=198 382, cumulative data 2010–2012), only 17% of infections were acquired abroad (Annex 3.1; Annex 3.3). The number of infections acquired abroad was reduced by 11%, from 11 722 cases in 2010 to 10 474 cases in 2012 (Annex 3.3). During 2008–2012, a decreasing trend in the number of confirmed travel-related cases was observed (p-value<0.05) (Figure 3.6).

Over the five-year period, country-specific trend in confirmed travel-related non-typhoidal salmonellosis cases decreased in Denmark, Finland, Norway and Sweden (p-value<0.05), and none of the countries reported a significant increase.

Information on the suspected country of infection was available for 92% confirmed travel-related cases (N=29 528). Most travel-related infections were acquired in non-EU countries (80%), mainly in Asia (N=14 208) and Africa (N=6 956) (Figure 3.7).

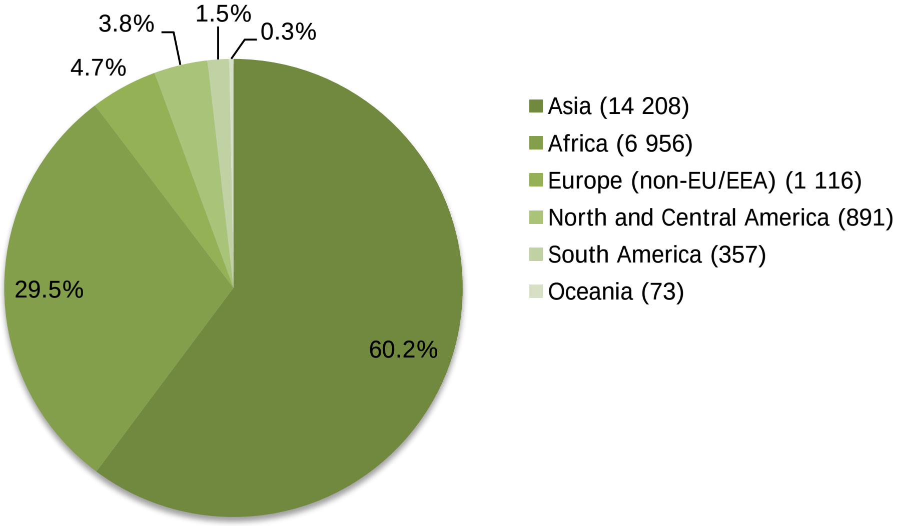
Overall, Thailand (N=5 012), Turkey (N=4 261) and Egypt (N=2 870) were the most commonly reported countries of origin for *Salmonella* infections, accounting for 41% of all travel-related cases with known travel destination in 2010–2012 (Figure 3.8).

Figure 3.6. Trend in number of confirmed travel-related non-typhoidal salmonellosis cases by EU/EEA country, 2008–2012 (N=57 566)



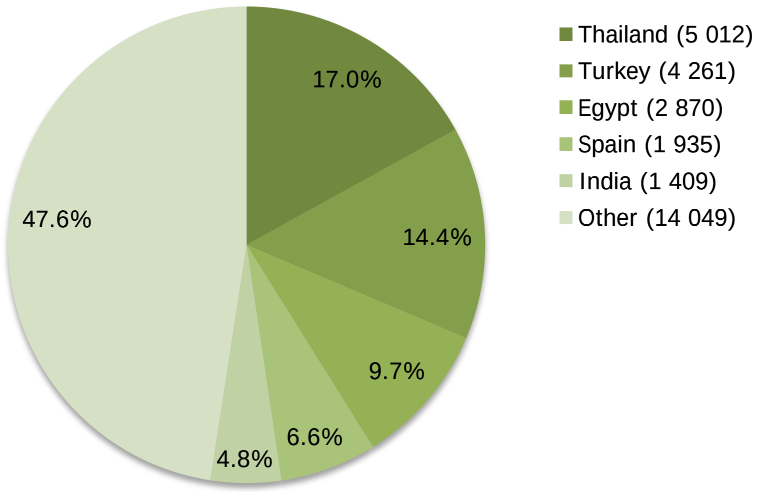
Source: Austria, Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Ireland, Malta, the Netherlands, Slovakia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Figure 3.7. Origin of travel-related non-typhoidal salmonellosis infections acquired in non-EU/EEA countries by geographical regions, EU/EEA countries, 2010–2012



Source: Austria, Czech Republic, Denmark (from 2012), Estonia, Finland, Germany, Greece, Hungary (only 2010 and 2012 data), Ireland, Latvia, Luxembourg (only 2010 and 2011 data), Malta, the Netherlands, Portugal, Slovakia, Sweden, United Kingdom; EEA countries: Iceland and Norway

Figure 3.8. Five most frequently reported countries of infection in confirmed travel-related non-typhoidal salmonellosis cases as reported by EU/EEA countries, 2010–2012



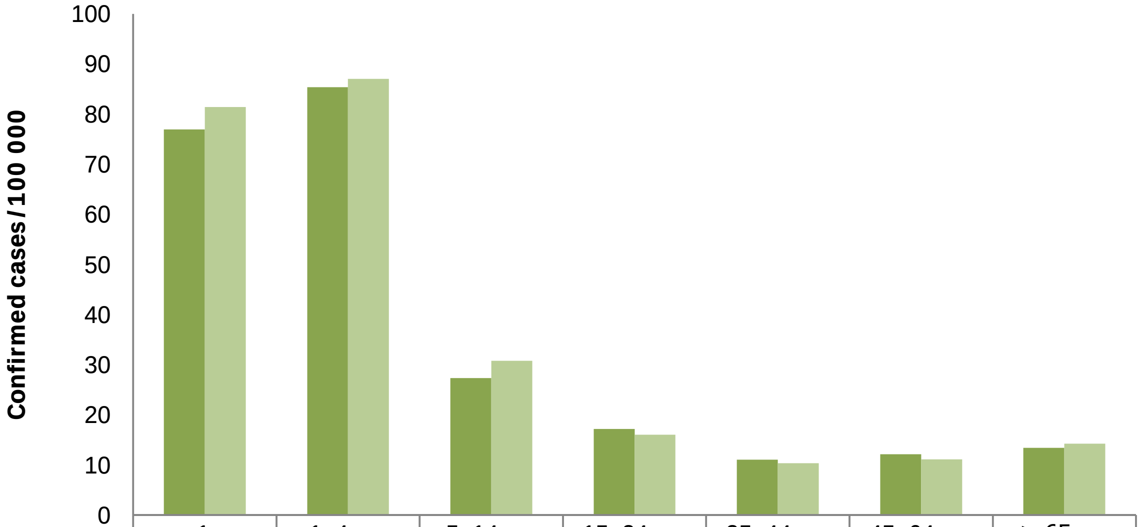
Source: Austria, Czech Republic, Denmark (from 2012), Estonia, Finland, Germany, Greece, Hungary (only 2010 and 2011 data), Ireland, Latvia (from 2011), Luxembourg, Malta (only 2011 data), the Netherlands, Portugal (only 2011 data), Slovakia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Age and sex

During 2010–2012, a total of 27 EU/EEA countries provided data on age and sex for 88% of confirmed non-typhoid salmonellosis cases.

The highest notification rate was in the 1–4-year-old age group for both males and females (> 85 cases per 100 000), followed by children younger than one year of age (>76 cases per 100 000) (Figure 3.9; Annex 3.4). When compared with the youngest age-groups, a remarkable difference was observed in children older than five years; age-specific notification rates were lower than 31 cases per 100 000 population (Figure 3.9; Annex 3.4) or adults. The highest burden in terms of number of reported cases (N=50 304) was also in the age group 1–4 years (Annex 3.4).

Figure 3.9. Notification rates of confirmed non-typhoidal salmonellosis cases by age group and sex in EU/EEA countries, 2010–2012 (N=248 140)



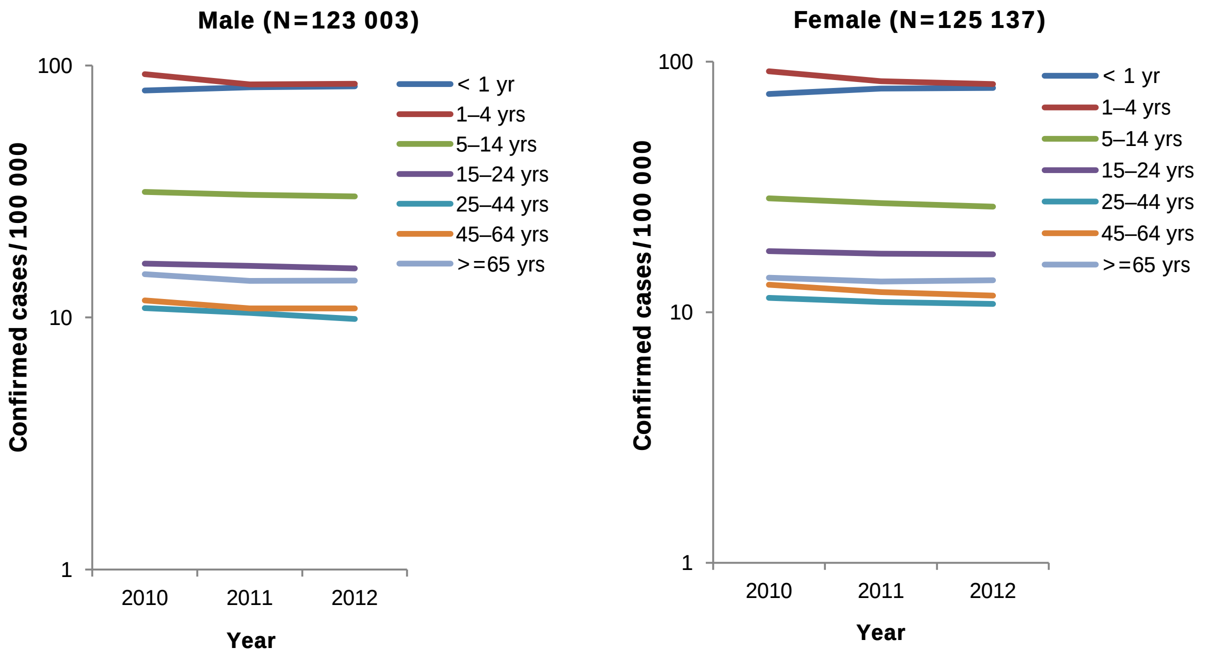
	< 1 yr	1–4 yrs	5–14 yrs	15–24 yrs	25–44 yrs	45–64 yrs	≥ 65 yrs
Females	76.9	85.4	27.4	17.2	11.0	12.2	13.5
Males	81.4	87.0	30.8	16.0	10.4	11.1	14.3

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

There were no differences in the overall rates between males and females (overall male-to-female ratio 0.98:1) (Annex 3.4). The male-to-female ratio ranged from 0.78:1 in those older than 65 years, and 1.18:1 in those aged 5–14 years (Annex 3.4).

The age-specific trends by sex are shown in Figure 3.11. During the three-year period a general reduction in age-specific rates was detected in all age groups and for both sexes, with the exception of those younger than one year (Figure 3.10; Annex 3.4).The observed decrease was significant in males aged between 15 and 44 years (linear regression, p-value<0.05).

Figure 3.10. Semi-logarithmic graph showing trends in notification rates of confirmed non-typhoidal salmonellosis cases by age groups and sex in EU/EEA countries, 2010–2012 (N=248 140)



Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Salmonella serotypes

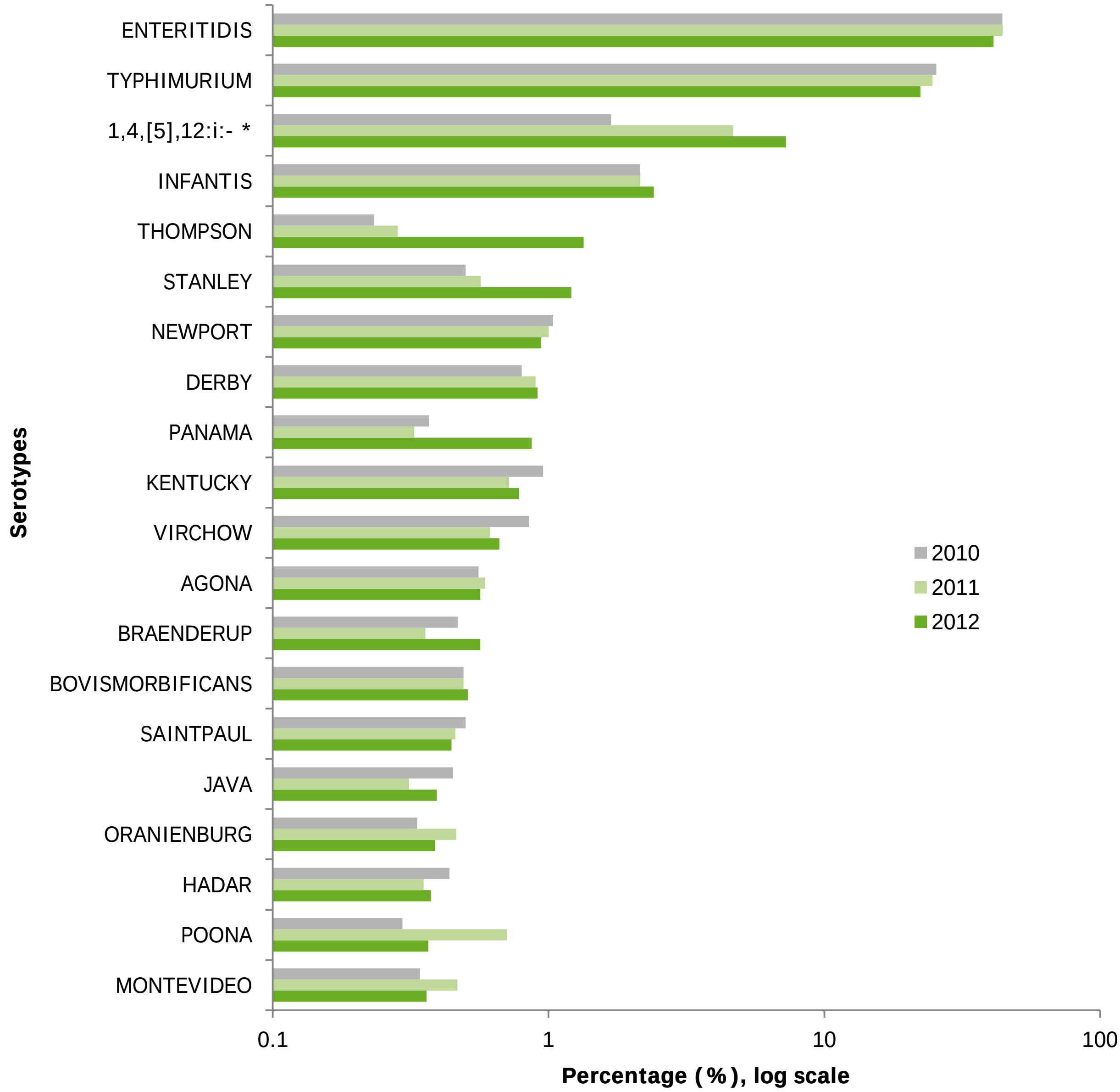
From 2010 to 2012, 27 EU/EEA countries reported information on *Salmonella* serotypes for 83% of confirmed cases. Overall, 788 non-typhoidal *Salmonella* serotypes have been identified across Europe during 2010–2012, of which the 20 most common are listed in Annex 3.5 and represented in figure 3.11.

The ten most frequently reported serotypes[2] in the EU/EEA countries during the three-year period accounted for 79% (n=191 407) of the typed isolates (Annex 3.5), with the two most common serovars: *S.* Enteritidis (n=104 851) and *S.* Typhimurium (n=58 660), responsible for 67% of cases with known information on serotype (Annex 3.5).

Substantial changes have been observed in the distribution of serotypes from 2010 to 2012 (Figure 3.11; Annex 3.5). The major increase observed for monophasic *S.* Typhimurium 1,4,[5],12:i:- from 1 410 in 2010 to 5 836 cases in 2012, is mainly explained by a change in the TESSy, in particular by the introduction of the new reporting code in2010. The dramatic rise in reporting of *S.* Thompson detected in 2012 (from 195 in 2010 to 1 075 in 2012), was due to a large national outbreak occurred in the Netherlands in July. A rise in the number of cases was also observed in *S.* Stanley and *S.* Panama, reflecting the occurrence of an outbreak across EU/EEA countries, (Figure 3.11; Annex 3.5). The number of isolates peaked in 2011 for serovars Poona, Montevideo and Oranienburg (Figure 3.11). A major decrease was observed for *S.* Virchow and *S.* Kentucky (Figure 3.11). Minor decreases in reporting were detected for *S.* Typhimurium, *S.* Java and *S.* Hadar (Figure 3.11; Annex 3.5).

[2] Top 10 Serotypes (cumulative cases 2010-2012): *S.* Enteritidis, *S.* Typhimurium, monophasic *S.* Typhimurium 1,4,[5],12:i:-, *S.* Infantis, *S.* Newport, *S.* Derby, *S.* Kentucky, *S.* Stanley, *S.* Virchow and *S.* Thompson.

Figure 3.11. Distribution of the 20 most common^ *Salmonella* serotypes in confirmed cases as reported in 2010 (n=68 764), in 2011 (N=66 317) and in 2012 (n=67 313) by EU/EEA countries



^ Based on serotype data on confirmed non-typhoidal Salmonella cases reported in 2012.

** 1,4,[5],12:I:-: monophasic* S. *Typhimurium 1,4,[5],12:i:-*

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Serotypes and origin of infection

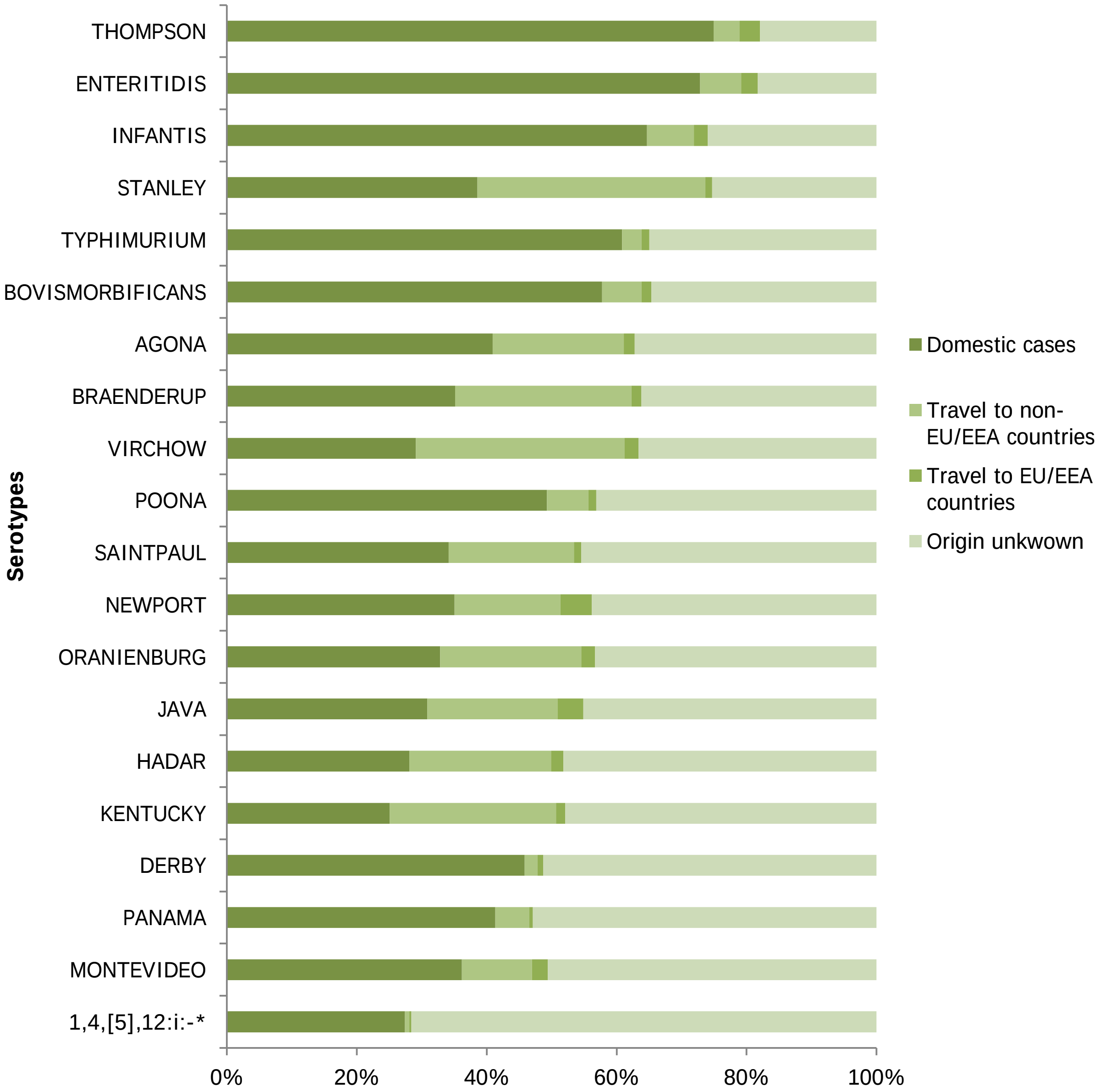
Of the 242 456 serotyped isolates of *Salmonella* reported between 2010 and 2012 by 27 EU/EEA countries, 70% (n=170 724) included information on origin of infection. The proportion of isolates without information on the origin of infection varied highly among serotypes, ranging between 18% and 72% (Figure 3.12; Annex 3.6)

Among serotypes with available information on origin, *S.* Typhimurium, *S.* Enteritidis, monophasic *S.* Typhimurium 1,4,[5],12:i:-, *S.* Derby, *S.* Infantis, *S.* Thompson, *S.* Panama, *S.* Poona and *S.* Bovismorbificans reported the highest proportion of domestic infections (Figure 3.12; Annex 3.6).

Most of infections due to *S.* Kentucky, *S.* Virchow and *S.* Stanley were acquired abroad, travelling to non-EU/EEA countries (Figure 3.12; Annex 3.6). Among travel-related infections acquired in EU/EEA countries, the most commonly reported serotypes were *S.* Newport and *S.* Java (Figure 3.12; Annex 3.6).

The distribution of *Salmonella* serotypes in domestic cases (Figure 3.13; Annex 3.7) did not differ significantly from the overall distribution reported between 2010 and 2012. The rise in reporting of *S.* Stanley isolates among travel-related infections acquired in EU/EEA countries sustains the occurrence of a multi-country outbreak in Europe (Figure 3.14a; Annex 3.8). An increase in the proportion of *S.* Thompson was also observed among travel-related infections acquired in non-EU/EEA countries (Figure 3.14b; Annex 3.8).

Figure 3.12. The 20 most common^ non-typhoidal *Salmonella* serotypes by origin of infection in EU/EEA countries, 2010–2012

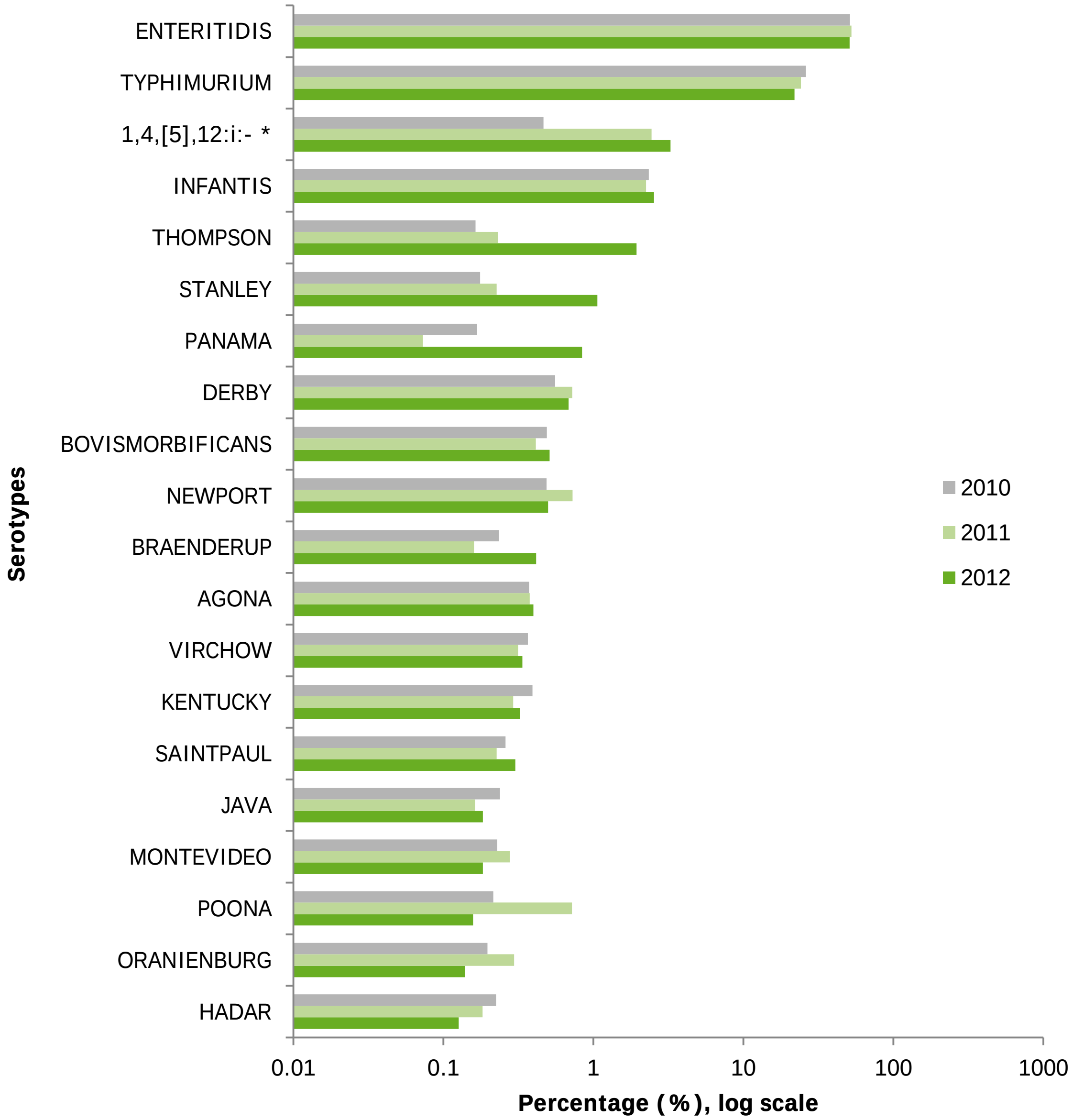


^ Based on serotype data on confirmed non-typhoidal Salmonella cases reported in 2012.

** 1,4,[5],12:i:-: monophasic* S. *Typhimurium 1,4,[5],12:i:-*

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Figure 3.13. The 20 most common^ *Salmonella* serotypes in domestic cases and their reported distribution in 2010 (n=43 520), in 2011 (n=42 774) and in 2012 (n=41 233), EU/EEA countries



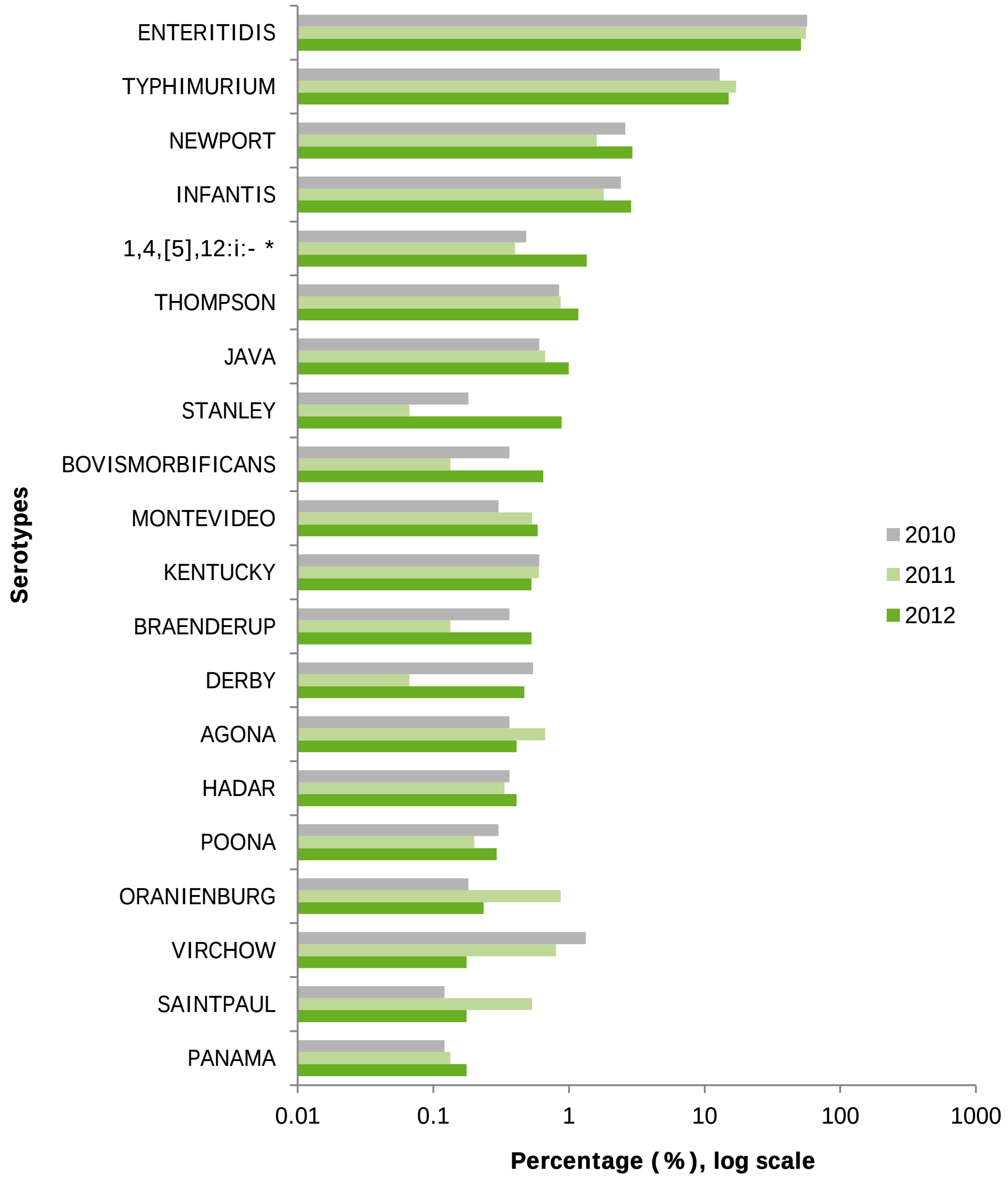
^ Based on serotype data on confirmed non-typhoidal Salmonella cases reported in 2012.

** 1,4,[5],12:i:-: monophasic* S. *Typhimurium 1,4,[5],12:i:-*

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Figure 3.14a and b. The 20 most common^ *Salmonella* serotypes in travel-related cases and their distribution as reported by EU/EEA countries in 2010–2012

a. Cases travelling to EU/EEA countries in 2010 (n=1 357), in 2011 (n=1 246) and in 2012 (n=1 384)

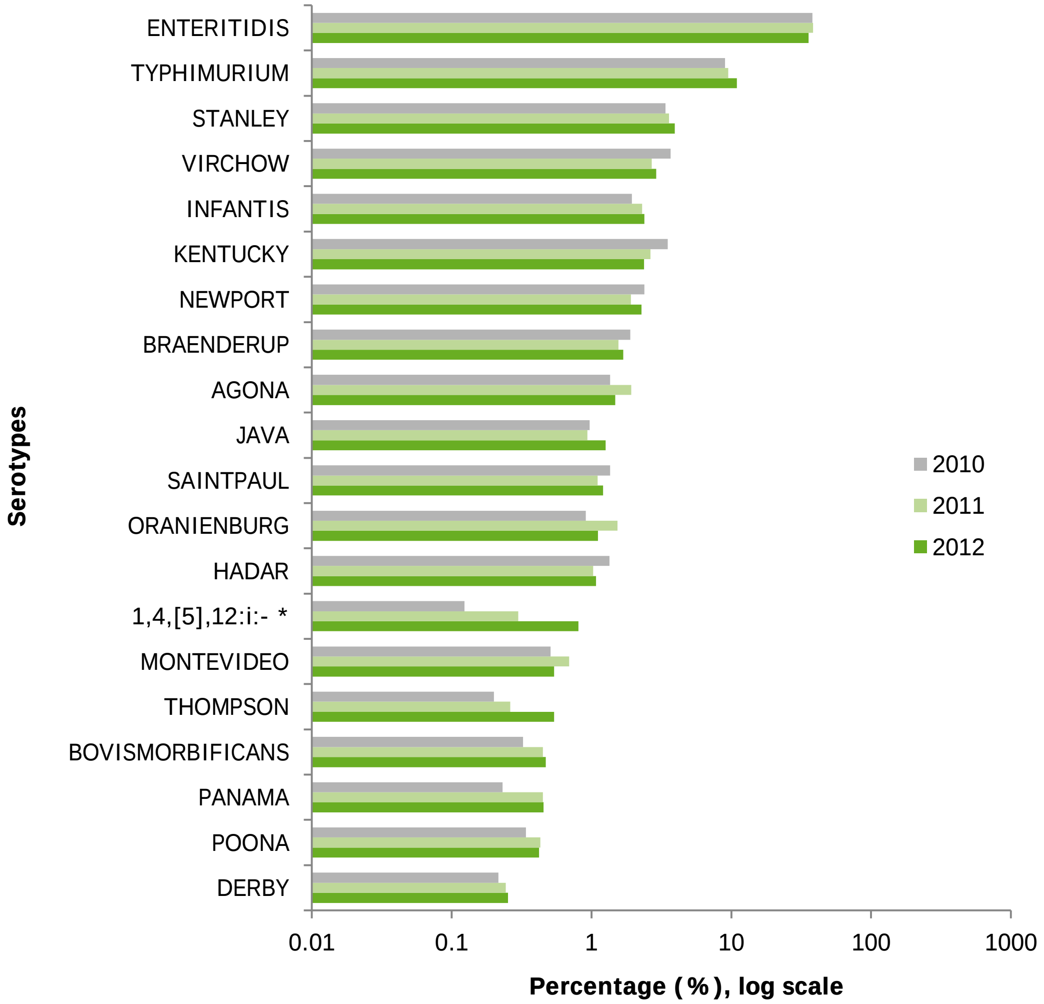


^ Based on serotype data on confirmed non-typhoidal Salmonella cases reported in 2012.

** 1,4,[5],12:i:-: monophasic* S. *Typhimurium 1,4,[5],12:i:-*

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

b. Cases travelling to non-EU/EEA countries in 2010 (n=4 655), in 2011 (n=3 845) and in 2012 (n=4 264)



^ Based on serotype data on confirmed non-typhoidal Salmonella cases reported in 2012.

** 1,4,[5],12:i:-: monophasic* S. *Typhimurium 1,4,[5],12:i:-*

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Trends by serotypes

Trends were calculated for six selected serotypes between 2008 and 2012. The selected serotypes were the six most commonly reported in 2012[3]. Results by origin of infection of cases are shown in Figure 3.15a and b.

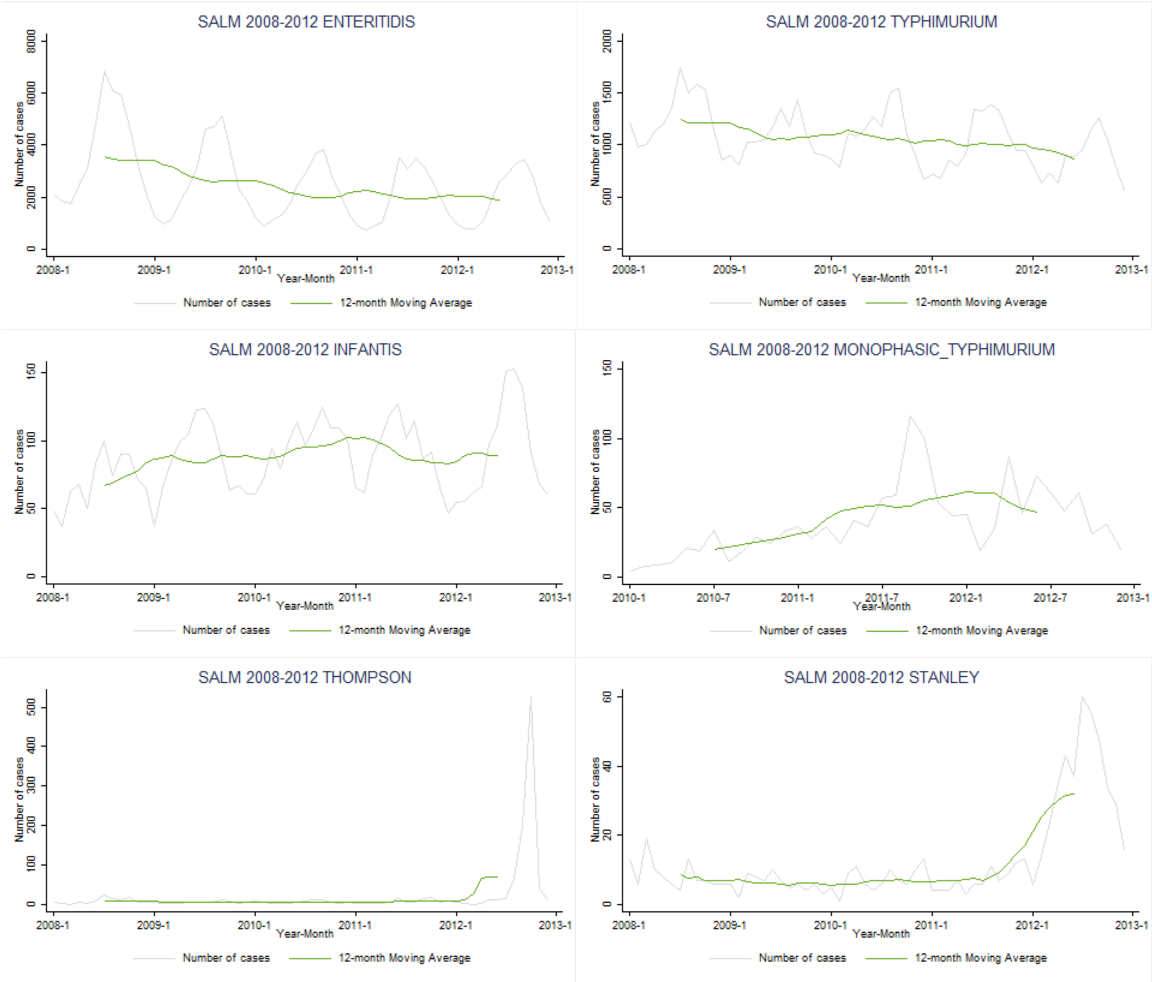
Among domestic cases, a significant reduction in notification was observed for *S.* Enteritidis and *S.* Typhimurium since 2008 (p-value<0.01). The most important rise was recorded for *S.* Thompson (p-value<0.05). A slight increase in confirmed cases of *S.* Infantis and *S.* Stanley was also noticed (p-value<0.05) (Figure 3.15a).

Among travel-related cases, *S.* Infantis increased from 2008 to 2012 (p-value<0.05). A small decreasing trend was found for *S.* Stanley (p-value<0.01), while *S.* Enteritidis, *S.* Typhimurium and *S.* Thompson remained stable over the five-year period (Figure 3.15b).

[3] Six most commonly reported in 2012: *S.* Enteritidis, *S.* Typhimurium, monophasic *S.* Typhimurium 1,4,[5],12:i:-, *S.* Infantis, *S.* Stanley, *S.* Thompson.

Figure 3.15a and b. Trends by origin of infection for six selected *Salmonella* serotypes, EU/EEA countries, 2008–2012

a. Domestic cases; *S.* Enteritidis (N=151 636), *S.* Typhimurium (N=64 053), *S.* Infantis (N=5 228), monophasic *S.* Typhimurium 1,4,[5],12:i:- (N=1 415), *S.* Thompson (N=1 247), *S.* Stanley (N=754).



Source: Austria, Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Ireland, Malta, the Netherlands, Slovakia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

b. Travel-related cases; *S.* Enteritidis (N=19 930), *S.* Typhimurium (N=4 946), *S.* Stanley (N=1 380), *S.* Infantis (N=858), *S.* Thompson (N=190), monophasic *S.* Typhimurium 1,4,[5],12:i:- (N=146)

Source: Austria, Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Ireland, Malta, the Netherlands, Slovakia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Seasonality by serotypes

Seasonality was analysed for the six most common serotypes in 2012: *S.* Enteritidis, *S.* Typhimurium, monophasic *S.* Typhimurium 1,4,[5],12:i:-, *S.* Infantis, *S.* Stanley and *S.* Thompson and results are shown by origin of infection in figure 3.16a and b.

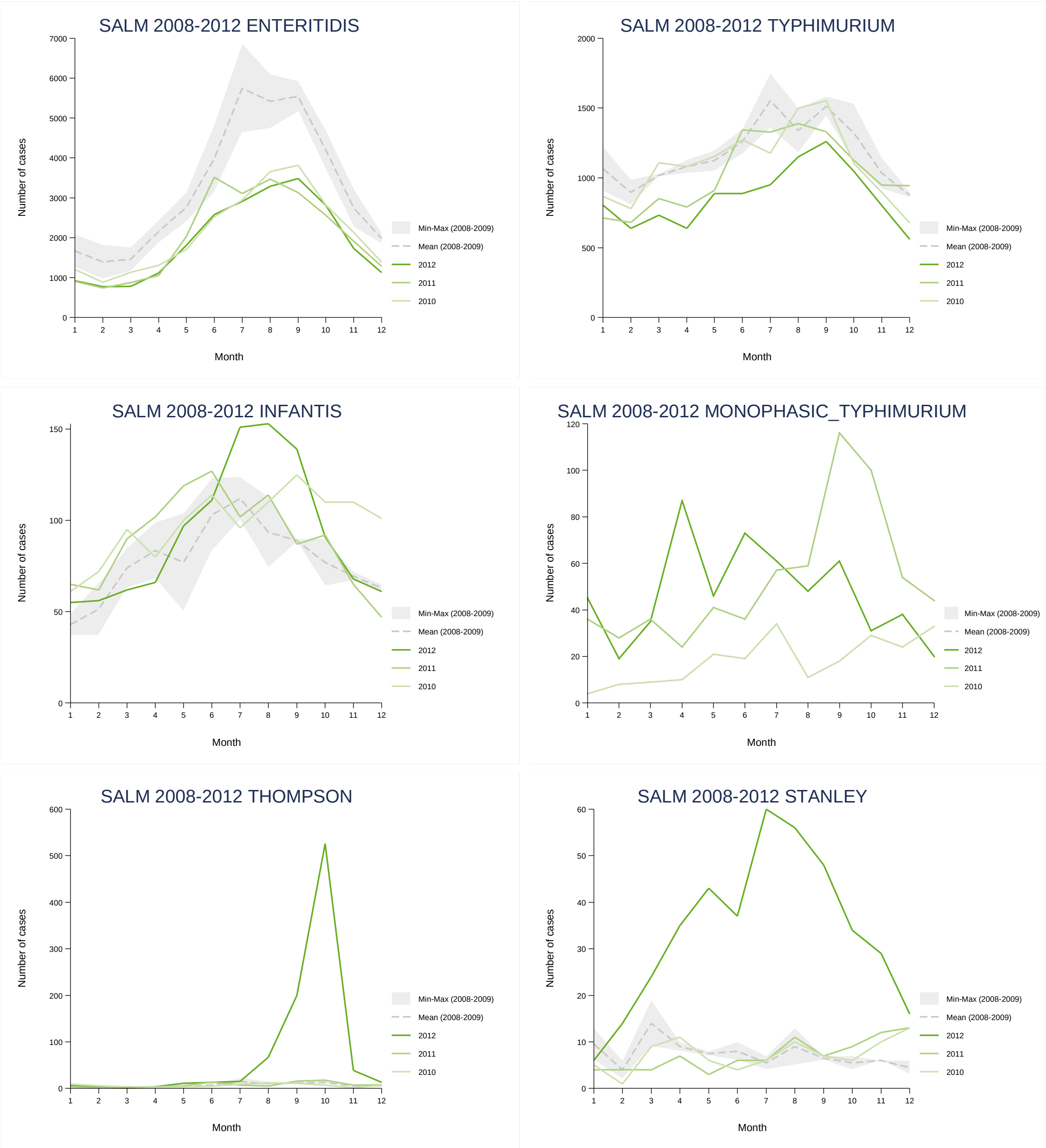
Serotypes *S.* Enteritidis and *S.* Typhimurium showed a very clear seasonality, the number of reported cases started increasing between April and May and peaked between July and September. The same summertime seasonal pattern was found in domestically-acquired as in travel-related infections (Figure 3.16a and b).

Serotype *S.* Infantis and *S.* Thompson also showed some summertime seasonality, with an increase in reported cases starting between May and June and lasting to October/November (Figure 3.16a and b). Seasonal fluctuations of *S.* Infantis were rather steady in travel-related infections (Figure 3.16b), while the seasonal distribution of domestic cases observed in 2010 and 2011 was slightly different from the previous years (Figure 3.16a). The seasonal pattern of *S.* Thompson was more evident in travel-related than in domestic infections, and the 2012 was characterised by a peak in October (Figure 3.16a and b).

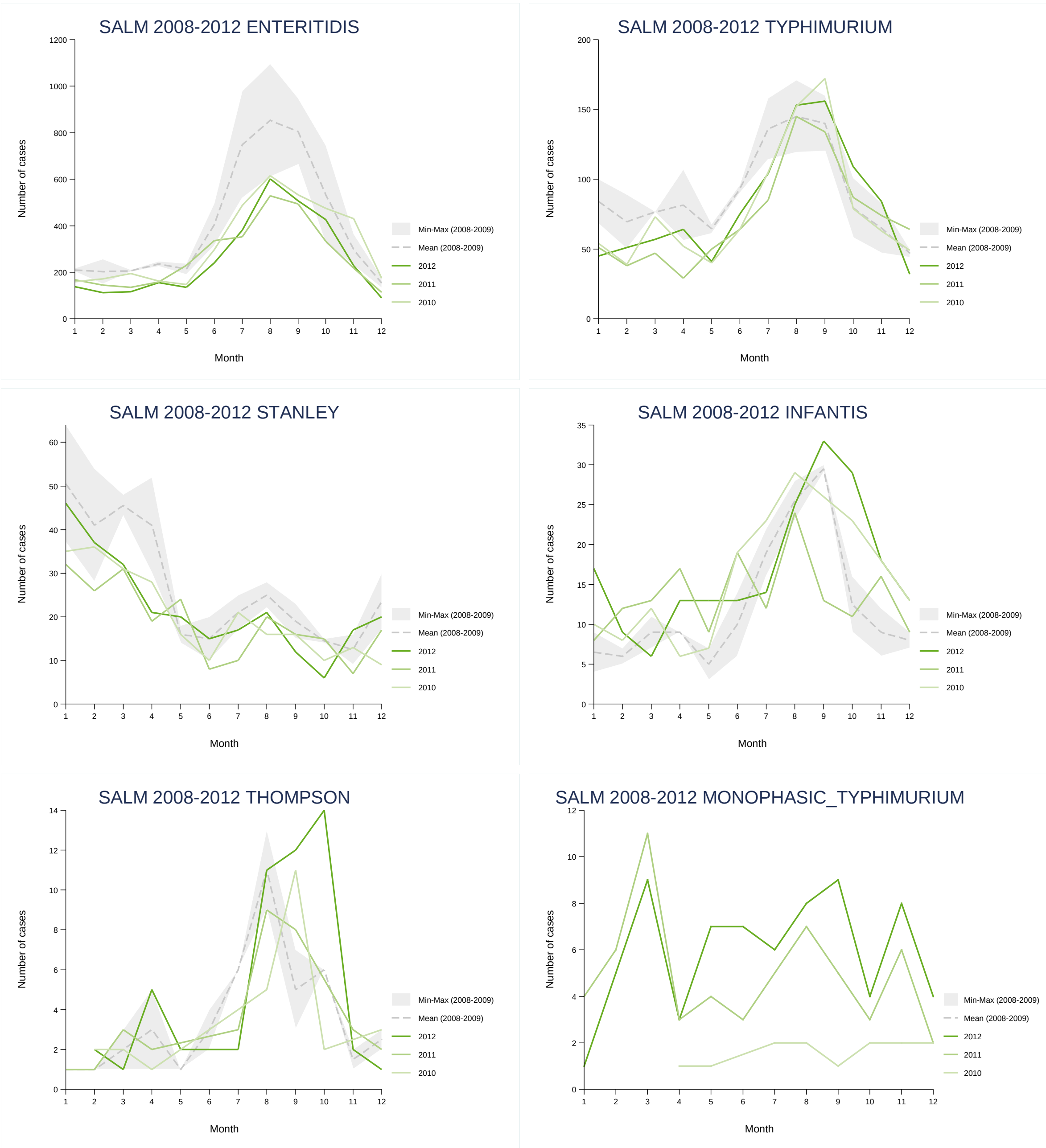
Travel-related infections due to *S.* Stanley were predominant during winter months, while domestic infections were more balanced throughout the year, with the exception of 2012 where a peak in confirmed domestic cases was recorded in August (Figure 3.16a and b). Monophasic *S.* Typhimurium 1,4,[5],12:i:-did not show any clear seasonality.

Figure 3.16a and b. Seasonality of the six most commonly reported non-typhoidal *Salmonella* serotypes by origin of infection, EU/EEA countries, 2008–2012.

a. Domestic cases; *S.* Enteritidis (N=159 132), *S.* Typhimurium (N=65 287), *S.* Infantis (N=5 372), monophasic *S.* Typhimurium 1,4,[5],12:i:- (N=1 524), *S.* Thompson (N=1 284), *S.* Stanley (N=886)



b. Travel-related cases; *S.* Enteritidis (N=19 930), *S.* Typhimurium (N=4 946), *S.* Stanley (N=1 380), *S.* Infantis (N=858), *S.* Thompson (N=190), monophasic *S.* Typhimurium 1,4,[5],12:i:- (N=146)



Source: Austria, Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Ireland, Malta, the Netherlands, Slovakia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Seasonality by serotype and age group

Seasonality by age group was analysed for the four most commonly reported *Salmonella* serotypes in 2012 (*S.* Enteritidis, *S.* Typhimurium, monophasic *S.* Typhimurium 1,4,[5],12:i:- and *S.* Infantis) and results are shown in Figures 3.17 (a, b, c and d).

The monthly distribution of *S.* Enteritidis was similar across all age groups, with most cases reported during summertime (Figure 3.17a). In children younger than one year of age, reporting of cases started increasing in February and peaked between July and August; a smaller peak in January was also observed. In cases aged between 1 and 14 years, the increase of reporting started in March and peaked between August and September. The seasonal pattern in those older than 15 years was characterised by two peaks during summer, one in June/July and the other in August/September (Figure 3.17a).

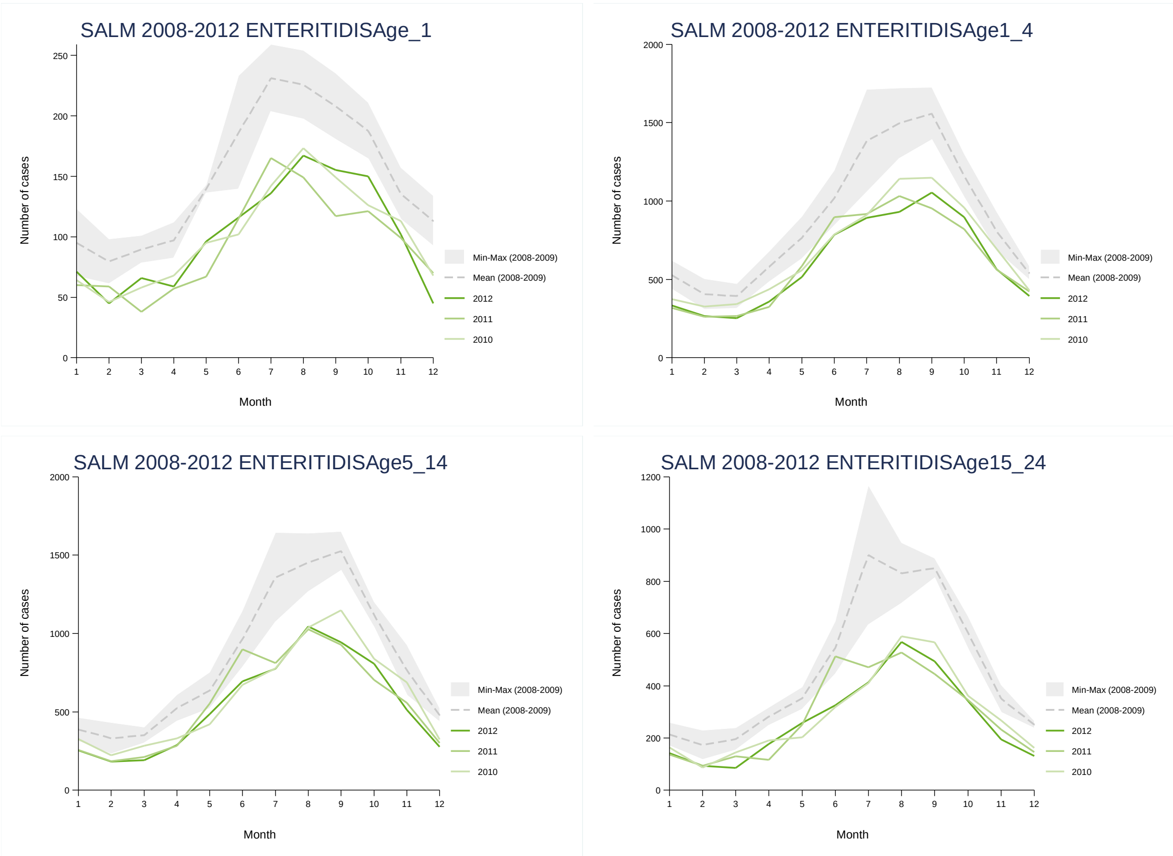
The number of *S.* Typhimurium cases aged between 1 and 14 years started increasing in February/March and peaked in late summer (August/September) with a second smaller peak in January (Figure 3.17b). In children younger than one year and cases aged between 15 and 64 years, the summertime seasonal pattern showed some variability across years, with the highest number of cases reported in early summer (June/July) or late summer (August/September) (Figure 3.17b). No clear seasonality was observed in those older than 65 year of age (Figure 3.17b).

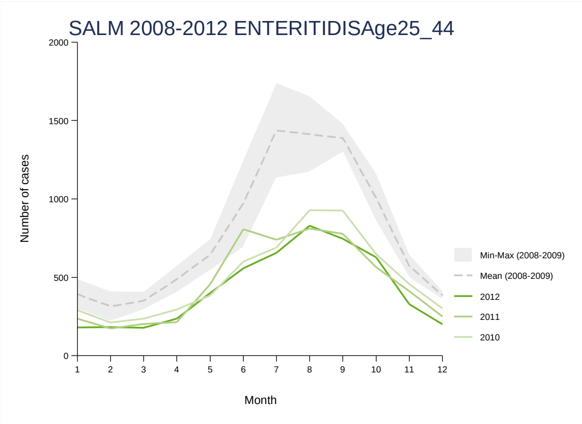
The distribution of monophasic *S.* Typhimurium 1,4,[5],12:i:- did not present a clear seasonality in any age group during 2010–2012, with the exception of 2011, when cases showed a peak in September across all age groups (Figure 3.17c).

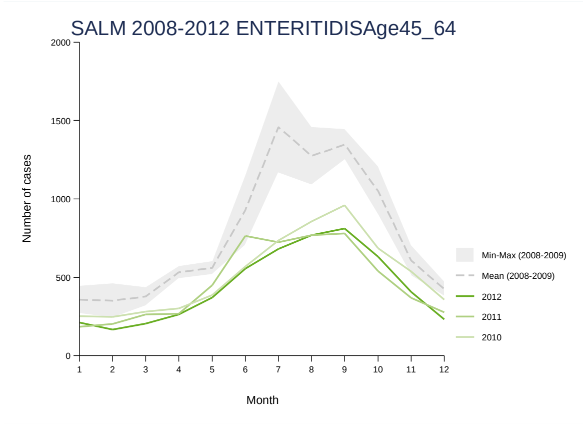
A high variability characterised the seasonal distribution of *S.* Infantis in all age groups (Figure 3.17d). In 2012 a peak of cases between August and September was observed in all age group except those younger than one year, where the highest number of cases was reported earlier in summer (June/July) (Figure 3.17d). In cases aged between 1 and 14 years, and in those older than 65 years a smaller increase during spring (March/May) was reported, while in children younger than one year of age and adults aged between 45 and 64 years, a second smaller peak was reported during winter (January/February) (Figure 3.17d).

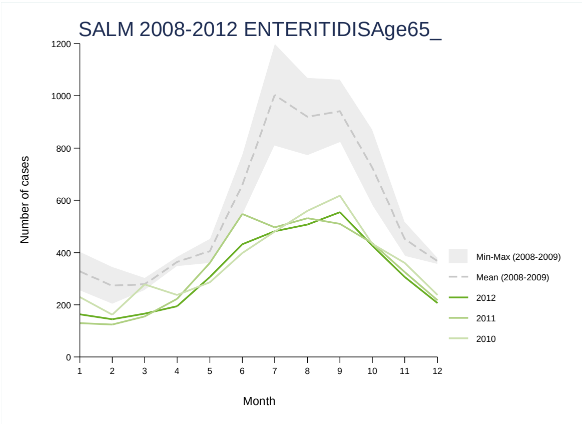
Figure 3.17a, b, c and d. Seasonality of the four most commonly reported non-typhoidal *Salmonella* serotypes in 2012 by age groups, EU/EEA countries, 2008–2012

a. Confirmed cases of *S.* Enteritidis (N=209 762) by month of notification and age group

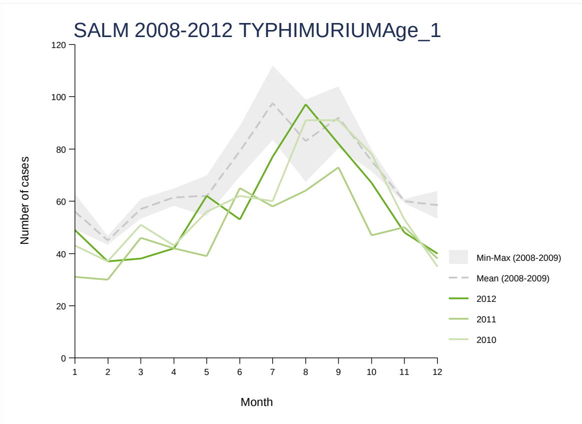


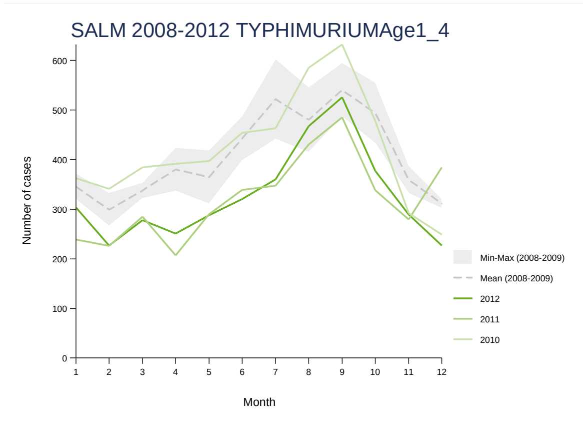


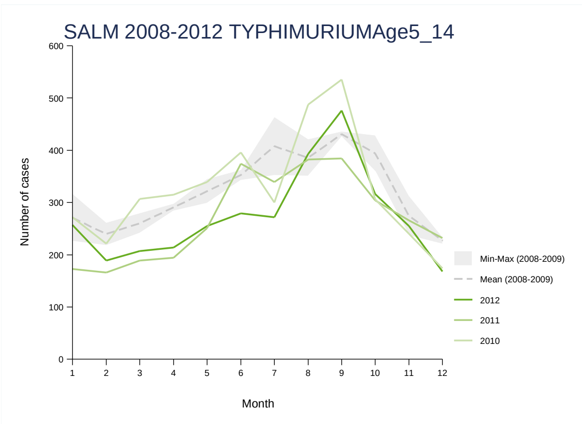


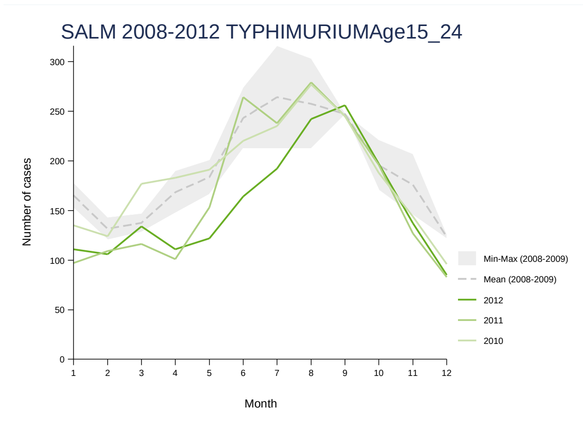


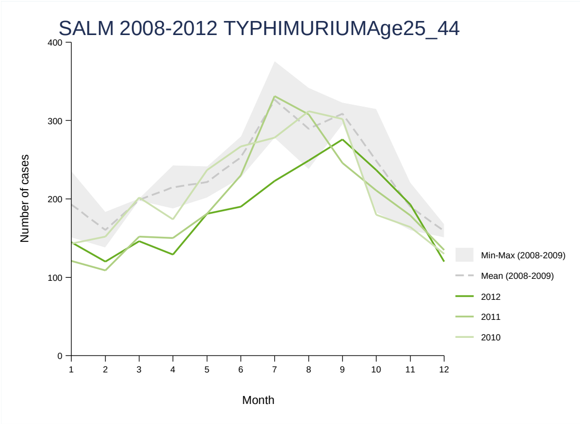
b. Confirmed cases of *S.* Typhimurium (N=94391) by month of notification and age group

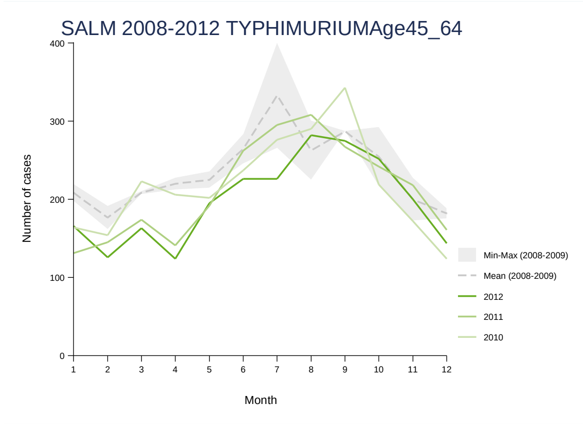


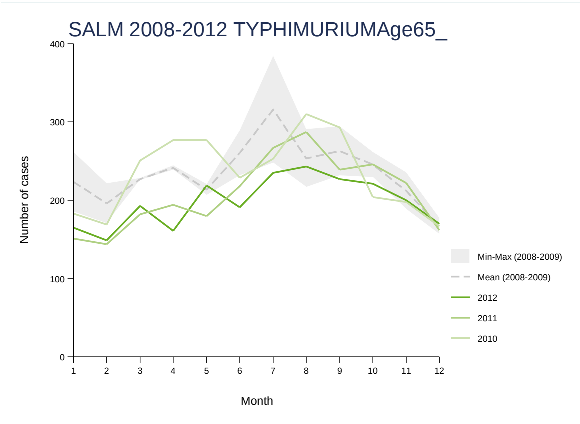




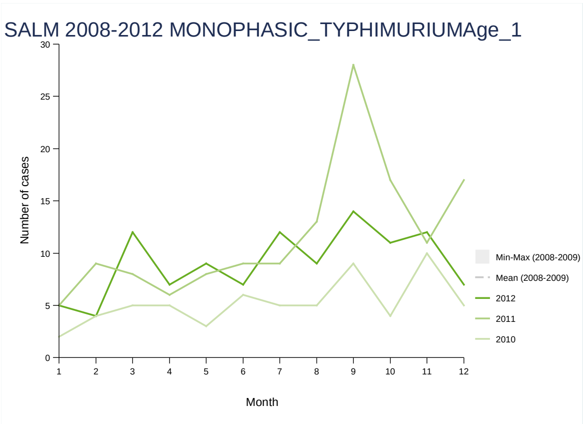


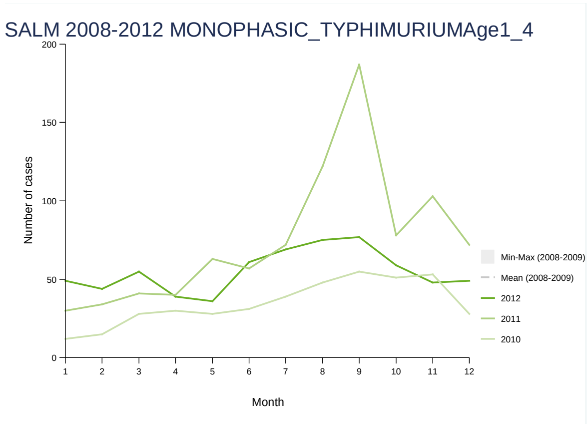


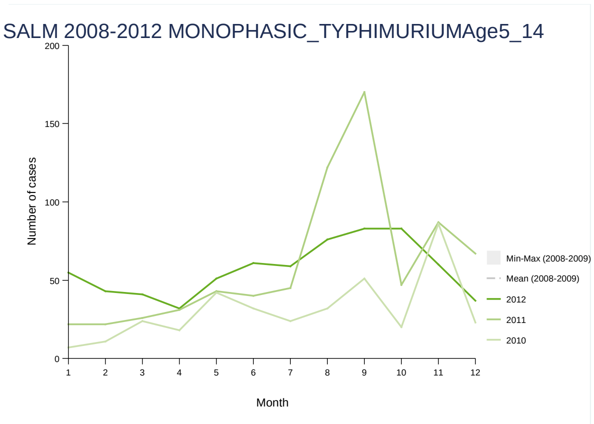


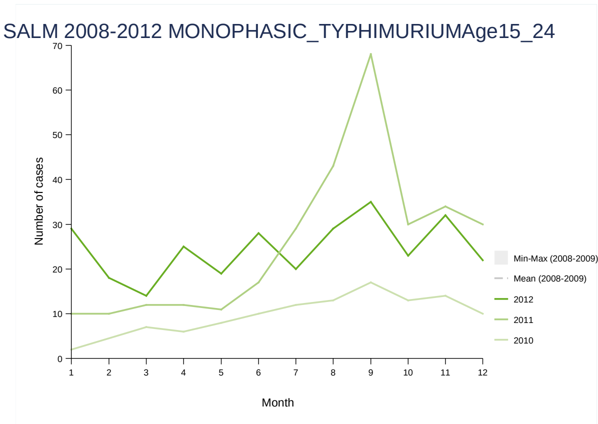


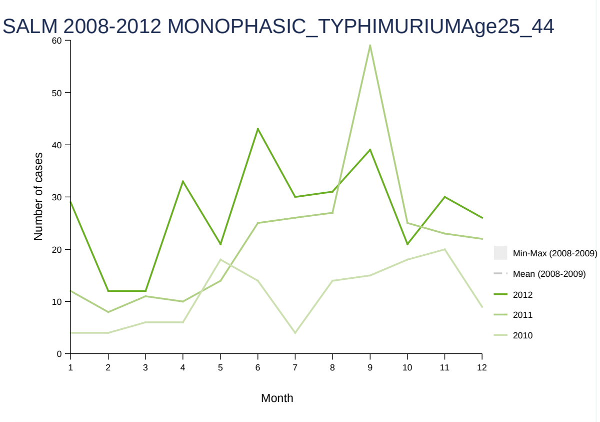
c. Confirmed cases of monophasic *Salmonella* Typhimurium 1,4,[5],12:i:-(N=7 229) by month of notification and age group

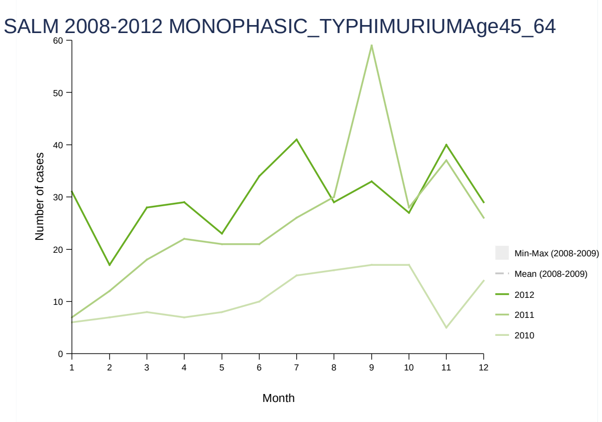


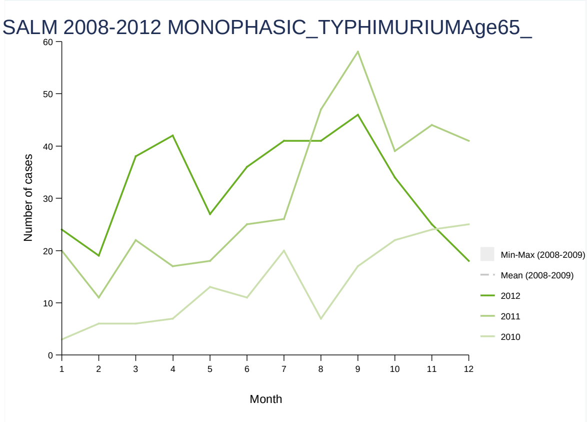




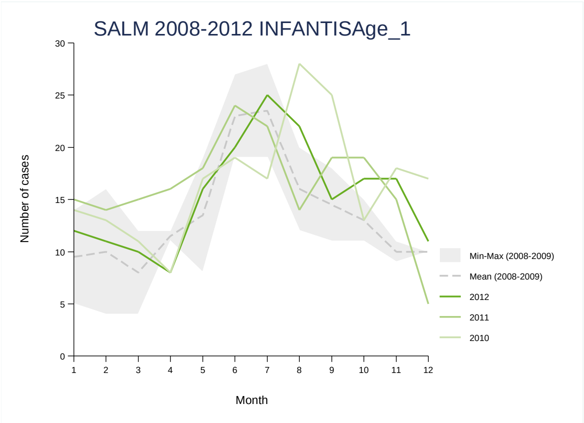


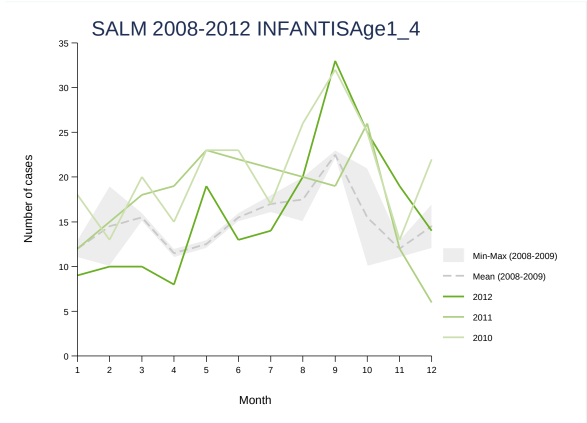


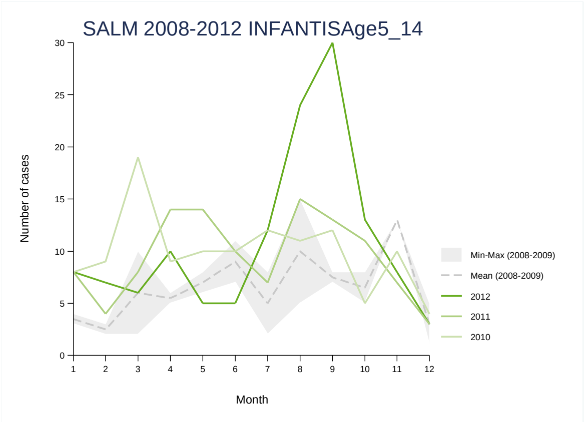


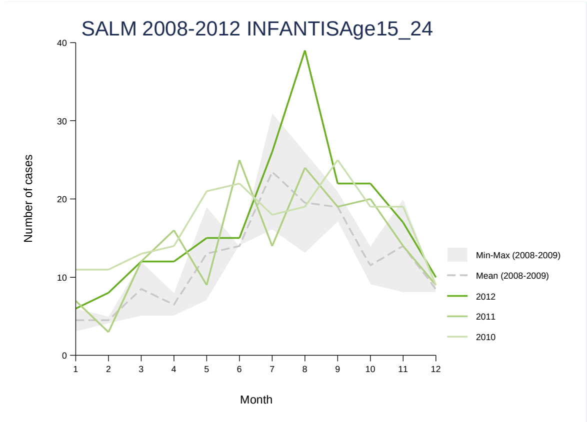


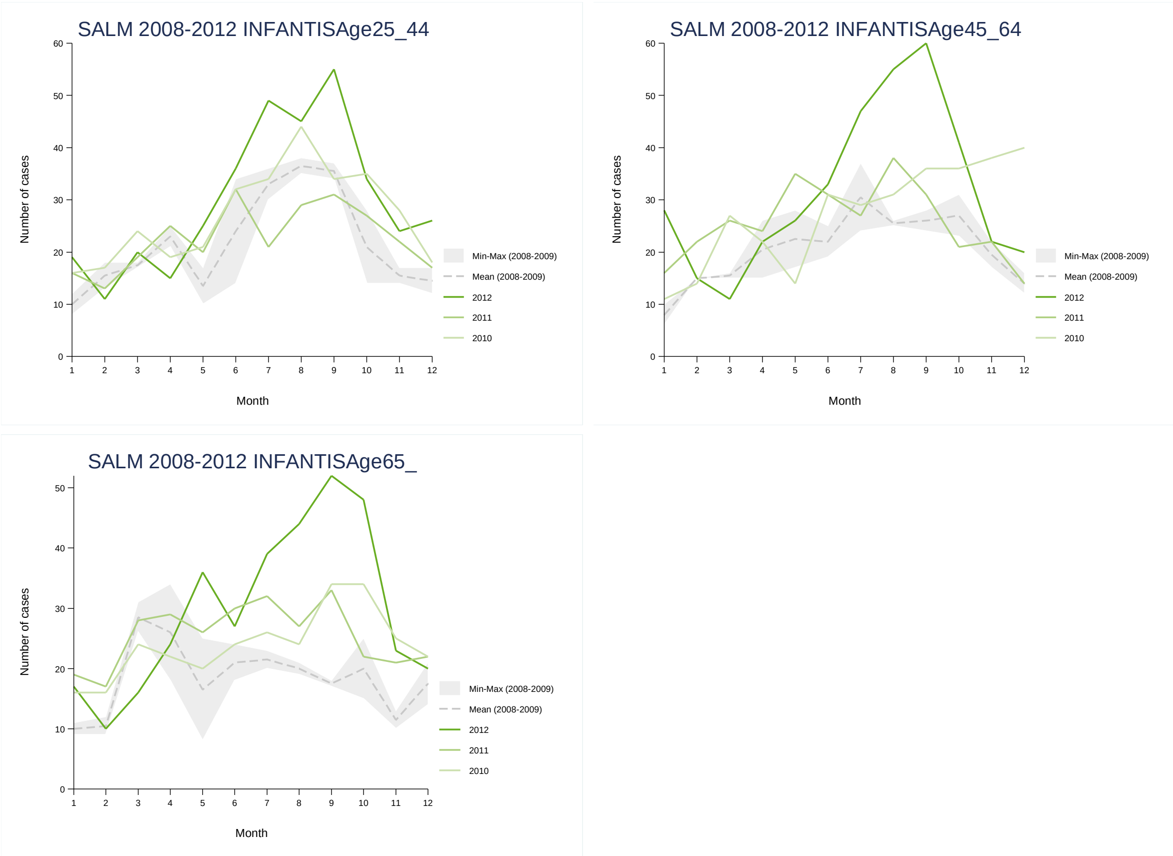
d. Confirmed cases of *S.* Infantis (N=7 711) by month of notification and age group











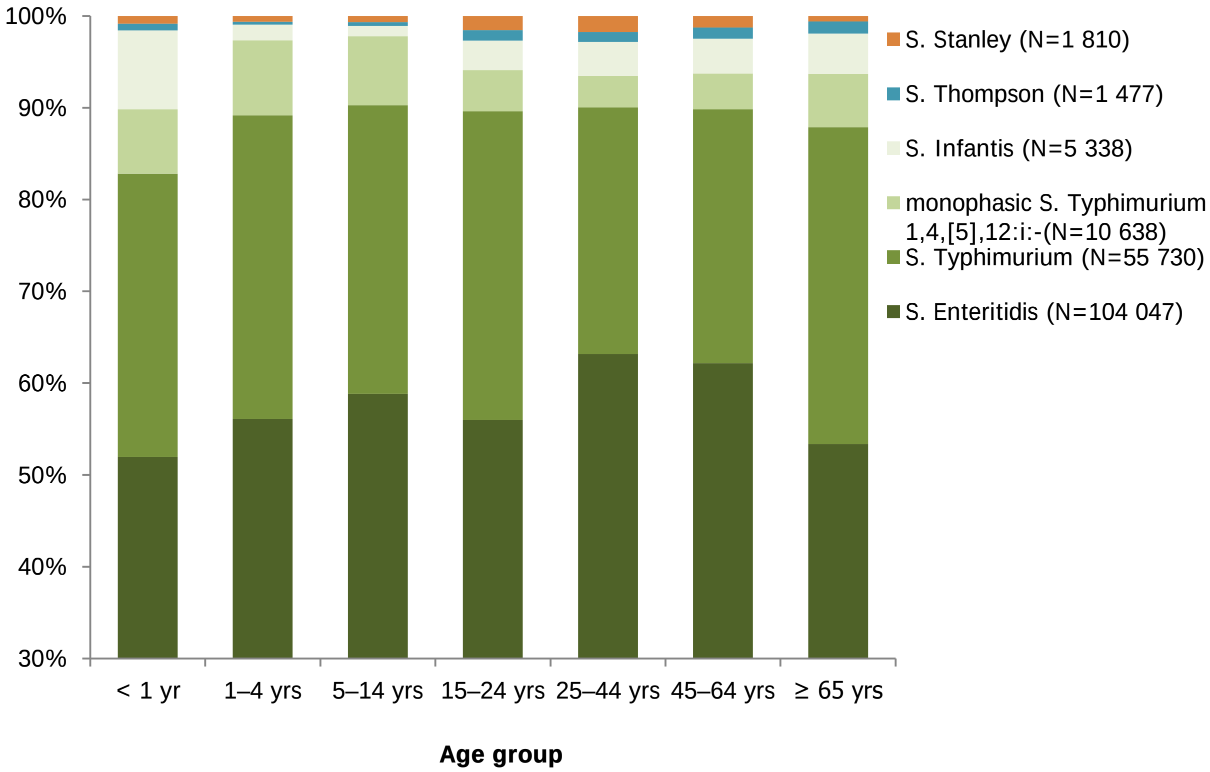
Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Luxemburg, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Salmonella serotypes and age

As in previous years, the six selected serovars (*S.* Enteritidis, *S.* Typhimurium, *S.* Infantis, monophasic *S.* Typhimurium 1,4,[5],12:i:-, *S.* Stanley and *S.* Thompson) are spread quite uniformly over all age groups (Annex 3.9).

Salmonella Enteritidis had highest relative proportion among adults between 25 and 64 years whereas of the other five serovars. *Salmonella* Typhimurium was distributed quite homogeneously among all age groups. *Salmonella* Infantis was relatively more common among children below one year of age than in other age groups. The relative proportion of *S.* Thompson was the highest in older than 65 year of age and *S.* Stanley was more common among aged 25–44 years. Monophasic *S.* Typhimurium 1,4,[5],12:i:-was prevalent in cases younger than 15 years, with the highest relative proportion among 1–4 years old (Figure 3.18).

Figure 3.18. Relative distribution of six selected non-typhoidal *Salmonella* serotypes by age groups in EU/EEA countries, 2010–2012



Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Severity

The severity of salmonellosis was evaluated through the hospitalisation and the proportion of deaths due to salmonellosis (outcome) among all confirmed cases, by calculating the case–fatality ratio. The specimen type used for diagnosis of *Salmonella* infection was also evaluated. Relative confidence intervals (95% CI) were calculated when analysing the hospitalisation ratio and the case–fatality ratio (CFR), and results were described on a country basis (Annex 3.10, Annex 3.11).

Hospitalisation

Hospitalisation data were included in the EU-level salmonellosis surveillance for the first time in 2009. Overall, between 2010 and 2012, the information was reported for a very low proportion of cases (10.4%). The completeness of reporting slightly improved during the three-year surveillance period, from 8.5% in 2010 to 11.4% in 2012 (Table 3.4), as well as the number of reporting countries increased from 8 in 2010 to 11 in 2012 (Annex 3.10). Since there is an extremely high proportion of unknown/missing data (>85%), results on hospitalisation should be interpreted with caution.

At the EU/EEA level, the proportion of hospitalised cases increased significantly between 2010 and 2011, from 38% (CI 95%: 37%–39%) to 44% (CI 95%: 43%–45%) and then remained stable during 2011–2012 (Table 3.4). At country level, the highest hospitalisation ratios (>70 % of cases hospitalised) were reported in Greece, Portugal and Romania; these countries also reported among the lowest notification rates of non-typhoidal salmonellosis, which indicates that the surveillance systems primarily focuses on the more severe cases (Annex 3.10).

Table 3.4. Hospitalisation ratio of confirmed non-typhoidal salmonellosis cases in EU/EEA countries, 2010–2012

Hospitalisation	Year		
	2010	2011	2012
Number of confirmed cases	102456	96907	92443
Confirmed cases covered (%)[1]	8.5	11.6	11.4
Hospitalised cases	3319	4893	4474
Hospitalisation ratio (%)[2] (confidence interval 95%)	38.1 (37.1–39.1)	43.6 (42.6–44.5)	42.5 (41.6–43.5)

Source: Austria (from 2011), Cyprus (from 2012), Estonia, Greece, Hungary, Ireland, Malta (from 2011), Portugal, Romania, United Kingdom; EEA country: Norway

[1] The proportion (%) of confirmed cases for which information on hospitalisation was available.

[2] Calculated as number of hospitalised cases of the confirmed cases for which this information was available.

Outcome

Fifteen countries provided data on the status after the disease course during 2010–2012, with one country starting the reporting of information in 2011(Annex 3.11). The proportion of confirmed cases with recorded outcome (alive/dead) of the infection increased from 46% in 2010, to 49% in 2012 (Table 3.5).

Based on known data only, the case–fatality ratio associated with salmonellosis cases at EU/EEA level was low and stable during the three-year period, ranging between 0.12%–0.13% (Table 3.5).

Age-specific case–fatality ratio highly varied with age (Table 3.6). No deaths were reported in children younger than one year of age. The case–fatality ratio was very low, under 0.05%, in cases aged between 1 and 44 years, while in the elderly group (over 65 years) it was about 0.7%, five to six times higher than in adults between 45 and 64 years (Table 3.6).

Table 3.5. Number of deaths and case–fatality ratio of confirmed non-typhoidal salmonellosis cases by year in EU/EEA countries, 2010–2012

Outcome	Year		
	2010	2011	2012
Number of confirmed cases	102 456	96 907	92 443
Confirmed cases covered (%)[1]	46.4	49.2	49.1
Number of deaths	62	60	62
Case fatality ratio (%)[2] (confidence interval 95%)	0.13 (0.10–0.17)	0.12 (0.09–0.16)	0.13 (0.10–0.17)

Source: Austria (from 2011), Cyprus, Czech Republic, Estonia, Germany, Greece, Hungary, Ireland, Latvia, Malta, Portugal, Romania, Slovakia, United Kingdom; EEA country: Norway

[1] The proportion (%) of confirmed cases for which information on death was available.

[2] Calculated as number of fatal cases of the confirmed cases for which this information was available.

Table 3.6. Number of deaths and case–fatality ratio of confirmed non-typhoidal salmonellosis cases by age groups and year in EU/EEA countries, 2010–2012

Age group	2010			2011			2012		
	Cases	No. of deaths	Case–fatality ratio (%)	Cases	No. of deaths	Case–fatality ratio (%)	Cases	No. of deaths	Case–fatality ratio (%)
<1 yr	1 955	0	0.00	1 850	0	0.00	1 924	0	0.00
1–24 yrs	24 233	4	0.02	24 177	2	0.01	22 934	2	0.01
25–44 yrs	7 352	1	0.01	7 434	1	0.01	7 021	2	0.03
45–64 yrs	7 336	9	0.12	7 531	9	0.12	7 050	10	0.14
≥ 65 yrs	6 654	48	0.72	6 695	48	0.72	6 440	48	0.73
Total	**47 530**	**62**	**0.13**	**47 687**	**60**	**0.12**	**45 369**	**62**	**0.13**

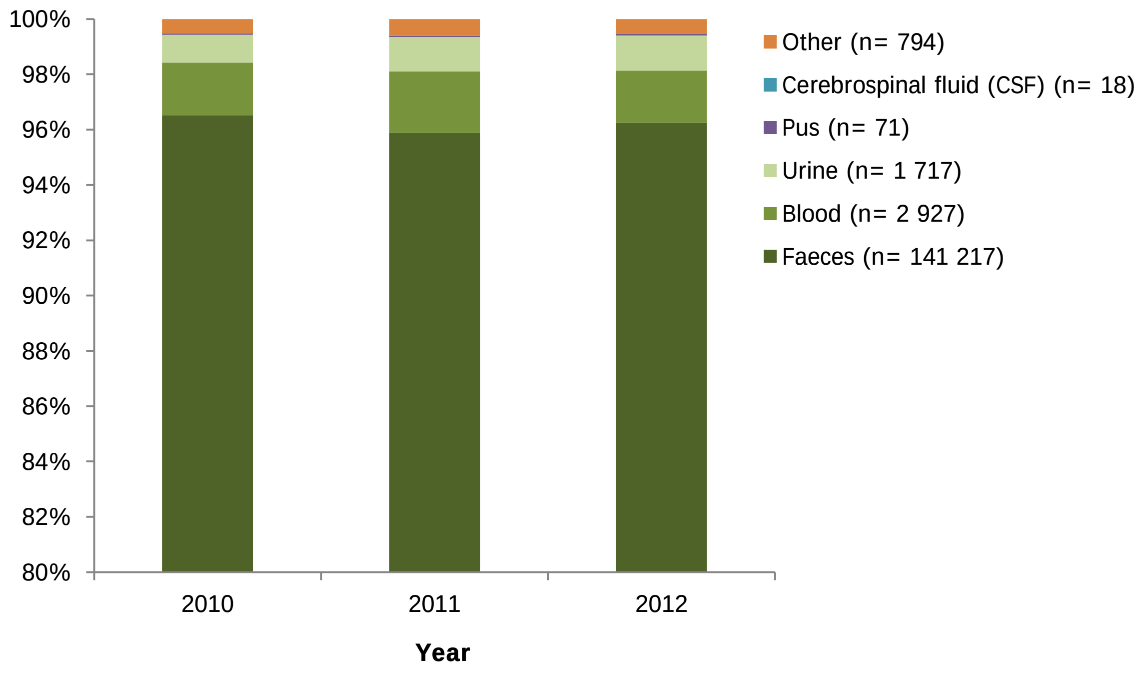
Source: Austria (from 2011), Cyprus, Czech Republic, Estonia, Germany, Greece, Hungary, Ireland, Latvia, Malta, Portugal, Romania, Slovakia, United Kingdom; EEA country: Norway

Isolation by specimen type

Types of specimens used for laboratory confirmation of salmonellosis did not differ significantly between 2010 and 2012 (Annex 3.12). The most common specimen 97% (n=141 217) used to confirm salmonellosis was faeces.

The second most frequently used specimen was blood 1.9% (N=2 927). Detailed information on distribution of specimen type is presented in Figure 3.19.

Figure 3.19. Distribution of confirmed non-typhoidal salmonellosis cases diagnosed from different specimen type as reported by EU/EEA countries in 2010–2012 (N=146 744)



Source: Austria, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, United Kingdom; EEA country: Norway

Discussion

The steady decrease in human non-typhoidal salmonellosis cases described at the EU/EEA level since 2004[5], continued during 2010–2012, with a reduction of 10% in the number of reported cases, from 102 456 cases in 2010 to 92 443 cases in 2012. Country-specific trends decreased in the majority of reporting countries between 2008 and 2012, suggesting a positive public health impact of implementation of various EU-level prevention and control measures. This includes the implementation of *Salmonella* control programmes in the poultry industry since 2007, as well as improved hygiene and education of consumers and food-workers [2-7]. Salmonellosis is nevertheless the second most common zoonosis in humans in the EU/EEA, and was associated with 1 533 foodborne outbreaks in 2012 [2].

Significant increasing trends were observed in France and the Netherlands. The increasing trend in the Netherlands can be explained by a very large outbreak of *S.* Thompson in 2012 (866 confirmed cases), in which smoked salmon was the confirmed vehicle [8], thus a gradual decrease of Salmonella infections can be seen in the Netherlands after the outbreak in 2013 [9]. The increase in France may be partially driven by three large outbreaks due to monophasic *S.* Typhimurium 1,4,[5],12:i:- occurring between 2010 and 2011. The investigations indicated dried pork sausage as being the most likely source of two of the outbreaks (682 cases between August and October 2011; 337 cases between November and December 2011) [10]. In one outbreak, beef burgers were identified as the cause (554 cases in October 2010) [11]. A constant increase of the serotype monophasic *S.* Typhimurium 1,4,[5],12:i:- has been recorded in France since 2008 [12].

A high variability was observed in country-specific notification rates of non-typhoidal salmonellosis that ranged from more than 70 cases to less than 5 cases per 100 000 population. However, it should be noted that comparison between countries can be grossly misleading, even within the European Union, and the reported numbers don't reflect the circulation of *Salmonella* infection in human population. The seroincidence from the analysis of the levels of antibody showed a 10-fold difference and almost inverse correlation between seroincidence and reported cases in the European countries for non-typhoidal salmonellosis. Obtained results may reflect the true differences in the burden of salmonellosis in different countries, but also be affected by quality and coverage of the surveillance systems, number of samples collected from patients, case reporting and typing protocols applied [3, 6, 13, 14].

As in previous years [5], the highest notification rate was detected in children between 1 and 4 years of age, followed by newborns (<1 year). This may be due to the greater proportion of symptomatic infections among the young, but also to the fact that parents are more likely to seek medical care if young children show gastrointestinal symptoms and paediatricians are more likely to submit a sample for culture [15]. There were no differences in the overall rates between males and females.

According to the data provided in 2010–2012, salmonellosis is mainly acquired domestically. A decreasing trend in the annual number of domestic cases was observed since 2008, however, from 2010 to 2012 the number of domestically-acquired infections increased by 3.8%. Only 17% of cases in the EU/EEA were reported as travel-related. Among travellers, the infection is mostly contracted in non-EU countries (80% of travel-related infections), mainly in Asia (60% of infections) and Africa (30% of infections). As observed in previous years [2-6], the proportion of domestic versus imported cases varied across EU/EEA countries, with the highest proportion of travel-associated infections reported by the Nordic countries (Finland, Iceland, Norway and Sweden). However, it is important to take into account that several factors, such as the limited standardisation for travel-related infections at European level, the completeness and consistency of the collected information, and the incubation period considered for travellers may lead to misclassification or underreporting of *Salmonella* cases [16].

The severity of non-typhoidal salmonellosis was evaluated by looking at the proportion of hospitalised cases and the case–fatality ratio. Hospitalisation data were collected for the first time in 2009 and, as expected, the completeness of reporting slightly improved starting from 2011. About 40% of salmonellosis cases with known data required hospital care, and the hospitalisation ratio increased significantly from 38% in 2010 (CI 95%: 37%–39%) to 43% in 2012 (CI 95%: 42%–44%). The observed increase may be due to several factors, such as a better case-ascertainment or an improvement in reporting, or may reflect a real increase. However, since the information was reported for a very low proportion of cases (10.4% in 2010–2012), results on hospitalisation should be interpreted with caution. The observed differences in hospitalisation rates across EU/EEA countries may reflect the diversity among national surveillance systems rather than differences in the severity of the disease.

At the EU/EEA level, non-typhoidal salmonellosis had a low case–fatality ratio (CFR), ranging between 0.12% and 0.13%, but the risk of death increased noticeably with increasing age. In fact, in the elderly group (over 65 years) the case–fatality ratio was 0.7%, about six times higher than in adults between 45 and 64 years, while it was very low (under 0.05%) in cases aged between 1 and 44 years. These figures should be interpreted cautiously as there is no common definition of the point in time at which a fatal outcome is determined. Moreover, data were reported only by a limited number of countries, the proportion of unknown data was very high and some national surveillance system may focus only on diagnosis of the most severe cases.

Salmonella serotyping is an important tool for surveillance purposes, which allows us to evaluate the effect of *Salmonella* control measures in various food-animal sources, and to follow trends and dynamic changes. It is also useful for identifying sources of infection and routes of transmission to humans, as well as to target new interventions and control measures [6, 15, 17]. Despite the high number of *Salmonella* serotypes described in the literature [7], and although all these are virtually capable of infecting humans, most human infections are caused by a limited number of serotypes. The ten most frequently reported serotypes[4] in EU/EEA countries during 2010–2012 accounted for about 80% of confirmed *Salmonella* cases with known information on serotype, with *S.* Enteritidis and *S.* Typhimurium, representing 43% and 24% of all typed isolates, respectively. Similar results have been described in all world regions but Oceania and North American, where *S.* Typhimurium was the most commonly reported serotype and *S.* Enteritidis held the second place [7]. As described in literature, only few European countries, such as Belgium, Denmark, France and Italy, have experienced this shift in the dominant serotypes from 2000–2005 [6, 15].

Most serotypes showed a marked seasonality, increasing over the summer. The summertime seasonal pattern was extremely clear for serotypes *S.* Enteritidis and *S.* Typhimurium, while more variability was found for *S.* Infantis and *S.* Thompson. Although the reasons of this pattern are not entirely known, climatic factors are significant predictors of salmonellosis. The increase in temperature during summer favours pathogen multiplication in the environment, and subsequent shedding by animal hosts, facilitating cross-contaminations, increases the risk of food-borne transmission. At the same time, insufficient refrigeration and improper handling of foods during the warm months as well as changes in social habits due to the warmer season could also potentially enhance *Salmonella* transmission [15, 18]. The winter peak (January) reported for travel-related infections due to *S.* Stanley may reflect increased travel to warm climates for holidays.

The two most common serovars, *S.* Enteritidis and *S.* Typhimurium, were spread across all age groups. In children less than one year of age, *S.* Infantis had the highest notification rate. Monophasic *S.* Typhimurium 1,4,[5],12:i:- was prevalent in cases younger than 15 years, with the highest relative proportion among 1–4 years old. The relative proportion of *S.* Thompson was the highest in those older than 65 year of age.

[4] Top 10 serotypes (cumulative cases 2010–2012): *S.* Enteritidis, *S.* Typhimurium, *S.* Monophasic Typhimurium 1.4.[5].12:i:-, *S.* Infantis, *S.* Newport, *S.* Derby, *S.* Kentucky, *S.* Stanley, *S.* Virchow and *S.* Thompson.

Substantial changes have been observed in the distribution of serotypes from 2010 to 2012, as decreases in one serotype are balanced by corresponding increases in another. During 2010–2012, the most important rise was recorded for monophasic *S.* Typhimurium 1,4,[5],12:i:-, followed by *S.* Thompson. Monophasic *S.* Typhimurium 1,4,[5],12:i:- appears to be of increasing importance in many European countries and has caused a substantial number of infections in both humans and animals [3, 5, 12, 19]. However this rise may be partially explained by changes in the reporting system at EU/EEA level, as the introduction in 2010 of a separate code for reporting this particular serotype to TESSy. The rise in the number of cases due to *S.* Thompson, particularly evident in 2012 is explained by the large outbreak in the Netherlands (866 people affected), in which smoked salmon was the confirmed vehicle [7]. The increase reported in *S.* Stanley cases, was related to a multi-country outbreak linked to the contamination of the turkey production chain occurring in Europe between August 2011 and January 2013 [20]. The increase in *S.* Panama cases was caused by an outbreak in one German federal state and one Italian region. The outbreak investigation concluded that the probable source of the outbreak were raw pork products, such as seasoned minced pork and shortly ripened raw sausages [3]. *S.* Poona caused a large national outbreak in Spain (with 285 confirmed cases) due to contaminated milk formula affecting mainly children under 6 months old [21].

Since 2008, a significant reduction in confirmed cases was reported for *S.* Enteritidis. The decrease could be explained by the intense focus on particular serovars and the introduction of specific monitoring and control programs in order to reduce the prevalence of *Salmonella*, and the risk to public health in the EU. When attributing human foodborne salmonellosis cases to animal reservoirs, laying hens providing eggs intended for human consumption were shown to be the most important reservoir for *S.* Enteritidis, and pigs for *S.* Typhimurium [22, 23]. The *Salmonella* seroincidence numbers in general population were correlated with prevalence data of *Salmonella* in laying hens, broilers and slaughter pigs [14]. From 2008, Member States have implemented *Salmonella* control programmes for laying hens for the most important *Salmonella* serotypes (prevalence less than 2% for *S.* Enteritidis and *S.* Typhimurium) [2-7, 15].

Except for *S.* Enteritidis and *S.* Typhimurium, which are the most prevalent serovars worldwide, and *S.* Infantis, which is described in all regions, geographical differences have been reported for the other *Salmonella* serotypes. Between 2010 and 2012, most infections due to *S.* Kentucky, *S.* Virchow and *S.* Stanley were acquired abroad, travelling to non-EU/EEA countries, and a decline in number of reported cases was observed. Among travel-related infections acquired in EU/EEA countries, the most commonly reported serotypes were *S.* Newport and *S.* Java. In literature, *Salmonella* Newport was mainly observed in Latin and North American and European countries. *Salmonella* Virchow is reported among the top serotypes in Asia, Europe, and the Oceania regions [7, 17], while *Salmonella* Stanley in Southeast Asia and Thailand [24].

The introduction of specific monitoring and control programs at the European level should focus on the most common serotypes acquired domestically and/or acquired travelling to another European country, as they better represent those *Salmonella* serotypes that circulate in Europe, and could be of farm animal origin. Moreover, since human salmonellosis may be a consequence of international travel, human migration, food and animals trade, and the failure of control programmes against *Salmonella* in one country may represent a public health concern for other countries [7].

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4 Shigellosis in the EU/EEA, 2010–2012

Shigellosis

Shigellosis is a gastrointestinal infection caused by bacteria of the genus *Shigella*. All four known *Shigella* species (*S. sonnei*, *S. flexneri, S. boydii and S. dysenteriae*) can cause human disease. The most affected are young children. Shigellosis is not endemic in the EU, and most infections are acquired while travelling in endemic countries. *S.* sonnei is the most commonly reported species causing infections in the EU citizens.

Clinical symptoms may range from mild enteric infection (watery, self-limiting diarrhoea) to very serious symptoms characterised by cramps, high fever, vomiting, intestinal perforation and bloody diarrhoea. Reiter's disease (reactive autoimmune arthritis) and haemolytic-uremic syndrome (HUS) are possible post-infectious complications.

The usual transmission route is faecal-oral, directly from person-to-person, or indirectly through contaminated food or water. Contaminated water and unsanitary handling of different fresh food products (salads and vegetables) by infected food handlers are the most common causes of the infections.

More information on shigellosis can be found at the ECDC website [13].

Surveillance of shigellosis in the EU/EEA in 2010–2012

Since 2008, ECDC has been coordinating European surveillance of listeriosis infection, in close collaboration with a network of nominated experts, epidemiologists and microbiologists from EU/EEA countries as part of the Food- and Waterborne Diseases and Zoonoses (FWD) Network.

The scope of surveillance is defined by the general surveillance objectives for food- and waterborne diseases and the EU case definition for shigellosis (see Annex H).

The aims and purposes of the disease-specific surveillance were discussed with the European Food- and Waterborne Diseases and Zoonoses Network. For shigellosis surveillance, the following areas were highlighted:

- Standardised diagnostic methods should be available before introducing an external quality assessment scheme for *Shigella* spp.
- The molecular typing method for *Shigella* spp. should be explored further.

The European Surveillance System (TESSy) allows the standard reporting of cases of shigellosis with an agreed set of variables. In 2010–2012, the reporting of shigellosis covered 29 variables, 27 of which were common variables for all diseases and two were specific for shigellosis. The common variables are presented in Table 1 in the chapter on 'Data collection and analyses'. Additional *Shigella*-specific variables are presented below in Table 4.1. In 2012, 25 EU/EEA countries had a compulsory reporting system with full population coverage for shigellosis, one country had a voluntary system, and one country did not report *Shigella* infections to TESSy (Table 4.2).

Table 4.1. Enhanced dataset collected for shigellosis cases, EU/EEA, 2010–2012

Variable	Description in TESSy
Pathogen	Species or genus of the pathogen which is the cause of the reported disease
Serotype	Serotype of the pathogen which is the cause of the reported disease

National surveillance systems for shigellosis

Table 4.2. Notification systems for shigellosis cases in EU/EEA countries, 2012

Country	Reported since	Legal character[a]	Case based/aggregated[b]	National coverage[c]	Changes in surveillance system in 2010–2012
Austria	1947	Cp	C	Y	
Belgium	–	V	C	Y	
Bulgaria	1971	Cp	A	Y	No changes
Cyprus	–	Cp	C	Y	
Czech Republic	2008	Cp	C	Y	
Denmark	–	Cp	C	Y	No changes
Estonia	1945	Cp	C	Y	
Finland	–	Cp	C	Y	
France	–	V	C	N (population coverage 44%)	

Country	Reported since	Legal character[a]	Case based/ aggregated[b]	National coverage[c]	Changes in surveillance system in 2010–2012
Germany	2001	Cp	C	Y	No changes
Greece	–	Cp	C	Y	
Hungary	–	Cp	C	Y	
Ireland	–	Cp	C	Y	
Italy	–	V	C	N	
Latvia	1946	Cp	C	Y	No changes
Lithuania	–	Cp	C	Y	
Luxembourg	2004	V	C	Y	
Malta	–	Cp	C	Y	
Netherlands	–	Cp	C	Y	
Poland	–	Cp	C	Y	
Portugal	–	Cp	C	Y	
Romania	–	Cp	C	Y	
Slovakia	1958	Cp	C	Y	
Slovenia	–	Cp	C	Y	No changes
Spain	1996	Cp	C	Y	
Sweden	1969	Cp	C	Y	
United Kingdom	–	O	C	Y	
Iceland	–	Cp	C	Y	
Liechtenstein	–	–	–	–	–[d]
Norway	1975	Cp	C	Y	

[a] *Legal character: Cp=compulsory, V=voluntary, O=other*

[b] *C=case based, A=aggregated*

[c] *National coverage: Y=yes, N=no*

[d] *Not reported/no data provided*

Epidemiological situation in 2010–2012

Major findings

- A stable trend in the number of confirmed shigellosis cases was observed from 2008 to 2012 at EU/EEA level.
- The average notification rate in 2010–2012 was 1.8 cases per 100 000 population.
- The majority (64%) of reported shigellosis infections with known data were acquired abroad, mostly in non-EU countries.
- *Shigella sonnei* was the most commonly reported species (56% of total species reported) in 2010–2012, followed by *S. flexneri* (33% of total species reported).
- The trend in the number of *S. flexneri* cases significantly increased during 2008–2012.
- The highest rates of *Shigella* infections in 2010–2012 were reported in children younger than five years of age; the lowest rates were recorded in cases aged 65 years or older.
- The highest burden in terms of the number of reported cases was noted in the age group 25–44 years, most likely related to travels to endemic countries.
- *S. flexneri* infections acquired in EU/EEA countries were mainly due to serotype 3a, whereas serotypes 2a, 2b, 1b, 4a and 6 were most frequently isolated from cases travelling to non-EU/EEA countries.
- The reporting of *S. flexneri* serotype X tripled in 2012 (compared with 2010) and was mainly associated with domestically acquired infections.
- About 45% of shigellosis cases with known data (21% of total cases) required hospital care in 2010–2012.
- Shigellosis has a low mortality rate; only six deaths were reported during the three-year surveillance period (2010–2012).

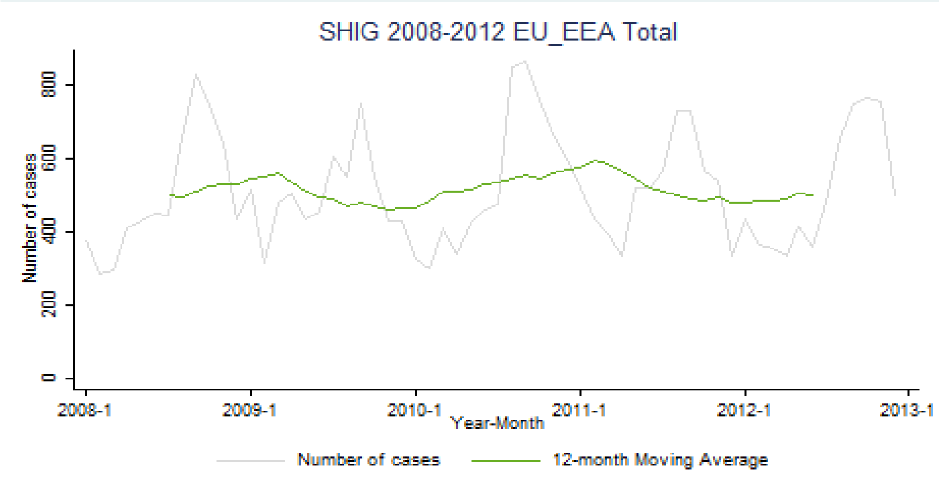
Overview of trends

From 2010 to 2012, 21 969 confirmed shigellosis cases were reported to TESSy by 27 EU Member States and two EEA countries, excluding Liechtenstein. One country (Italy) started reporting in 2012 (Table 4.3).

At EU/EEA level, a stable trend in number of confirmed shigellosis cases was observed since 2008 (Figure 4.1) but variations between countries were notable. The average confirmed case rate in 2010–2012 was 1.8 cases per 100 000 population, with a range of 7 312 cases reported in 2011 and 7 336 in 2010 (Table 4.3).

Between 2010 and 2012, the highest number of confirmed shigellosis cases was reported by the United Kingdom (cumulative N=5 972), accounting for 27% of all reported cases, followed by Bulgaria (cumulative N=2 171) and France (cumulative N=2 101; population coverage 44%), each representing 10% of total confirmed cases (Table 4.3). On average, the highest three-year country-specific notification rate for shigellosis was observed in Bulgaria (9.8 cases per 100 000), followed by Slovakia (8.3 cases per 100 000), whereas the lowest average rates were reported in Poland (0.05 cases per 100 000) and Portugal (0.06 cases per 100000) (Table 4.3).

Figure 4.1. Trend in number of confirmed shigellosis cases in EU/EEA countries, 2008–2012 (N=30 329)



Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Table 4.3. Confirmed shigellosis cases and notification rates (per 100 000 population) by country in EU/EEA countries, 2010–2012

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	98	1.17	36	0.43	57	0.68
Belgium*	342	-	317	-	340	-
Bulgaria^	596	7.88	798	10.83	777	10.60
Cyprus	0	-	2	0.24	0	-
Czech Republic	387	3.68	157	1.50	266	2.53
Denmark	91	1.64	91	1.64	105	1.88
Estonia	46	3.43	22	1.64	34	2.54
Finland	162	3.03	126	2.34	88	1.63
France[a]	774	2.72	641	2.24	686	2.39
Germany	697	0.85	664	0.81	518	0.63
Greece	33	0.29	47	0.42	89	0.79
Hungary	63	0.64	43	0.44	32	0.33
Ireland	60	1.34	42	0.92	29	0.63
Italy*	-	-	-	-	30	-
Latvia	11	0.49	10	0.48	3	0.15
Lithuania	42	1.26	40	1.31	52	1.73
Luxembourg	13	2.59	16	3.13	14	2.67
Malta	2	0.48	4	0.96	0	-
Netherlands[b]	523	3.16	550[b]	3.3	674[b]	4.03
Poland	24	0.06	18	0.05	13	0.03
Portugal	6	0.06	3	0.03	10	0.10
Romania	293	1.37	371	1.73	354	1.66

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Slovakia	370	6.82	536	9.94	449	8.31
Slovenia	31	1.51	18	0.88	25	1.22
Spain	76	0.17	81	0.18	264	0.57
Sweden	557	5.96	454	4.82	328	3.46
United Kingdom~	1 881	3.06	2 070	3.34	2 021	3.21
EU total**	**7 178**	**1.76**	**7 157**	**1.74**	**7 258**	**1.75**
Iceland	2	0.63	1	0.31	1	0.31
Liechtenstein	-	-	-	-	-	-
Norway	132	2.72	163	3.31	77	1.54
EU/EEA total**	**7 312**	**1.77**	**7 321**	**1.76**	**7 336**	**1.76**

** Sentinel surveillance. Population coverage unknown, notification rate not calculated*

^ Aggregated reporting

[a] Population coverage 44%

[b] Numbers officially reported to TESSy. An update from the Netherlands received after the official TESSy data call deadline reported 389 cases for2011 and 395 cases for 2012 (PCR positive, but culture negative).

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

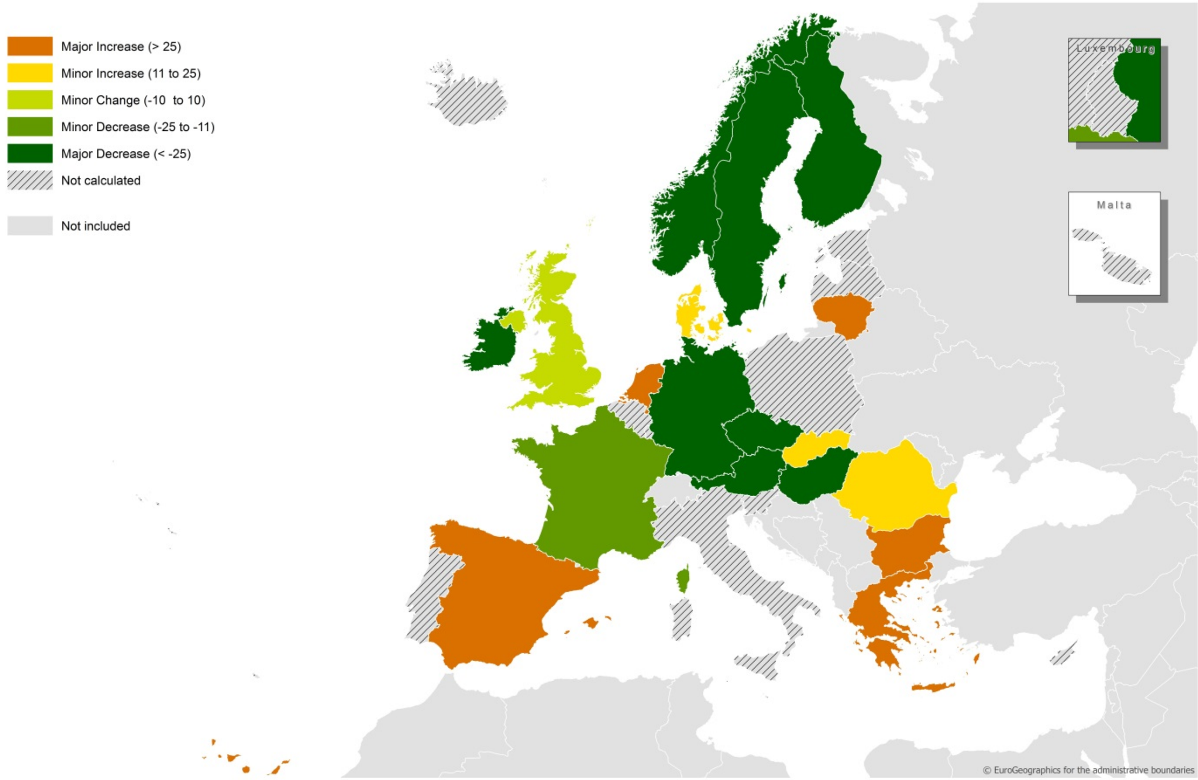
*** For each year shown, notification rates were calculated, with the exception of countries with unknown population coverage. Also excluded were populations of countries which did not report data. Populations of countries which reported 0 cases were included.*

– Not reported/not calculated

When comparing 2012 to 2010, the highest increase in rate was observed in Spain (from 0.2 to 0.6 cases per 100 000) (Figure 4.2; Table 4.3). A mayor significant increase was also reported in Bulgaria (from 7.9 to 10.6 cases per 100 000) (Figure 4.2; Table 4.3). A remarkable decrease in rates was observed in Austria (from 1.2 to 0.7 cases per 100 000), Finland (from 3.0 to 1.6 cases per 100 000), Norway (from 2.7 to 1.5 cases per 100 000) and Sweden (from 6.0 to 3.5 cases per 100 000) (Figure 4.2; Table 4.3).

Please note that in a country with a small population, even low absolute numbers of reported cases can lead to a relative overrepresentation.

Figure 4.2. Percentage change in notification rates of shigellosis cases in EU/EEA countries, 2010–2012

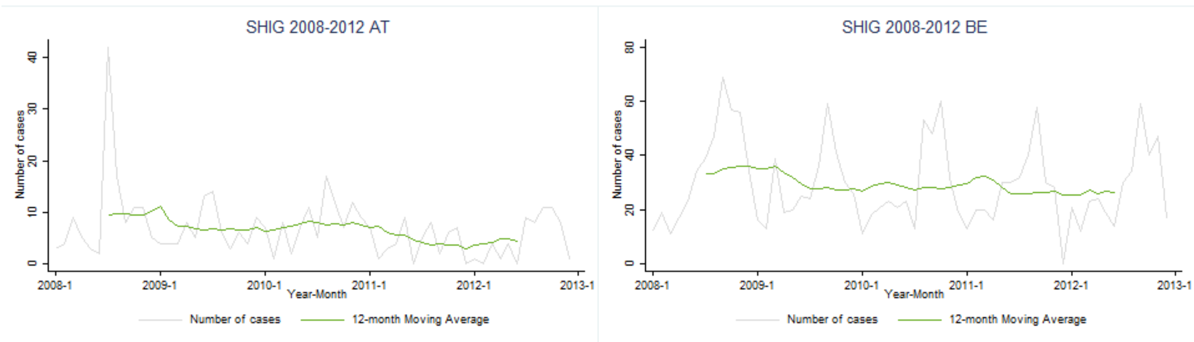


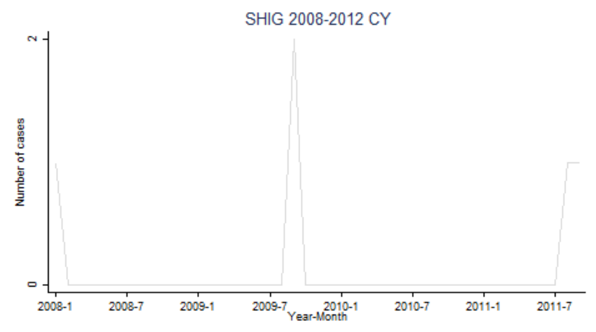
Not calculated: Country-specific percentage changes in notification rates were not calculated if the number of confirmed cases reported for one or more years during 2010–2012 was lower than 25, if sentinel surveillance systems had unknown population coverage, or if there was incomplete reporting for one of the reporting years.

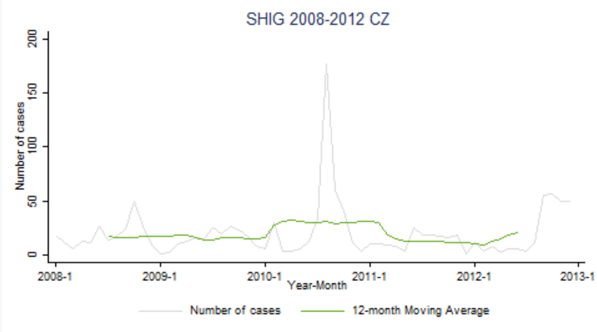
Source: The European Surveillance System (TESSy) data, 2010–2012

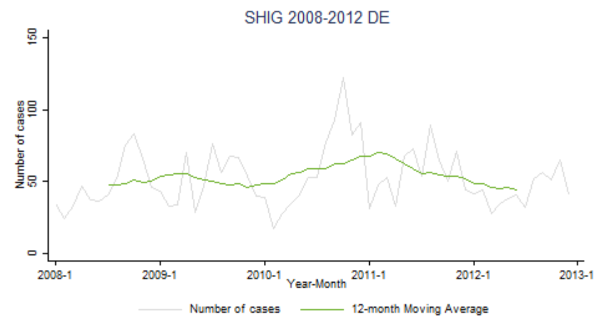
Country-specific trends in number of confirmed shigellosis cases were calculated from 2008 to 2012 (Figure 4.3). Statistically significant increases were recorded in three EU/EEA countries; the most significant rise was observed in the United Kingdom (p-value < 0.001), followed by the Netherlands (p-value < 0.01) and Greece (p-value ≤ 0.001) (Figure 4.3). Only Ireland showed a slight but significant decreasing trend in number of confirmed shigellosis cases (p-value < 0.01) (Figure 4.3).

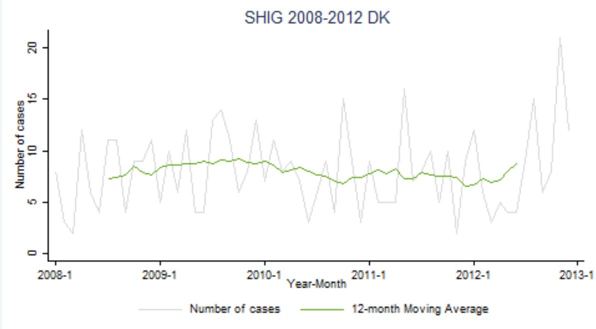
Figure 4.3. Trend in number of confirmed shigellosis cases by EU/EEA country, 2008–2012

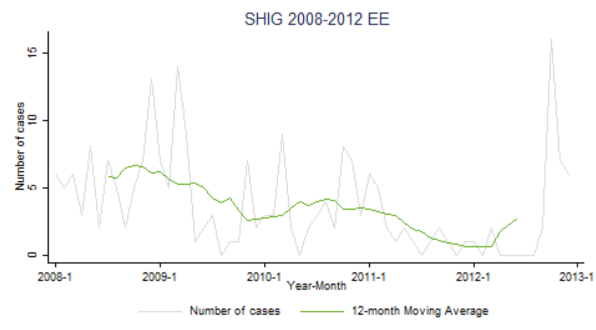


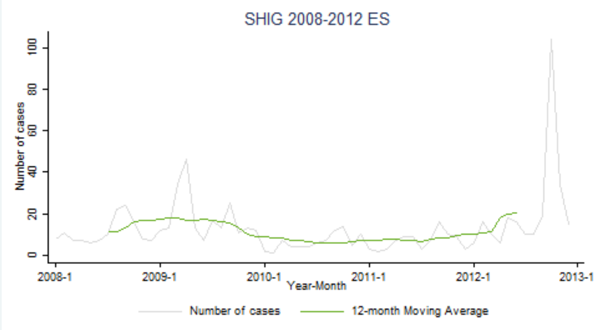

SHIG 2008-2012 CY
Number of cases
0
2
2008-1
2008-7
2009-1
2009-7
2010-1
2010-7
2011-1
2011-7
Year-Month

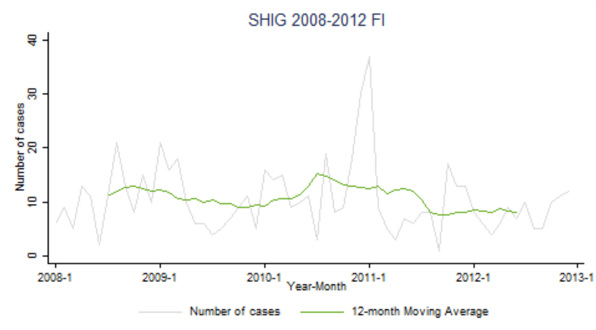

SHIG 2008-2012 CZ
Number of cases
0
50
100
150
200
2008-1
2009-1
2010-1
2011-1
2012-1
2013-1
Year-Month
Number of cases
12-month Moving Average

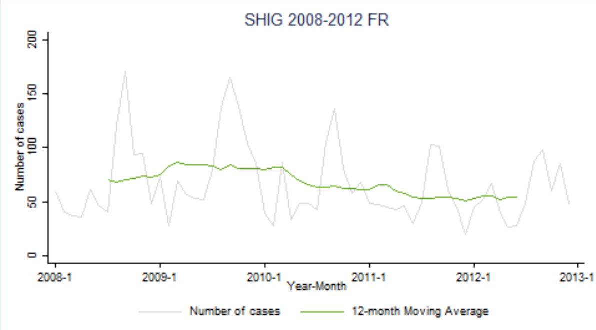

SHIG 2008-2012 DE
Number of cases
0
50
100
150
2008-1
2009-1
2010-1
2011-1
2012-1
2013-1
Year-Month
Number of cases
12-month Moving Average

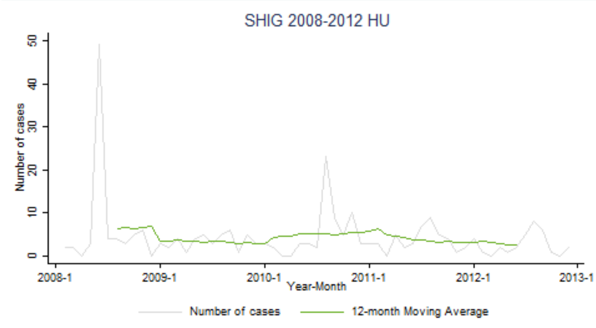

SHIG 2008-2012 DK
Number of cases
0
5
10
15
20
2008-1
2009-1
2010-1
2011-1
2012-1
2013-1
Year-Month
Number of cases
12-month Moving Average

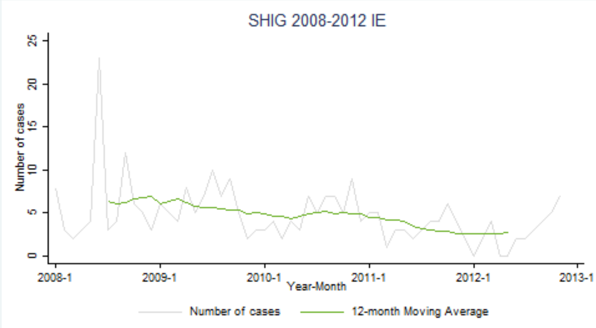

SHIG 2008-2012 EE
Number of cases
0
5
10
15
2008-1
2009-1
2010-1
2011-1
2012-1
2013-1
Year-Month
Number of cases
12-month Moving Average

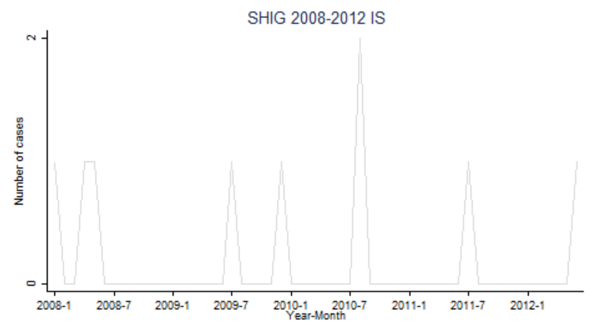

SHIG 2008-2012 ES
Number of cases
0
20
40
60
80
100
2008-1
2009-1
2010-1
2011-1
2012-1
2013-1
Year-Month
Number of cases
12-month Moving Average

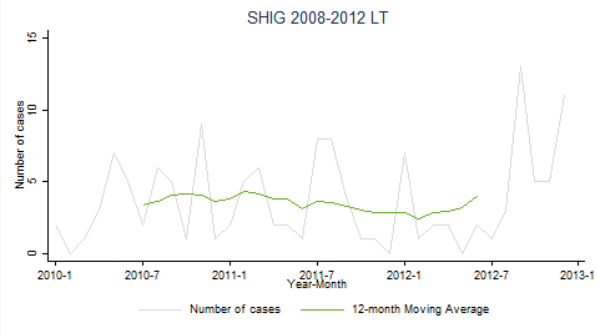

SHIG 2008-2012 FI
Number of cases
0
10
20
30
40
2008-1
2009-1
2010-1
2011-1
2012-1
2013-1
Year-Month
Number of cases
12-month Moving Average

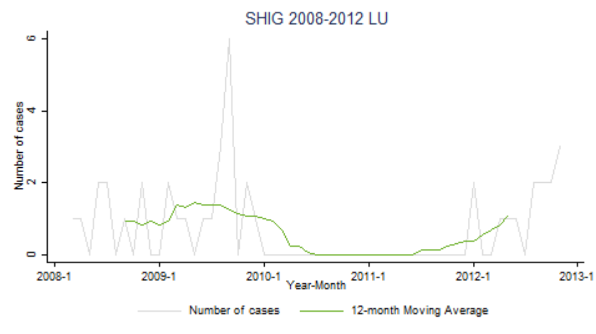

SHIG 2008-2012 FR
Number of cases
0
50
100
150
200
2008-1
2009-1
2010-1
2011-1
2012-1
2013-1
Year-Month
Number of cases
12-month Moving Average

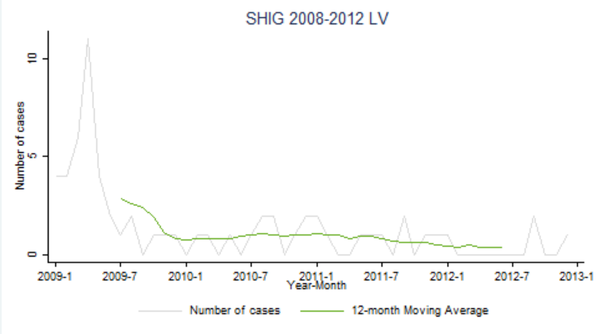

SHIG 2008-2012 HU
Number of cases
0
10
20
30
40
50
2008-1
2009-1
2010-1
2011-1
2012-1
2013-1
Year-Month
Number of cases
12-month Moving Average

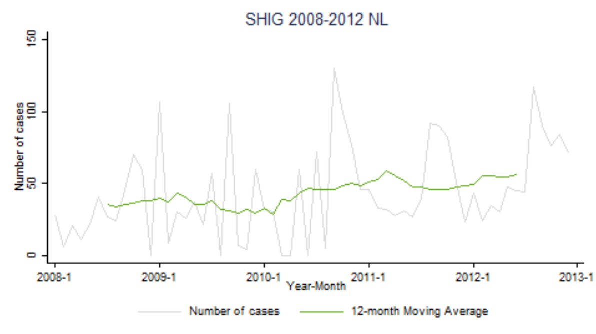

SHIG 2008-2012 IE
Number of cases
0
5
10
15
20
25
2008-1
2009-1
2010-1
2011-1
2012-1
2013-1
Year-Month
Number of cases
12-month Moving Average

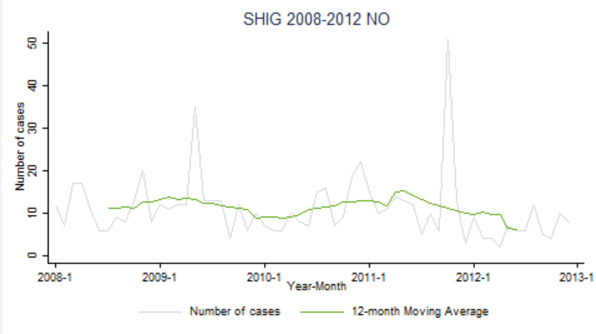

SHIG 2008-2012 IS
Number of cases
0
2
2008-1 2008-7 2009-1 2009-7 2010-1 2010-7 2011-1 2011-7 2012-1
Year-Month

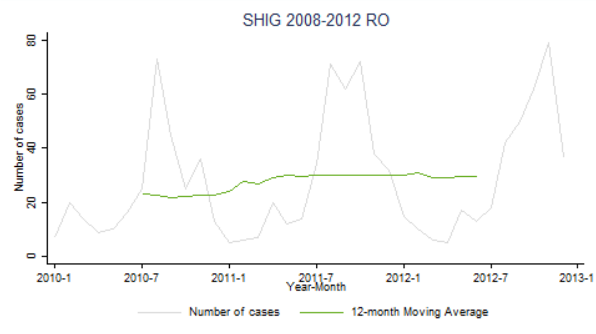

SHIG 2008-2012 LT
Number of cases
0 5 10 15
2010-1 2010-7 2011-1 2011-7 2012-1 2012-7 2013-1
Year-Month
Number of cases
12-month Moving Average

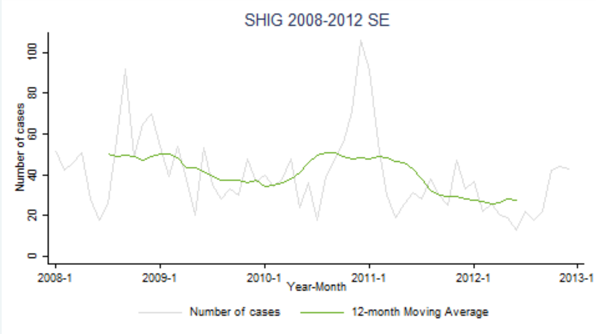

SHIG 2008-2012 LU
Number of cases
0 2 4 6
2008-1 2009-1 2010-1 2011-1 2012-1 2013-1
Year-Month
Number of cases
12-month Moving Average

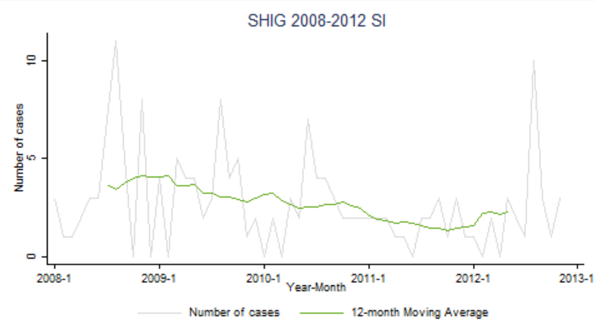

SHIG 2008-2012 LV
Number of cases
0 5 10
2009-1 2009-7 2010-1 2010-7 2011-1 2011-7 2012-1 2012-7 2013-1
Year-Month
Number of cases
12-month Moving Average

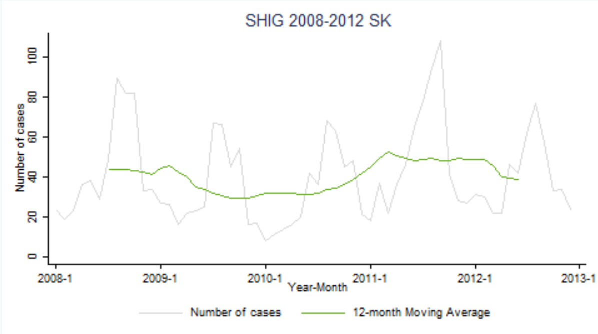

SHIG 2008-2012 NL
Number of cases
0 50 100 150
2008-1 2009-1 2010-1 2011-1 2012-1 2013-1
Year-Month
Number of cases
12-month Moving Average

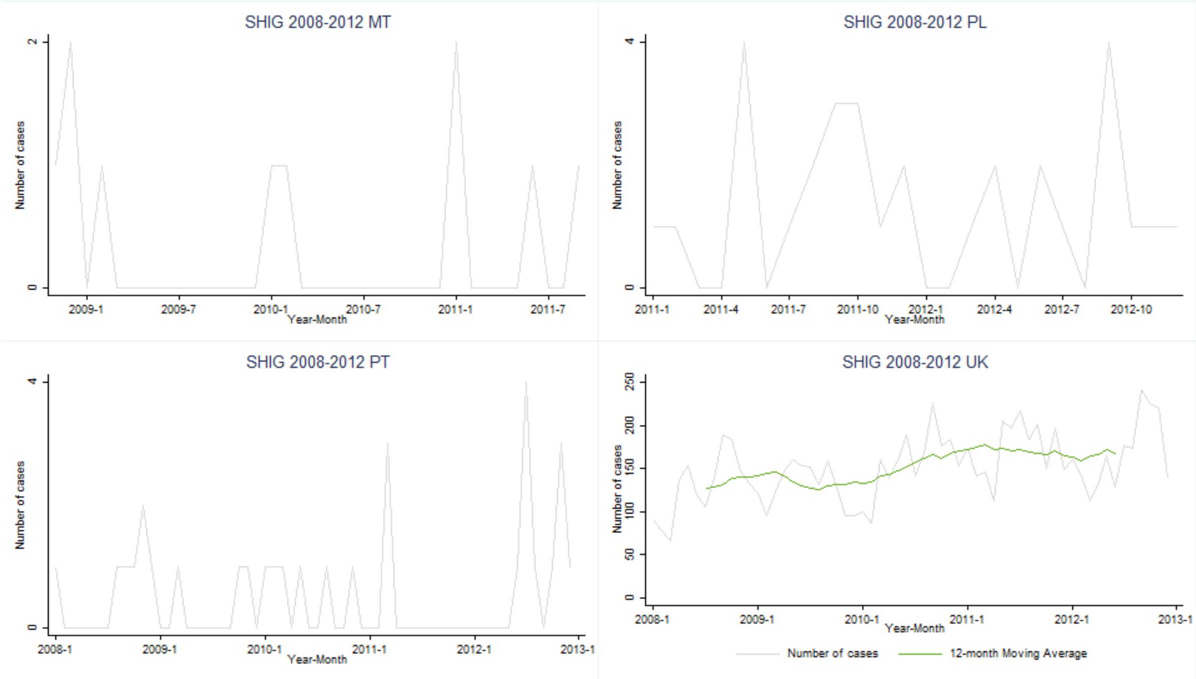

SHIG 2008-2012 NO
Number of cases
0 10 20 30 40 50
2008-1 2009-1 2010-1 2011-1 2012-1 2013-1
Year-Month
Number of cases
12-month Moving Average


SHIG 2008-2012 RO
Number of cases
0 20 40 60 80
2010-1 2010-7 2011-1 2011-7 2012-1 2012-7 2013-1
Year-Month
Number of cases
12-month Moving Average


SHIG 2008-2012 SE
Number of cases
0 20 40 60 80 100
2008-1 2009-1 2010-1 2011-1 2012-1 2013-1
Year-Month
Number of cases
12-month Moving Average


SHIG 2008-2012 SI
Number of cases
0 5 10
2008-1 2009-1 2010-1 2011-1 2012-1 2013-1
Year-Month
Number of cases
12-month Moving Average


SHIG 2008-2012 SK
Number of cases
0 20 40 60 80 100
2008-1 2009-1 2010-1 2011-1 2012-1 2013-1
Year-Month
Number of cases
12-month Moving Average



Country codes: see page xiv

Please note that graphs are on different scales.

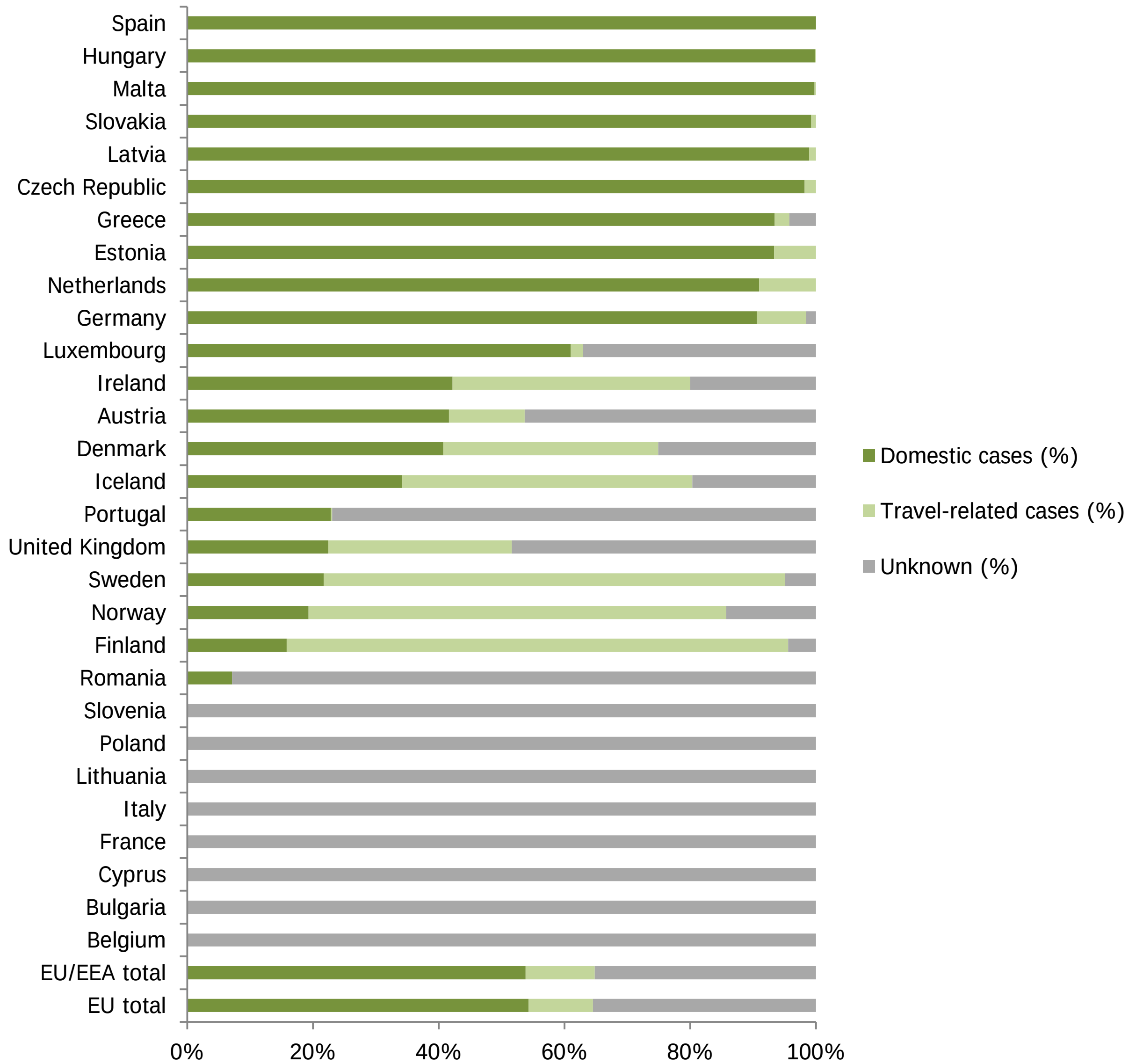
Country-specific trends were not calculated if less than five confirmed cases were reported per month during the period 2008–12.

Origin of the infection

During the three-year surveillance period from 2010 to 2012, 24 EU/EEA countries reported annual data on the origin of infection (domestic/travel related) for 10 363 confirmed shigellosis cases (47%, pooled data). Five countries reported information only for a part of the surveillance period (Figure 4.4; Annex D: Table D4.1).

The proportion of domestic versus travel-associated cases varied markedly between countries (Figure 4.4; Annex D: Table D4.1). Of the countries that reported information on origin of infection for more than 25 cases, the highest proportion of domestic cases was reported by Greece and Hungary (> 90% domestic cases), whereas Finland and Sweden reported the highest proportions of travel-associated infections (> 85% travel-related cases) (Figure 4.4; Annex D: Table D4.1).

Figure 4.4. Proportion of confirmed shigellosis cases by origin of infection (domestic/travel-related) as reported by EU/EEA countries, 2010–2012 (N=21 969)



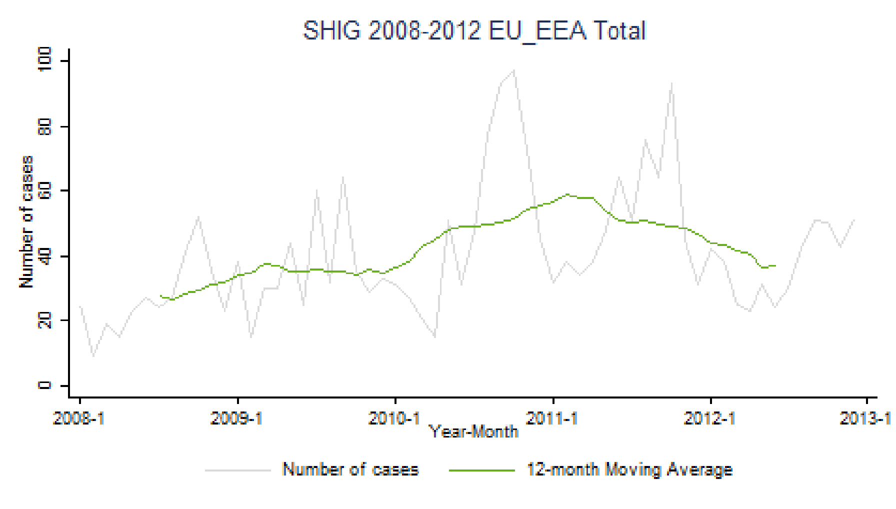
Domestic cases

Of the cases for which information on the origin was available (47%; n=10 363, cumulative data 2010–2012), about one-third (36%; 3 744 cases) of *Shigella* infections reported at the EU/EEA level in 2010–2012 were domestically acquired (Figure 4.4; Annex D: Table D4.1). The number of confirmed domestic cases increased by 35% in 2012 compared with 2010 (from 1 091 to 1 452 cases), mainly due to one country (Slovakia) starting to report domestic cases in 2012 (Annex D: Table D4.2).

Of the EU/EEA countries that provided information on the origin of infection, ten countries (Cyprus, Estonia, Finland, Germany, Hungary, Malta, the Netherlands, Slovenia, Iceland and Norway) reported data on domestic cases for every year of the 2008–2012 surveillance period and were therefore included in the trend analyses. During the five-year period, a significant increasing trend of domestic shigellosis cases was observed among these countries (Figure 4.5; Annex D: Table D4.2).

Between 2008 and 2012, country-specific trends in reported domestic shigellosis cases increased significantly in Germany and in the Netherlands (p-value < 0.01) but remained stable in the other countries.

Figure 4.5. Trend and number of confirmed domestic shigellosis cases in EU/EEA countries, 2008–2012 (N=2 441)



Source: Cyprus, Estonia, Finland, Germany, Hungary, Malta, the Netherlands, Slovenia; EEA countries: Iceland and Norway

Travel-related cases

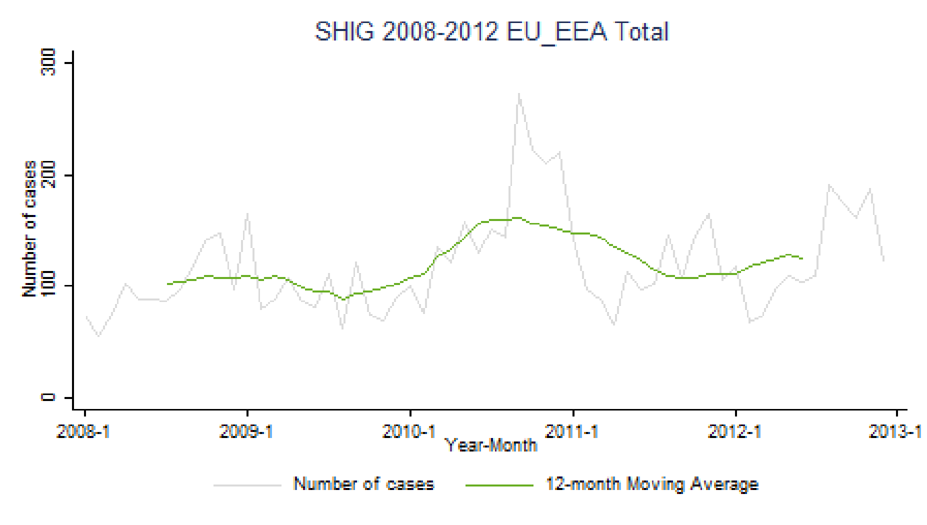
During 2010–2012, 6 625 travel-related shigellosis cases were reported by 22 EU/EEA countries, representing about 64% of all shigellosis cases with information on origin of infection (n=10 363, cumulative data 2010–2012) (Figure 4.4; Annex D: Table D4.1).

Among EU/EEA countries that provided information on importation, eleven countries (Cyprus, Denmark, Estonia, Finland, Germany, Hungary, Malta, the Netherlands, the United Kingdom, Iceland and Norway) reported data on travel-related cases for every year in 2008–2012 and were therefore included in the trend analysis. Overall, at the EU/EEA level, a slightly increasing trend was observed from 2008 to 2012 (Figure 4.6).

Over the five-year period (2008–2012), the trend in confirmed travel-related shigellosis infections decreased in Estonia and Norway (p-value < 0.01), whereas a significant increasing trend was observed in the Netherlands and in the United Kingdom (p-value < 0.01). The number of reported cases peaked in 2010. This was due to an increase of travel-related cases mainly in one country: the United Kingdom (Annex D: Table D4.3).

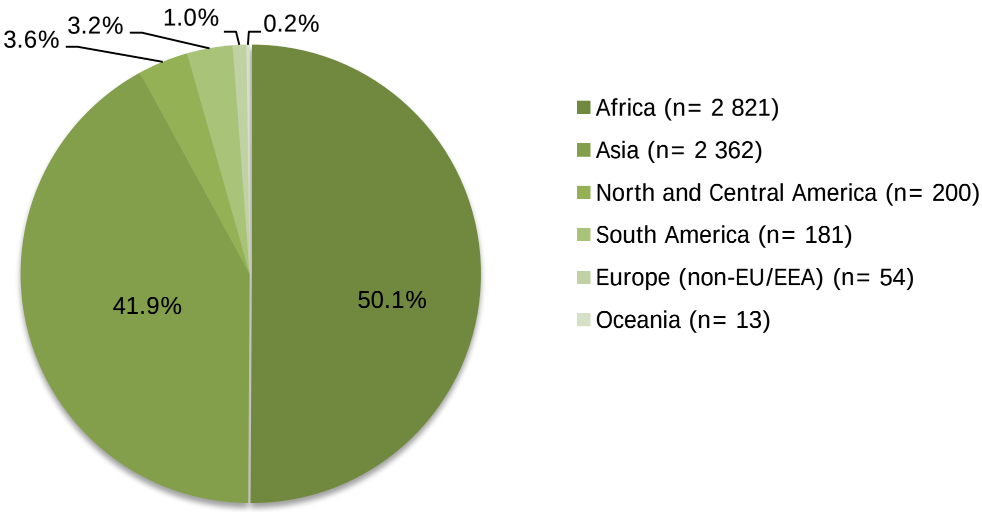
For the 6 625 travel-related infections reported for 2010–2012, data on suspected country of infection were available for 89% of confirmed shigellosis cases (n=5 904). The vast majority of travel-related infections were acquired in non-EU countries (95%), mainly in Africa (N=2 821) and Asia (N=2 362) (Figure 4.7). Overall, the most frequently reported countries of infection in travel-related shigellosis cases were Egypt, India and Morocco (Figure 4.8).

Figure 4.6. Trend and number of confirmed travel-related shigellosis cases in EU/EEA countries, 2008–2012 (N=7 145)



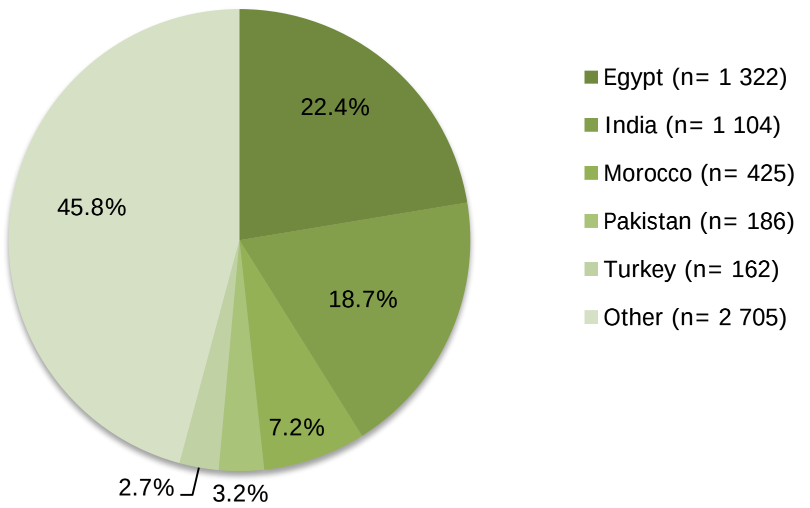
Source: Cyprus, Denmark, Estonia, Finland, Germany, Hungary, Malta, the Netherlands, United Kingdom; EEA countries: Iceland and Norway

Figure 4.7. Origin of travel-related shigellosis infections acquired in non-EU/EEA countries by geographical regions, EU/EEA countries, 2010–2012



Source: Austria, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Slovakia, Slovenia, Sweden, United Kingdom; EEA countries: Iceland and Norway

Figure 4.8. The five most frequently reported countries of infection in confirmed travel-related shigellosis cases as reported by EU/EEA countries, 2010–2012



Source: Austria, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Slovakia, Slovenia, Sweden, United Kingdom; EEA countries: Iceland and Norway

Age and sex

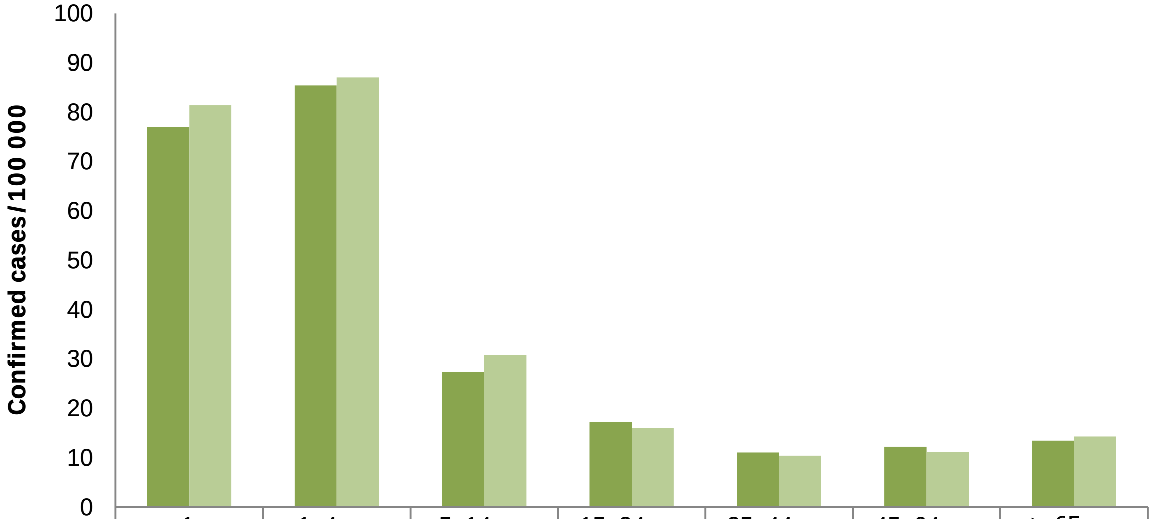
During 2010–2012, data on age and sex were reported for 88% of confirmed shigellosis cases by 28 EU/EEA countries. The highest burden in terms of number of reported cases was noted in the age group 25–44 years (n=6 818) that accounted for about 35% of all reported cases (Annex D: Table D4.4).

Children younger than five years showed the highest notification rate of shigellosis for both sexes (> 3.0 cases per 100 000) (Figure 4.9; Annex D: Table D4.4). In cases between 5 and 64 year of age notification rates ranged between 1.1 and 2.0 cases per 100 000 population, whereas in cases aged 65 years or older rates dropped to less than 1 cases per 100 000 population (Figure 4.9; Annex D: Table D4.4).

Some differences were observed in notification rates between sexes (Figure 4.9; Annex D: Table D4.4). In 2010–2012, the overall male-to-female ratio was 1.05:1 whereas a female predominance was observed in the age group 15-24 years (0.7:1). The sex ratio was slightly higher for males in older than 24 years, especially in the age group 25-44 years (1.2:1) (Figure 4.9; Annex D: Table D4.4).

Three-year trends in notification rates were analysed separately for each age group and by sex (Figure 4.10; Annex D: Table D4.4). During 2010–2012, notification rates significantly decreased in aged between 25 and 44 years of both sexes and in males aged 5 to 14 years (p-value < 0.05) (Figure 4.10; Annex D: Table D4.4).

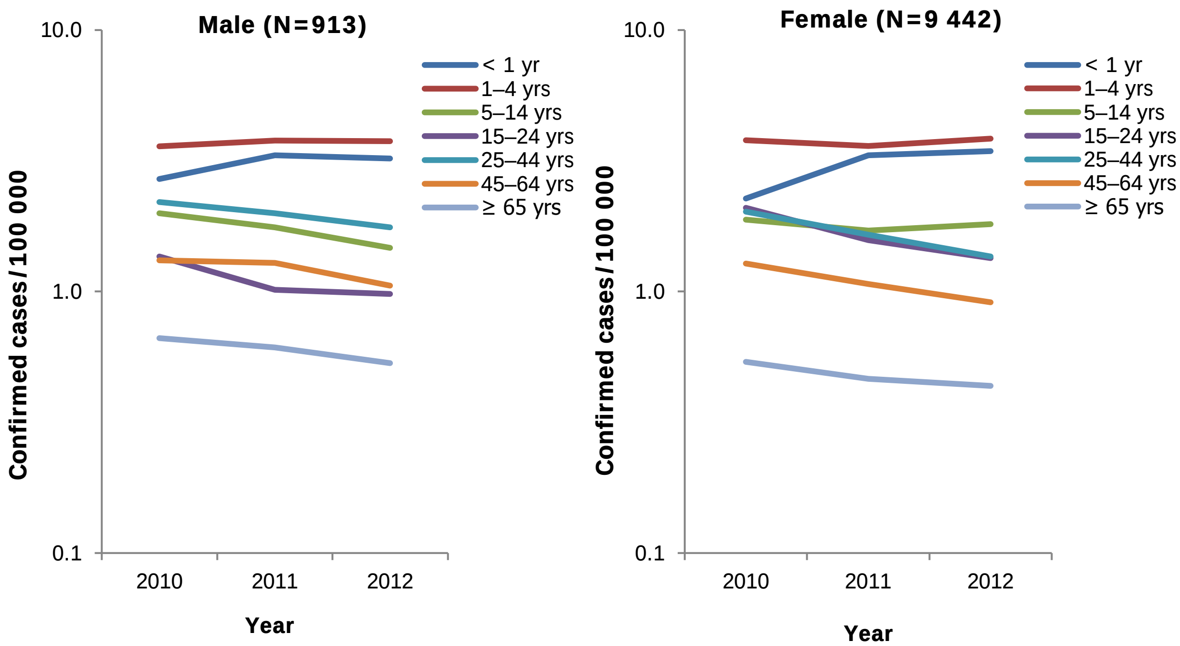
Figure 4.9. Notification rates of confirmed shigellosis cases by age group and sex in EU/EEA countries, 2010–2012 (N=19 355)



	< 1 yr	1–4 yrs	5–14 yrs	15–24 yrs	25–44 yrs	45–64 yrs	≥ 65 yrs
Females	76.9	85.4	27.4	17.2	11.0	12.2	13.5
Males	81.4	87.0	30.8	16.0	10.4	11.1	14.3

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Figure 4.10. Semi-logarithmic graph showing trends in notification rates of confirmed shigellosis cases by age groups and sex in EU/EEA countries, 2010–2012



Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Shigella species

In the three-year surveillance period from 2010 to 2012, 26 EU/EEA countries reported information on *Shigella* species for 16 261 confirmed cases (74% of total reported in 2010–2012), of which71% were reported with complete speciation and 3% were reported as '*Shigella* species unspecified' (Table 4.4).

Of all cases with known species data, *Shigella sonnei* and *Shigella flexneri* were the two most commonly reported species, accounting for 56% and 33% of cases, respectively (Table 4.4). The proportion of non-speciated *Shigella* cases ranged between 3.3% and 5.4% (Table 4.4).

Table 4.4. *Shigella* species in confirmed shigellosis cases, EU/EEA countries, 2010–2012

Species	2010		2011		2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
S. sonnei	3 246	56.8	2 802	57.7	3 046	53.5
S. flexneri	1 845	32.3	1 454	29.9	2 042	35.9
S. boydii	272	4.8	222	4.6	227	4.0
S. dysenteriae	161	2.8	120	2.5	132	2.3
Shigella spp.	187	3.3	260	5.4	245	4.3
Total known	**5 711**	**100**	**4 858**	**100**	**5 692**	**100**
Unknown/missing	1 601	21.9	2 463	33.6	1 644	22.4
Total	**7 312**		**7 321**		**7 336**	

Source: Austria, Belgium, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Sweden, United Kingdom; EEA countries: Iceland and Norway

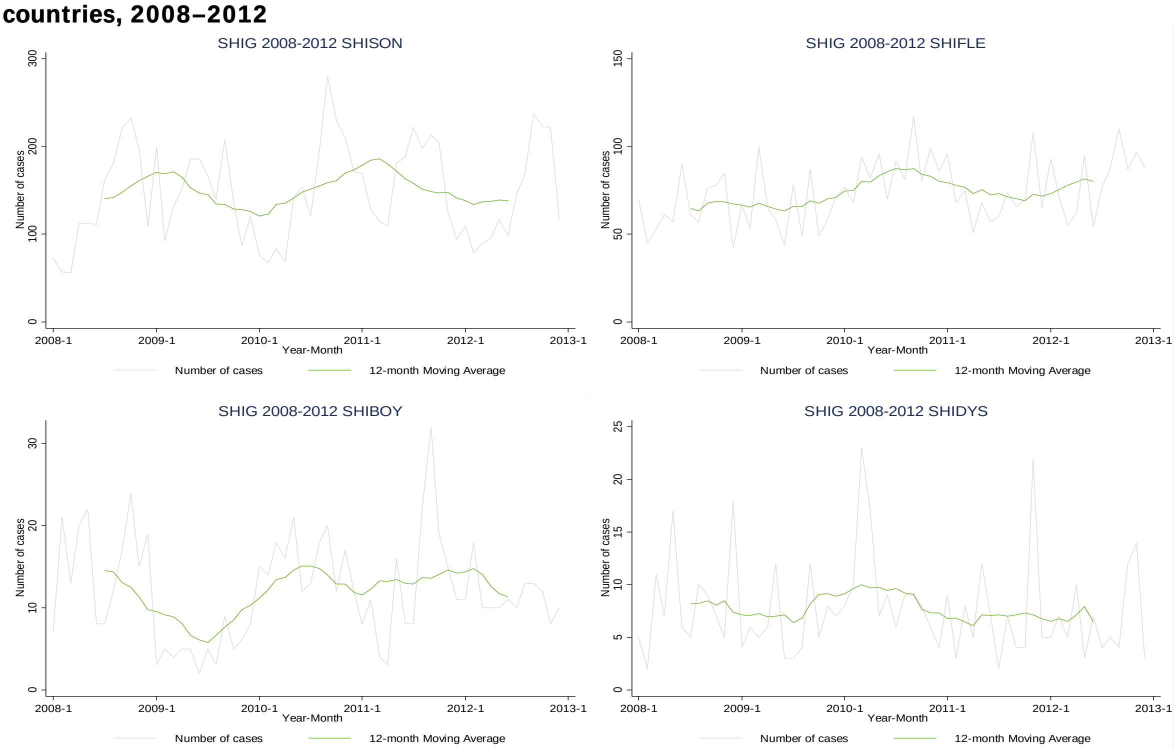
Trends by species and origin of infection

Trends in number of confirmed cases by *Shigella* species were calculated from 2008 to 2012, overall and by origin of infection.

Eleven EU/EEA countries provided data on species for every year in 2008–2012 (Austria, Belgium, Cyprus, Estonia, Finland, Hungary, Malta, the Netherlands, the United Kingdom, Iceland and Norway) and were included in the trend analysis. The level of completeness for this information was 87%. Reporting of *S. sonnei, S. boydii* and *S. dysenteriae* remained stable over the five-year period, whereas a significant increase was observed for *S. flexneri* (p-value < 0.01) (Figure 4.11).

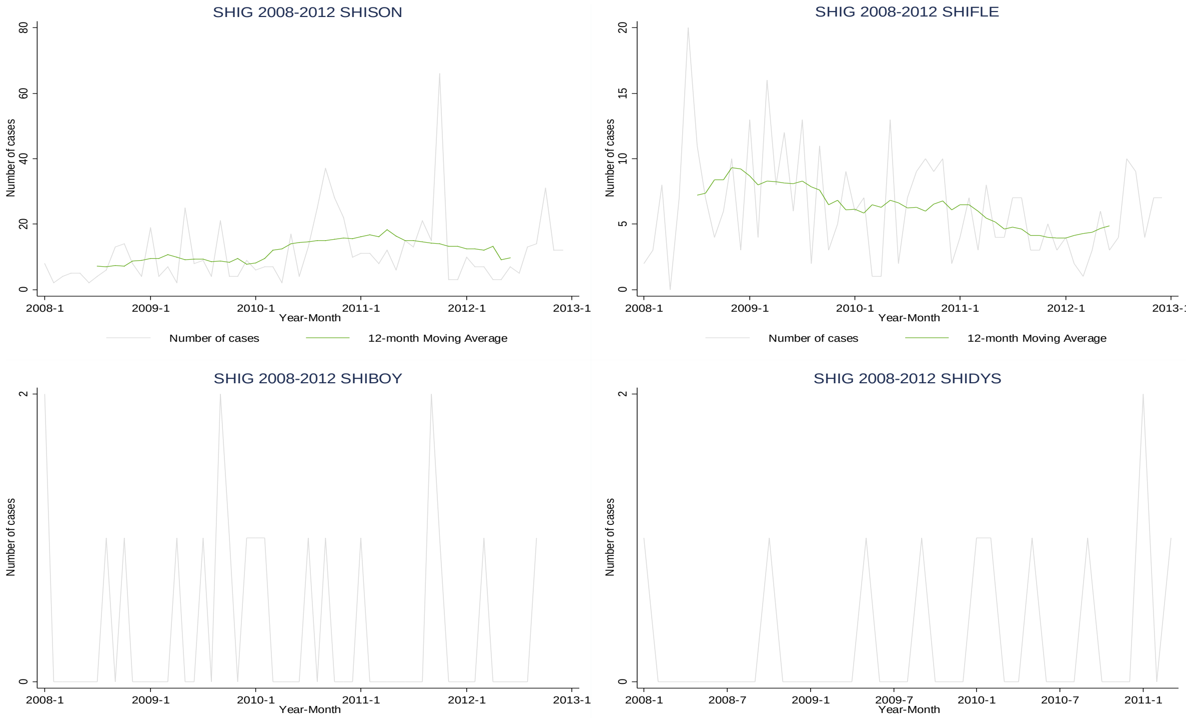
Only seven countries (Cyprus, Estonia, Finland, Hungary, Malta, the Netherlands and Norway) reported information on *Shigella* species and origin of infection for every year between 2008 and 2012; data completeness was 82%. *S. sonnei* was the most commonly reported species among both domestic and travel-related cases, and *S. flexneri* was the second most common. Among both domestic and travel-related shigellosis cases, the number of isolates reported remained stable for all *Shigella* species over the five-year period (99% significant level) (Figure 4.12 and Figure 4.13).

Figure 4.11. Trend in number of confirmed shigellosis cases by *Shigella* species (N=14 507), *S. sonnei* (N=8 882), *S. flexneri* (N=4 438), *S. boydii* (N=727) and *S. dysenteriae* (N=460), EU/EEA countries, 2008–2012



Source: Austria, Belgium, Cyprus, Estonia, Finland, Hungary, Malta, the Netherlands, United Kingdom; EEA countries: Iceland and Norway

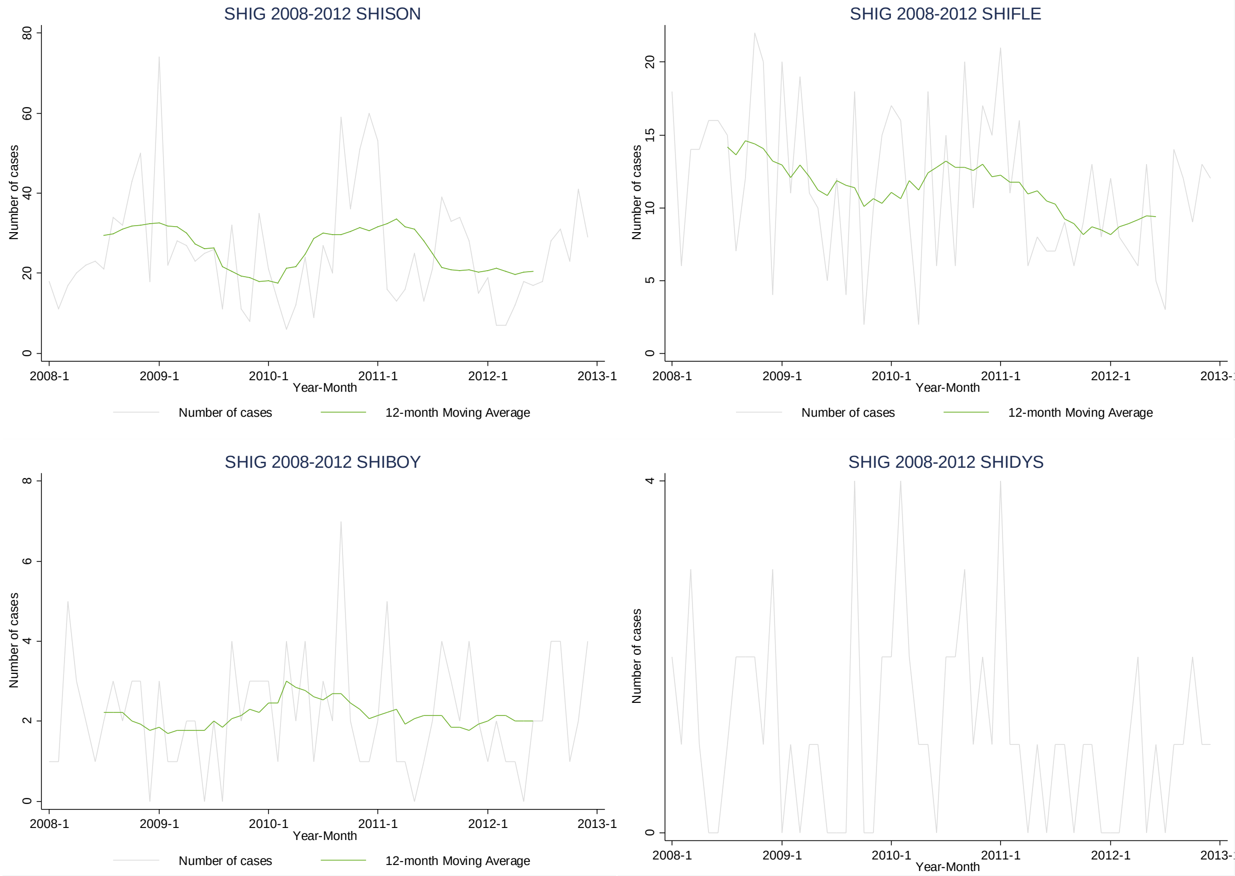
Figure 4.12. Trend in number of domestic shigellosis cases by *Shigella* species (N=1 086), *S. sonnei* (N=677), *S. flexneri* (N=378), *S. boydii* (N=20) and *S. dysenteriae* (N=11), EU/EEA countries, 2008–2012



Source: Cyprus, Estonia, Finland, Hungary, Malta and the Netherlands; EEA country: Norway

Country-specific trends were not calculated if less than five confirmed cases were reported per month during the period 2008–12.

Figure 4.13. Trend in number of travel-related shigellosis cases by *Shigella* species (N=2 412), *S. sonnei* (N=1 525), *S. flexneri* (N=687), *S. boydii* (N=131) and *S. dysenteriae* (N=69), EU/EEA countries, 2008–2012



Source: Cyprus, Estonia, Finland, Hungary, Malta, the Netherlands, United Kingdom; EEA country: Norway

Country-specific trends were not calculated if less than five confirmed cases were reported per month during the period 2008–12.

Species by age groups

During 2010–2012, data on species and age were provided by 26 EU/EEA countries for 16 067 confirmed shigellosis cases. The four reported *Shigella* species were spread across all age groups (Table 4.5; Annex D: Table D4.5), but significant differences in their age distribution were observed.

S. sonnei cases showed a significantly different age distribution compared to *S. flexneri* cases, with the exception of the 5–24-year age group. *Shigella sonnei* was more frequently isolated in adults aged between 25 and 64 years, whereas *S. flexneri* presented a higher proportion of infections among children under five years of age (Table 4.5; Annex D: Table D4.5). *S. boydii* was mainly isolated from cases over the age of 15 years, especially in people between 15 to 24 years of age and in cases older than 65 years of age (Table 4.5; Annex D: Table D4.5). *S. dysenteriae* was mostly isolated in people younger than 15 years of age (Table 4.5; Annex D: Table D4.5).

Table 4.5. Age distribution of confirmed *Shigella* cases by species (N=16 067), EU/EEA countries, 2010–2012

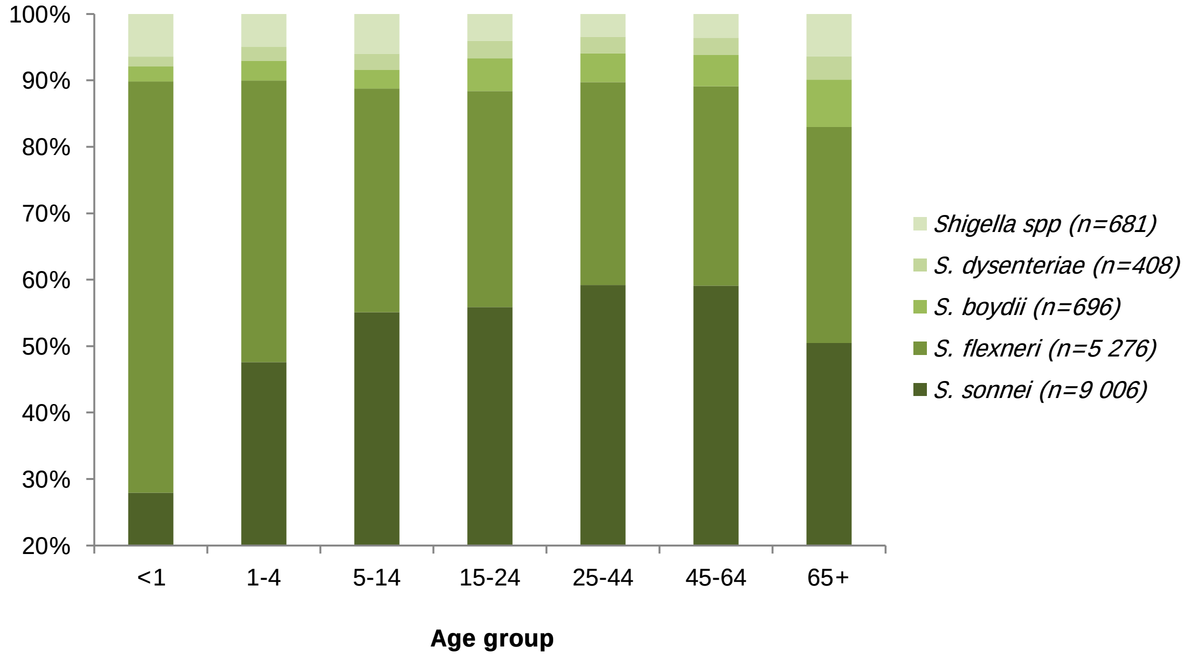
Age groups	*S. sonnei*		*S. flexneri*		*S. boydii*		*S. dysenteriae*		*Shigella* spp.	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
<1 yr	74	0.8	164	3.1	6	0.9	4	1.0	17	2.5
1–4 yrs	765	8.5	681	12.9	48	6.9	34	8.3	79	11.6
5–14 yrs	1 029	11.4	628	11.9	53	7.6	45	11.0	112	16.4
15–24 yrs	1 037	11.5	603	11.4	92	13.2	49	12.0	75	11.0
25–44 yrs	3 477	38.6	1 793	34.0	253	36.4	148	36.3	202	29.7

Age groups	*S. sonnei*		*S. flexneri*		*S. boydii*		*S. dysenteriae*		*Shigella* spp.	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
45–64 yrs	2 078	23.1	1 055	20.0	167	24.0	90	22.1	127	18.6
≥ 65 yrs	546	6.1	352	6.7	77	11.1	38	9.3	69	10.1
Total	**9 006**	**100**	**5 276**	**100**	**696**	**100**	**408**	**100**	**681**	**100**

Source: Austria, Belgium, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Sweden, United Kingdom; EEA countries: Iceland and Norway

The relative distribution of reported *Shigella* species by age groups showed that the proportion of infection due to *S. flexneri* was highest in children younger than one year of age and decreased with the increase of age, in contrast to *S. sonnei*, which showed gradually increasing relative proportions with increasing age up to 65 years (Figure 4.14; Annex D: Table D4.5). *S. boydii* and *S. dysenteriae* were slightly more frequently reported in cases over the age of 15 years (Figure 4.14; Annex D: Table D4.5). The relative proportion of *Shigella spp.* was evenly distributed in all age groups (Figure 4.14; Annex D: Table D4.5).

Figure 4.14. Relative distribution of the reported *Shigella* species by age groups, EU/EEA countries, 2010–2012



Source: Austria, Belgium, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Sweden, United Kingdom; EEA countries: Iceland and Norway

Seasonality by species and origin of infection

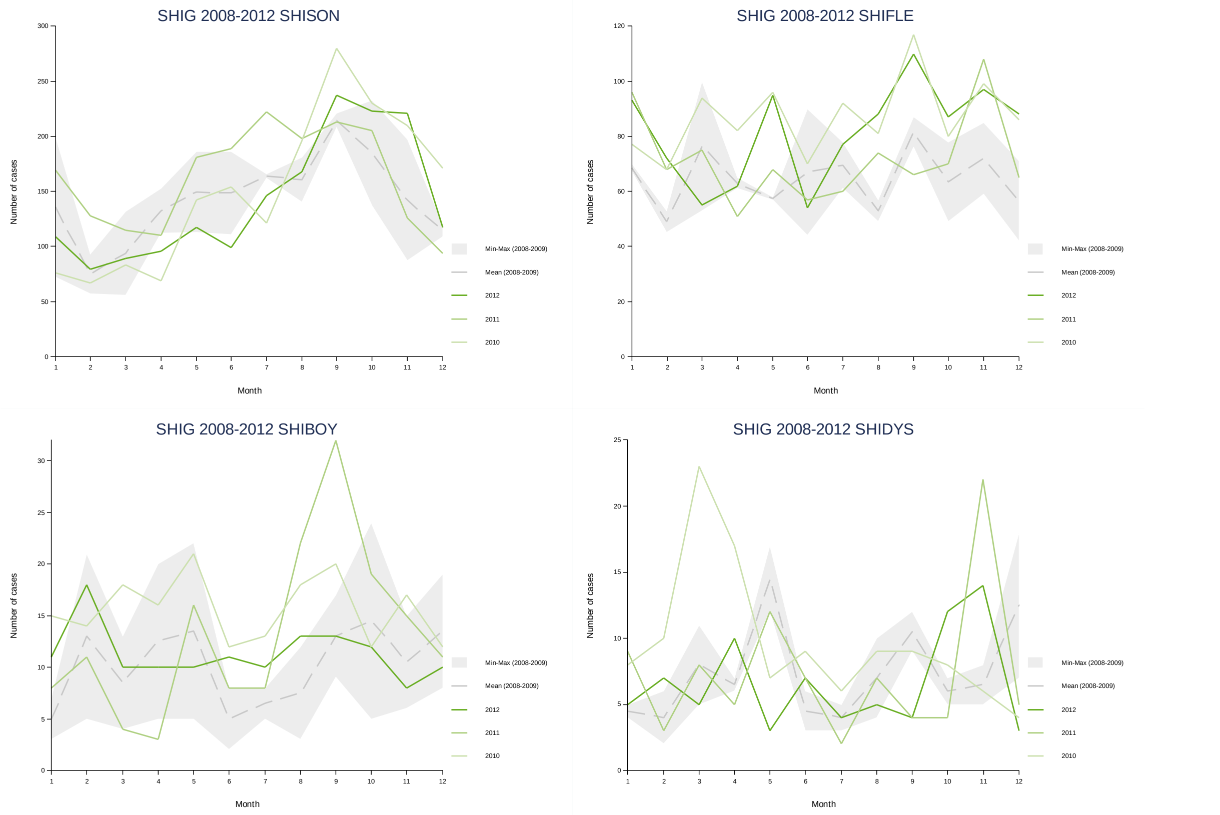
Seasonality was analysed for all reported *Shigella* cases by species (*S. flexneri*, *S. sonnei*, *S. boydii* and *S. dysenteriae*) and further stratified by origin of infection.

In 2010–2012, *Shigella sonnei* infections showed seasonality. The number of cases started to increase steadily in March and peaked in September, a second smaller peak of cases was reported in January (Figure 4.15). Marked differences in seasonality were detected between domestically acquired and travel-related infections. The vast majority of domestic cases of *Shigella sonnei* were reported in September and October, but the winter peak disappeared (Figure 4.16). Travel-related infections of *Shigella sonnei* showed a smaller peak in late summer and a more pronounced winter peak (Figure 4.17). This indicates that the autumn peak is driven by infections acquired within the reporting country while the winter peak is caused by imported infections. *S. flexneri* cases were reported without any evident seasonal pattern (Figure 4.15). A stratified analysis of domestically acquired infections (Figure 4.16) and infections associated with travel (Figure 4.17) did not show any seasonality either.

In 2011 and 2012, *S. dysenteriae* cases peaked in November, with a second smaller increase during spring (April and May), whereas in 2010 the majority of infections occurred in March (Figure 4.15). *S. boydii* did not show any clear seasonality; instead, an exceptional rise in cases was reported in September 2011 (Figure 4.15).

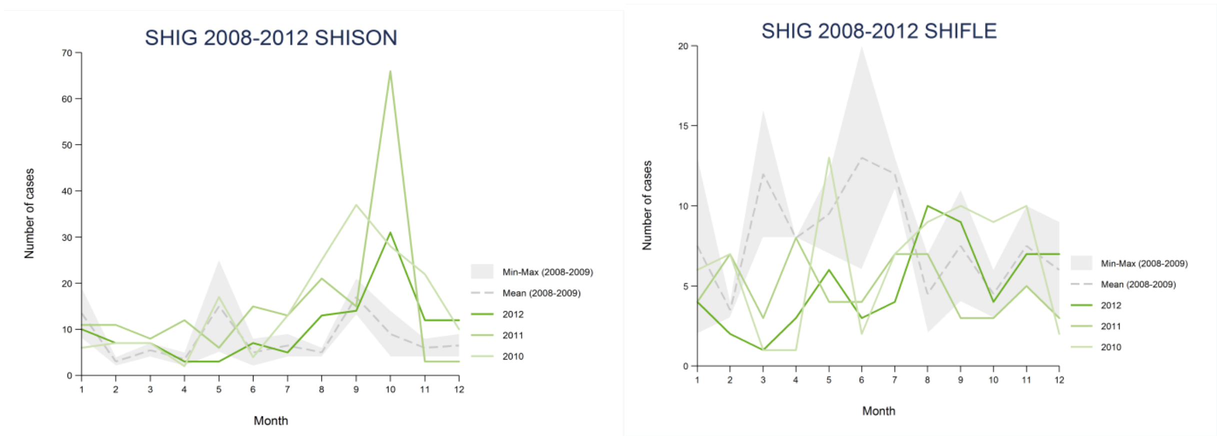
During 2010–2012, only very few cases were reported for *S. dysenteriae* and *S. boydii.* Information on origin of infection was insufficient to properly evaluate the seasonal distribution (Figure 4.16; Figure 4.17).

Figure 4.15. Monthly distribution of confirmed shigellosis cases by *Shigella* species (N=14 507), *S. sonnei* (N=8 882), *S. flexneri* (N=4 438), *S. boydii* (N=727) and *S. dysenteriae* (N=460), EU/EEA countries, 2008–2012



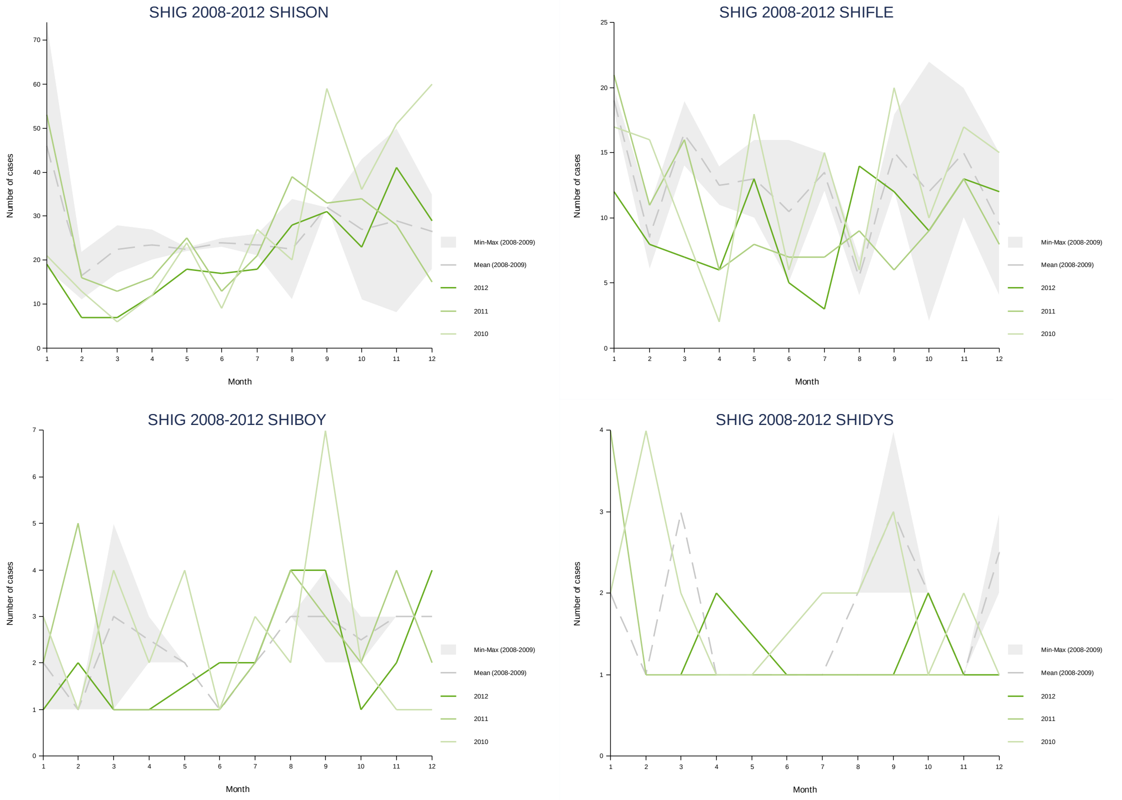
Source: Austria, Belgium, Cyprus, Estonia, Finland, Hungary, Malta, the Netherlands, United Kingdom; EEA countries: Iceland and Norway

Figure 4.16. Monthly distribution of confirmed domestic shigellosis cases by *Shigella* species (N=1 086), *S. sonnei* (N=677) and *S. flexneri* (N=378), EU/EEA countries, 2008–2012



Source: Cyprus, Estonia, Finland, Hungary, Malta and the Netherlands; EEA country: Norway

Figure 4.17. Monthly distribution of confirmed travel-related shigellosis cases by *Shigella* species (N=2 412), *S. sonnei* (N=1 525), *S. flexneri* (N=687), *S. boydii* (N=131) and *S. dysenteriae* (N=69), EU/EEA countries, 2008–2012



Source: Cyprus, Estonia, Finland, Hungary, Malta and the Netherlands; EEA country: Norway

Seasonality by species and age group

Seasonality by age group was analysed for the two most commonly reported species, *S. sonnei* and *S. flexneri* and it is shown in figures 4.18 and 4.19, respectively.

A clear seasonal pattern was observed during the summers of 2010–2012 for cases of *S. sonnei* aged in the 1–24-year age group. The number of cases started to increase in May, peaking sharply between September and October (Figure 4.18). Cases between 25 and 64 years of age did not present any clear seasonal pattern, and cases of 65 years or older were reported with irregular peaks throughout the year (Figure 4.18). Cases reported for *S. sonnei* in infants below one year of age were too few to properly evaluate the seasonal distribution (Figure 4.18).

The seasonal distribution of *S. flexneri* infections in children between one and four years of age, in the 25–44-year age groups, and people over the age of 64 did not show a clear pattern during 2010–2012 (Figure 4.19). Cases between 5 and 24 years of aged showed two peaks, one between August and September and a smaller one in January (Figure 4.19). It was not possible to properly evaluate the seasonal distribution for *S. flexneri* among infants younger than one year because the number of cases was too small. (Figure 4.19).

Figure 4.18. Distribution of confirmed *Shigella sonnei* (N=8 764) cases by month and age group, EU/EEA countries, 2008–2012

Source: Austria, Belgium, Estonia, Finland, Hungary, Malta, the Netherlands, United Kingdom; EEA countries: Iceland and Norway

Figure 4.19. Distribution of confirmed *Shigella flexneri* (N=4 339) cases by month and age group, EU/EEA countries, 2008–2012

Source: Austria, Belgium, Cyprus, Estonia, Finland, Hungary, Malta, the Netherlands, United Kingdom; EEA countries: Iceland and Norway

Shigella flexneri serotypes

S. flexneri is further divided into different serotypes based on the structure of the somatic 'O' antigen. During 2010–2012, 12 EU/EEA countries provided data on serological characterisation for 3 040 *S. flexneri* isolates (57% of total reported).

The most commonly reported *S. flexneri* serotype in the EU/EEA was 2a, accounting for about 29% of all reported serotypes throughout the three-year period from 2010 to 2012 (Table 4.6). The second most common serotype was 3a, representing about 19% of the known serotypes (Table 4.6). Overall, six serotypes (2a, 3a, 6, 1b, 2b and 2) caused almost 90% of all reported *S. flexneri* infections.

Table 4.6. Distribution of confirmed *Shigella flexneri* cases by serotype, EU/EEA countries, 2010–2012

Serotype	2010		2011		2012		Total 2010–2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
2a	362	29.2	206	29.4	322	29.3	890	29.3
3a	236	19.0	106	15.1	240	21.8	582	19.1
6	185	14.9	104	14.9	182	16.6	471	15.5
1b	170	13.7	91	13.0	157	14.3	418	13.8
2b	67	5.4	47	6.7	48	4.4	162	5.3
2	55	4.4	32	4.6	28	2.5	115	3.8
3b	24	1.9	10	1.4	26	2.4	60	2.0
X	7	0.6	7	1.0	20	1.8	34	1.1
Y	6	0.5	10	1.4	17	1.5	33	1.1
4	35	2.8	25	3.6	14	1.3	74	2.4
4a	13	1.0	12	1.7	11	1.0	36	1.2
1	24	1.9	20	2.9	10	0.9	54	1.8
3	18	1.5	18	2.6	10	0.9	46	1.5
1a	25	2.0	7	1.0	10	0.9	42	1.4
4c	13	1.0	5	0.7	4	0.4	22	0.7
5	1	0.1	0	0.0	0	0.0	1	0.0
Total known	**1 241**	**100**	**700**	**100**	**1 099**	**100**	**3 040**	**100**
Unknown/missing	604	32.7	754	51.9	943	46.2	2 301	43.1
Total reported	**1 845**		**1 454**		**2 042**		**5 341**	

Source: Austria, Belgium, Estonia, Finland (only 2010), France, Greece (only 2012), Hungary, Ireland (only 2012), Lithuania, Sweden, United Kingdom; EEA country: Norway

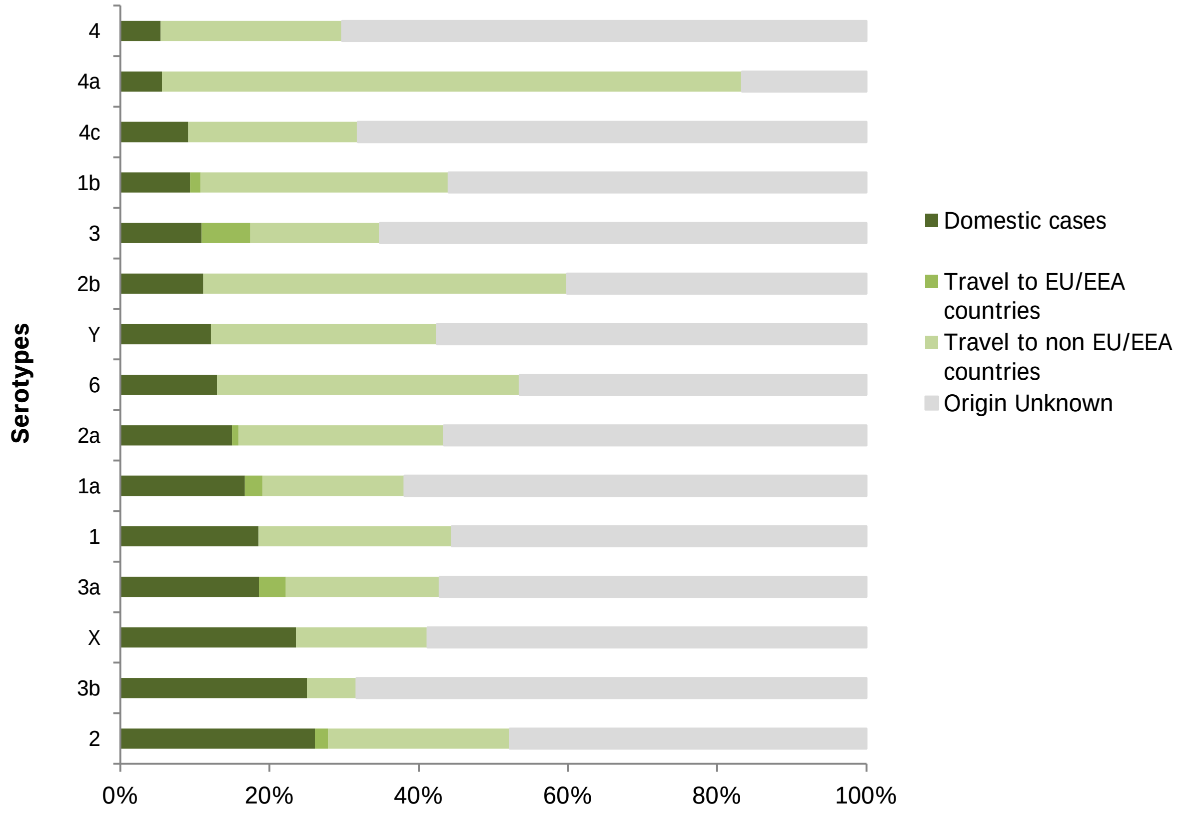
Shigella flexneri serotypes by origin of infection

Information on the origin of infection was reported for 1 391 *S. flexneri* serotypes (46% of total serotypes reported). The level of data completeness by serotype ranged from 30% to 100% (Figure 4.20; Annex D: Table D4.6).

The proportion of domestic cases versus travel-associated infections varied markedly between serotypes (Figure 4.20; Annex D: Table D4.6). Five of the six most commonly reported *S. flexneri* serotypes (2a, 3a, 6, 1b 2b and 2) were more often linked to travel, especially serotypes 6 (41%), 1b (33%) and 2b (49%). However, 15% and 19% of infections due to serotype 2a and 3a were reported among domestic cases, respectively (Figure 4.20; Annex D: Table D4.6). Serotype 2 was isolated in similar proportions from domestic and travel-related cases (Figure 4.20; Annex D: Table D4.6). Serotypes 3b and X were more frequently isolated from domestic cases than from cases associated with travel (Figure 4.20; Annex D: Table D4.6). The reporting of *S. flexneri* serotype X tripled in 2012 as compared with 2010 (Table 4.6).

However, due to the very low number of cases with available information on serotype and origin of infection, results should be interpreted with caution.

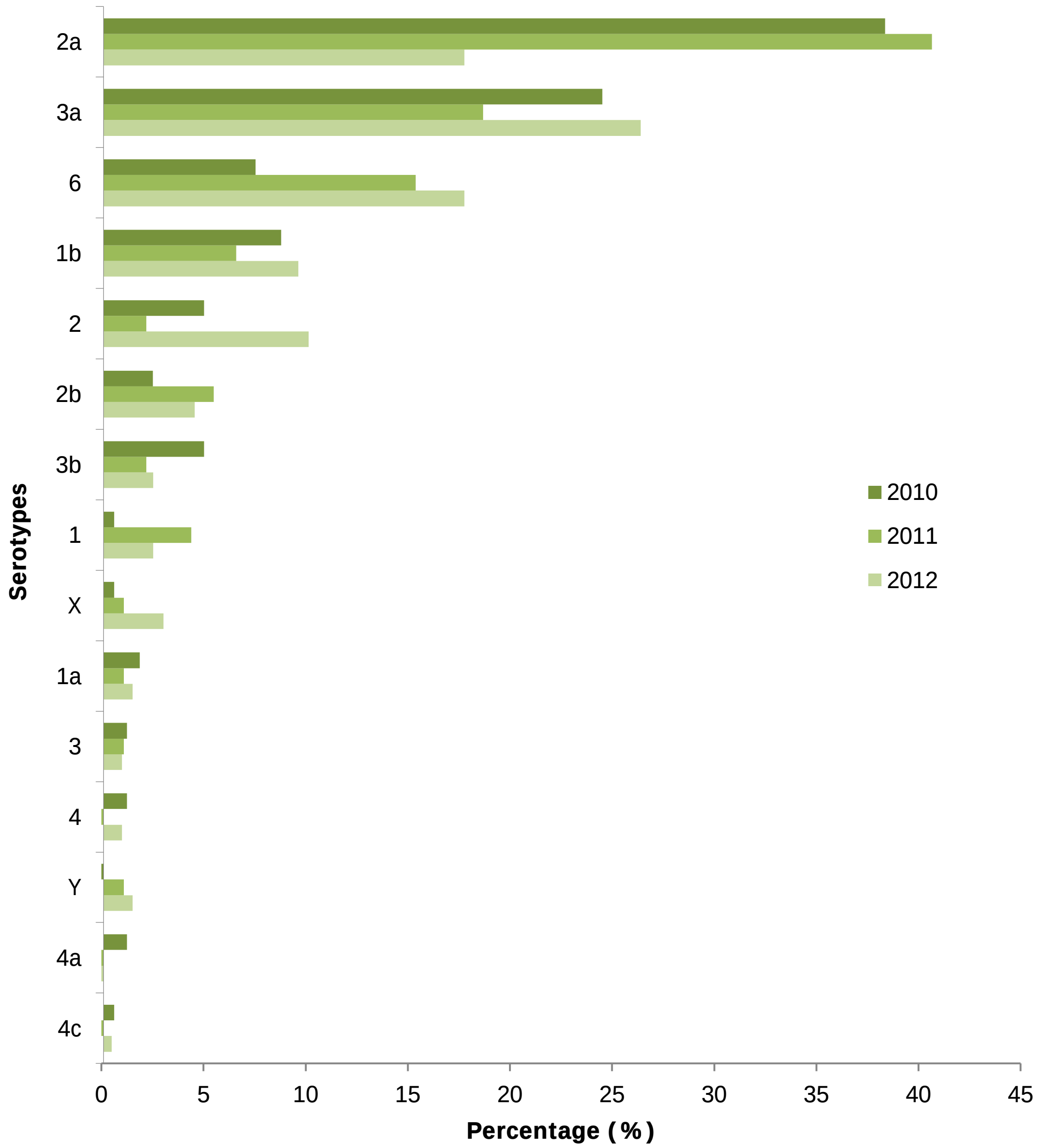
Figure 4.20. **Proportion of *Shigella flexneri* serotypes by origin of infection as reported by EU/EEA countries, 2010–2012 (N=20 477)**



Source: Austria, Belgium, Estonia, Finland (only 2010), France, Greece (only 2012), Hungary, Ireland (only 2012), Lithuania, Sweden, United Kingdom; EEA country: Norway

Among domestic cases, a decrease in the number of infections due to serotype 2a was recorded between 2010 and 2012, whereas serotype 6 constantly increased (Figure 4.21; Annex D: Table D4.7). A steady rise in domestically acquired infections was also found for serotype X, though the number of reported cases was low (Figure 4.21; Annex D: Table D4.7).

Figure 4.21. ***Shigella flexneri*** **serotypes in domestic confirmed cases and their distribution in 2010 (N=159), 2011 (N=91) and 2012 (N=197), EU/EEA countries**

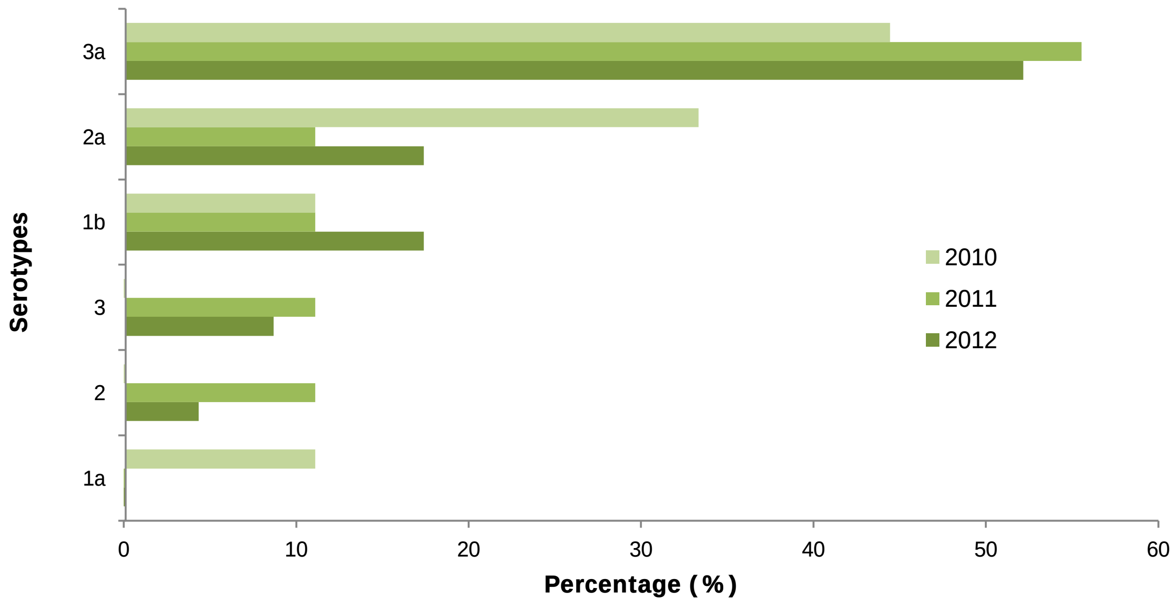


Source: Austria, Belgium, Estonia, Finland (only 2010), France, Greece (only 2012), Hungary, Ireland (only 2012), Lithuania, Sweden, United Kingdom; EEA country: Norway

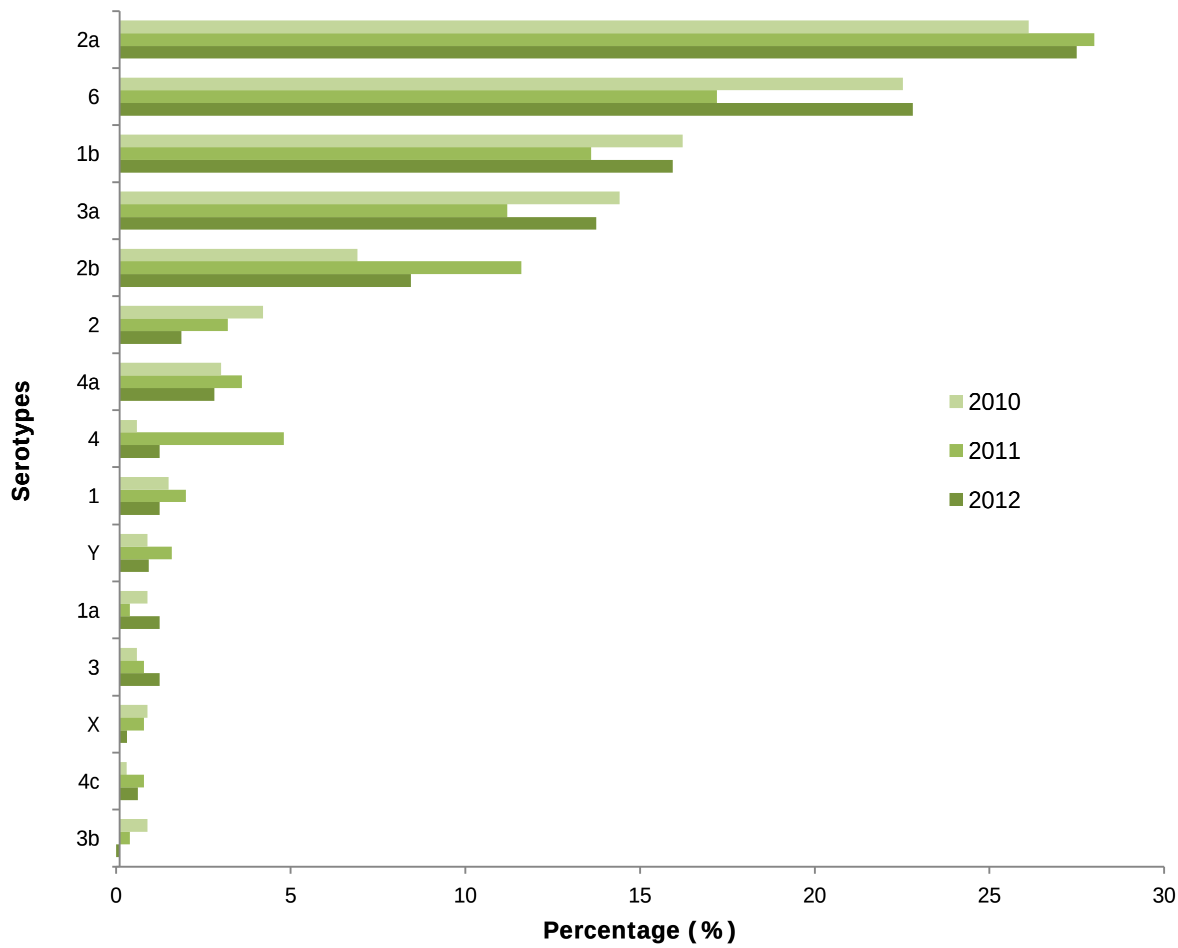
Among travel-related infections acquired in EU/EEA countries, *S. flexneri* serotype 3a was the predominant serotype throughout the three-year period. In 2012, the proportion of reported isolates increased by 17% over 2010 (Figure 4.22a; Annex D: Table D4.8). The number of cases was very low, so results should be interpreted with caution. For each of the other serotypes (1b, 2a, 3, 2, 1a) fewer than 10 cases were reported during the three-year surveillance period 2010–2012 (Annex D: Table D4.8). Among travel-related infections acquired in non-EU/EEA countries, serotypes 2a and 6 dominated over the analysed time period (2010–2012) and their numbers remained quite stable during this period (Figure 4.22b; Annex D: Table D4.8).

Figures 4.22a and b. Shigella flexneri serotypes in travel-related cases and their distribution as reported by EU/EEA countries in 2010–2012

a. Cases travelling to EU/EEA countries in 2010 (N=9), in 2011 (N=9) and in 2012 (N=23)



b. Cases travelling to non-EU/EEA countries in 2010 (N=333), in 2011 (N=250) and in 2012 (N=320)



Source: Austria, Belgium, Estonia, Finland (only 2010), France, Greece (only 2012), Hungary, Ireland (only 2012), Lithuania, Sweden, United Kingdom; EEA country: Norway

Shigella flexneri serotypes by age groups

Data on serotype and age were provided by 12 EU/EEA countries for 3 008 *S. flexneri* isolates (56% of the reported). The age distribution of confirmed *S. flexneri* cases is described for the six most commonly reported serotypes in 2010–2012 (2a, 3a, 6, 1b, 2b and 2).

During 2010–2012, about 60% of infections due to *S. flexneri* serotypes 2a, 6, 1b and 2b occurred in adults over 25 years (Table 4.7; Annex D: Table D4.10). For serotype 3a, the proportion of cases aged 25 years or older rose to 77% (Table 4.7; Annex D: Table D4.10). Half of cases due to serotype 2 was cases were up to 24 years old (Table 4.7; Annex D: Table D4.10). All serotype showed the highest proportions of cases in the age group 25–44 years, with the exception of serotype 2b that peaked in aged 45–64 years (Table 4.7; Annex D: Table D4.10).

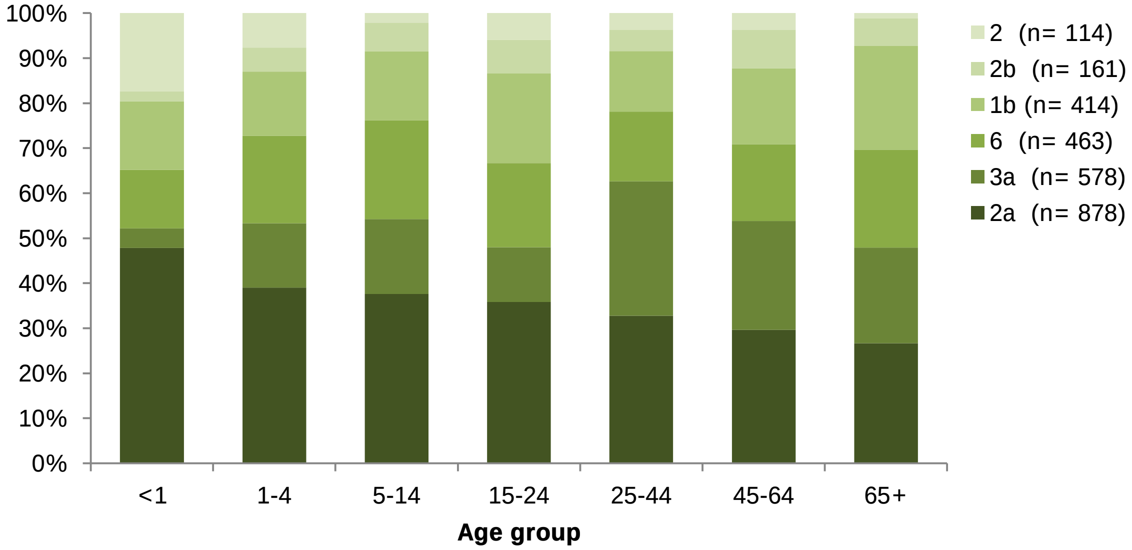
Table 4.7. Age distribution of confirmed *Shigella flexneri* cases by serotypes (N=2 608), EU/EEA countries, 2010–2012

Age groups	2a		3a		6		1b		2b		2	
	Cases	Per-centage (%)	Cases	Per-centage (%)	Cases	Per-centage (%)	Cases	Per-centage (%)	Cases	Per-centage (%)	Cases	Per-centage (%)
<1 yr	22	2.5	2	0.3	6	1.3	7	1.7	1	0.6	8	7.0
1–4 yrs	123	14.0	45	7.8	61	13.2	45	10.9	17	10.6	24	21.1
5–14 yrs	106	12.1	47	8.1	62	13.4	43	10.4	18	11.2	6	5.3
15–24 yrs	115	13.1	39	6.7	60	13.0	64	15.5	24	14.9	19	16.7
25–44 yrs	306	34.9	278	48.1	145	31.3	125	30.2	44	27.3	35	30.7
45–64 yrs	162	18.5	132	22.8	93	20.1	92	22.2	47	29.2	20	17.5
≥ 65 yrs	44	5.0	35	6.1	36	7.8	38	9.2	10	6.2	2	1.8
Total known	**878**	**100**	**578**	**100**	**463**	**100**	**414**	**100**	**161**	**100**	**114**	**100**
Unknown/missing	12	1.3	4	0.7	8	1.7	4	1.0	1	0.6	1	0.9
Total reported	**890**		**582**		**471**		**418**		**162**		**115**	

Source: Austria, Belgium, Estonia, Finland (only 2010), France, Greece (only 2012), Hungary, Ireland (only 2012), Lithuania, Sweden, United Kingdom; EEA country: Norway

With regard to the relative distribution of *S. flexneri* serotypes during 2010–2012 (Figure 4.23; Annex D: Table D4.10), serotypes 2a and 2 dominated in children under one year of age, and their proportion decreased with increasing age. Serotype 3a predominated among adults over 25 year of age. Serotypes 6, 1b and 2b were reported with similar proportions among all age groups.

Figure 4.23. Relative distribution of the six most common *Shigella flexneri* serotypes by age groups reported by EU/EEA countries, 2010–2012 (N=2 608)



Source: Austria, Belgium, Estonia, Finland (only 2010), France, Greece (only 2012), Hungary, Ireland (only 2012), Lithuania, Sweden, United Kingdom; EEA country: Norway

Severity

The severity of shigellosis was evaluated by analysing the hospitalisation percentage and the proportion of deaths due to shigellosis (outcome) among all confirmed cases by calculating the case–fatality ratio. Relative confidence intervals (95% CI) were calculated analysing the hospitalisation ratio and the case–fatality ratio (CFR). Results were described on a country basis (Annex D: Tables D4.11 and D4.12).

Hospitalisation

In 2010–2012, information on hospitalisation was reported for 21% of confirmed shigellosis cases by 17 EU/EEA countries (Annex D: Table D4.11). Since there is a relatively high proportion of unknown data (79%), results on hospitalisation of confirmed shigellosis cases should be interpreted with caution.

At the EU/EEA level, the proportion of hospitalised cases increased significantly in 2011 compared with 2010, from 39.9% (CI 95%: 36.9%–42.1%) to 47% (CI 95%: 44.6%–49.5%). It remained stable between 2011 and 2012 (Table 4.8). The observed increase was mainly driven by the United Kingdom, where the hospitalisation ratio rose from 60% in 2010 to 96.8% in 2011, although the hospitalisation ratio increased in parallel with an increasing completeness of reporting (Annex D: Table D4.11). From 2010 to 2012, a significant increase in the number of hospitalised shigellosis cases was also recorded in Hungary (32% in 2010; 72% in 2012) (Annex D: Table D4.11). The highest hospitalisation ratios (> 85% of cases) during the whole period were reported by Greece, Latvia and Portugal. These countries also reported some of the lowest notification rates for shigellosis, which indicates that the surveillance systems primarily focus on more severe cases (Annex D: Table D4.11). In 2010–2012, Romania also reported a high hospitalisation ratio (> 90% of cases hospitalised) (Annex D: Table D4.11).

Table 4.8. Hospitalisation ratio of confirmed shigellosis cases as reported by EU/EEA countries, 2010–2012

Hospitalisation	Year		
	2010	2011	2012
Number of confirmed cases	7 312	7 321	7 336
Confirmed cases (%)[1]	19.1	21.6	20.9
Hospitalised cases	552	745	755
Hospitalisation ratio (%)[2] (confidence interval 95%)	39.9 (36.9–42.1)	47.0 (44.6–49.5)	49.2 (46.7–51.7)

[1] Proportion (%) of confirmed cases for which information on hospitalisation was available.

[2] Calculated as number of hospitalised cases of the confirmed cases for which this information was available.

Source: Austria, Cyprus, Denmark (only 2010–2011), Estonia, Greece, Hungary, Ireland, Latvia (from 2011), Lithuania, Luxembourg (only 2010), Malta, the Netherlands, Portugal, Romania, Slovenia, United Kingdom; EEA country: Norway

During the three-year surveillance period (2010–2012), 21 EU/EEA countries reported data on outcome (alive/dead) for 8 507 confirmed shigellosis cases (Annex D: Table D4.12), with four countries (Denmark, Iceland, Poland and the United Kingdom) covering only one or two years (Annex D: Table D4.12). Completeness in reporting this variable hovered around an average level of 39% between 2010 and 2012 (Table 4.9; Annex D: Table D4.12). Based on known data only, the proportion of deaths among confirmed shigellosis cases was low at the EU/EEA level, with six deaths reported during the three-year surveillance period (Table 4.9; Annex D: Table D4.12). No deaths were reported at the EU/EEA level in 2010. Shigellosis cases with fatal outcome were reported by the Netherlands (n=1) and the United Kingdom (n=3) in 2011 and by Germany (n=1) and the Netherlands (n=1) in 2012 (Annex D: Table D4.12).

Table 4.9. Number of deaths and case–fatality ratio of confirmed shigellosis cases by year, EU/EEA countries, 2010–2012

Outcome	Year		
	2010	2011	2012
Number of confirmed cases	7 312	7 321	7 336
Confirmed cases (%)[1]	37.1	40.2	38.8
Number of deaths	0	4	2
Case–fatality ratio (%)[2] (confidence interval 95%)	0.00 (0–0.14*)	0.14 (0.04–0.35)	0.07 (0.01–0.25)

[1] The proportion (%) of confirmed cases for which information on death was available.

[2] Calculated as number of fatal cases of the confirmed cases for which this information was available.

** One-sided, 97.5% confidence interval*

Source: Austria, Cyprus, Czech Republic, Denmark (only 2010–2011), Estonia, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Malta, the Netherlands, Poland (from 2011), Portugal, Romania, Slovakia, Slovenia, United Kingdom (from 2011); EEA countries: Iceland (only 2010–2011) and Norway

Discussion

The overall EU/EEA trend in the number of confirmed shigellosis cases remained stable between 2008 and 2012, but some variations were observed among reporting countries. In most of the reporting countries the number of shigellosis cases remained at a stable level, and three countries (the United Kingdom, the Netherlands and Greece) showed a significant increasing trend during the five-year surveillance period (2008–2012).

In 2010–2012, the average annual notification rate was 1.6 cases per 100 000 population. When comparing 2010 with 2012, Spain showed the highest significant increase in notification rates, but this may be partially explained by an improvement in the reporting of cases or may reflect the occurrence of outbreaks. In October 2012, an outbreak of *S. sonnei*, affecting 112 people, was reported in a school in the north of Spain. The outbreak was linked to a sick child who had travelled to an endemic country [1].

Shigellosis remains a relatively uncommon infection among EU/EEA countries with two-thirds of the cases connected to travelling in non-EU countries, mainly in Africa and Asia. As in previous years (2006–2009), the most frequently reported countries for travel-related cases were Egypt, India and Morocco. These findings are in line with what is described in the literature [2-6]. The increasing trend of reported travel-related cases is partly due to an increase in the number of reporting countries and more comprehensive reporting of the importation.

Although shigellosis is mostly brought into the EU by travellers, about 35% of the infections reported in 2010–2012 were acquired domestically and linked to the consumption of contaminated food or sexual or other person-to-person transmission. During 2008–2012, an increasing trend in reported domestic shigellosis cases was observed at the EU/EEA level, and no country showed a statistically significant decrease in domestic cases between 2008 and 2012. This may be partially explained by better surveillance and improved reporting of the cases. An increase in person-to-person transmission of shigellosis was observed. Limited information on suspected transmission pathways was available in 2010–2012 (n=435 confirmed cases), with two countries (the Netherlands and Norway) reporting 76% of the transmission data for domestic cases. The main transmission route and cause of the increase of shigellosis cases in Norway was linked to the ingestion of contaminated food. In the Netherlands, sexual transmission, particularly in men who have sex with men, accounted about 45% of the endemic causes of infection with shigellosis among males [Ingrid Friesema, RIVM, personal communication, February 2015]. Sexual or other person-to-person transmission pathways are becoming more common in developed countries as transmission resulting from poor hygiene and sanitation is decreasing [3,5-7]. However, further studies and investigations are needed in order to better describe the epidemiology of the disease in Europe.

As in previous years [2,3], the risk for *Shigella* infection in 2010–2012 was highest in children younger than five years of age, while the highest burden in terms of number of reported cases was observed in adults between 25 and 44 years, most likely related to the higher number of travellers in this age group. The oldest age group (> 64 years) had the lowest age-specific notification rates. During 2010–2012, notification rates significantly decreased in people between 25 and 44 years of age, for both sexes. There was a slightly higher rate of confirmed cases reported in men, probably due to sexual risk behaviours [5-7].

Reporting of *Shigella* species was introduced in 2008. During 2010–2012, species information was provided for 74% of reported confirmed shigellosis cases. The two most commonly reported *Shigella* species causing human shigellosis were *Shigella sonnei* (56% of total species reported) and *Shigella flexneri* (33% of total species reported).

Shigella sonnei is the most commonly reported *Shigella* species in industrialised countries [5]. At the European level, the reported number of infections due to *S. sonnei* remained stable during 2008–2012. In 2010–2012, *S. sonnei* was the most common cause of shigellosis in children over five years of age, peaking in adults aged 25–64 years. Infections acquired domestically were characterised by a clear autumnal seasonal pattern. The more prominent peak observed among domestic cases in October 2011 was due to an outbreak in Norway, linked to the consumption of imported basil [11]. The peak in October 2012 can probably be explained by an outbreak in the north of Spain [1]. The winter peak in the distribution of travel-related *S. sonnei* infections reflects the increase in travelling during the winter holidays.

Shigella flexneri infections slightly increased over the five-year period (2008–2012), which is in agreement with findings from other studies [5-6, 8]. In 2010–2012, *S. flexneri* was mainly reported in children under one year of age and decreased with the increase of age. Cases were reported throughout the year without any evident seasonal pattern, and about 78% of all reported *S. flexneri* infections were due to serotypes 2a, 3a, 6 and 1b. *S. flexneri* infections acquired in non-EU/EEA countries were mainly associated with serotypes 2a, 6 and 1b. Serotype 3a caused about 19% of domestic shigellosis cases, and it was the most commonly reported serotype among infections acquired during travelling to EU/EEA countries. These results are consistent with other studies [6,7] and suggest that *S. flexneri* serotype 3a circulates in Europe. Serotype 3b and X were more frequently isolated from domestic than from travel-related cases. In 2012, the reporting of serotype X tripled over 2010. This increase was mainly driven the United Kingdom that reported the vast majority of serotype X infections in 2010–2012 (71% of all reported serotype X). However, due to the very low number of serotype X cases reported (n=34, cumulative data 2010–2012), interpretations should be made with caution. During 2010–2012, *S. flexneri* serotype 2a and serotype 2 were responsible for 65% of infections in children under one year of age. Serotype 3a was dominant in adults above the age of 25.

At the European level, six deaths were reported among confirmed shigellosis cases during the three-year surveillance period 2010–2012. The significant increase in the proportion of hospitalised shigellosis cases observed in the EU/EEA between 2010 and 2011 (from 40% to 47%) was mainly driven by the United Kingdom and probably due to an increase in the completeness of reporting. The highest hospitalisation ratios were reported by countries that also had notification rates which were among the lowest for shigellosis, which indicates that the surveillance systems primarily focus on more severe cases.

Every year, EU/EEA countries report foodborne *Shigella* outbreaks; foodborne transmission may occur through food contaminated during the preparation process by a contaminated food handler or food that was previously contaminated; sometimes transmission was through imported fresh food from non-EU/EEA countries.

In 2010, a very small outbreak of *S. flexneri* was notified in Poland (two cases, one hospitalised; evidence was strong). The outbreak was attributed to fruit, berries and juices, and restaurants were the reported setting. In addition, 12 EU/EEA countries reported 23 weak-evidence *Shigella* outbreaks, affecting 289 people and causing 32 hospitalisations [9]. The highest increase, with 168 confirmed domestic cases, was reported by the Czech Republic in two local outbreaks in two different regions [Radka Králová, NIPH, personal communication, February 2015].

In 2011, five strong-evidence outbreaks (with known vehicle) caused by *Shigella* were reported by three EU/EEA countries. Two outbreaks of *S. flexneri* linked to buffet meals were reported by Denmark and accounted for 70 cases, of which 11 were hospitalised, and no deaths were reported [10]. One outbreak due to *S. sonnei* by was reported Belgium. The outbreak was associated with buffet meals and accounted for 37 cases and two hospitalisations [10]. Two outbreaks caused by *S. sonnei* were reported by Norway. One was linked to imported fresh basil used in pesto and the other to buffet meals; in total, 77 persons became ill and six of them were admitted to hospital. There were no deaths reported [10,11].

In 2012, two strong-evidence outbreaks caused by *Shigella* were reported by France. Both were general outbreaks and resulted in 45 cases and five hospitalisations. There were no reported deaths. Broiler meat was implicated in an outbreak linked to common public settings, such as restaurants, cafés, pubs, bars and hotels, and mixed food was implicated in the other outbreak. The setting for the latter outbreak was a residential institution [12].

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5 STEC/VTEC infections in the EU/EEA, 2010–2012

Shiga toxin/verocytotoxin-producing *Escherichia coli* (STEC/VTEC) infection

E. coli is a common bacterium in the gastrointestinal tract and part of the normal bacterial flora. A large number of serogroups of *E. coli* have been recognised as Shiga toxin/verocytotoxin producers. STEC/VTEC infections are most often associated with serogroup O157 in the EU.

In STEC/VTEC infection, gastrointestinal symptoms range from mild to severe bloody diarrhoea, mostly without fever. Young children are most commonly affected. Children under five years of age and the elderly are the most susceptible age groups for STEC/VTEC infection. About 10% of patients may develop haemolytic-uraemic syndrome (HUS), characterised by acute kidney failure, among other symptoms. Antibiotic therapy is controversial and its value for treating HUS cases is debated. According to published literature, the mortality rate for HUS cases is about 3–5%.

STEC/VTEC infections are acquired by consuming contaminated food or water, but illness can also result from direct contact with infected or colonised (farm) animals or environments contaminated by animal faecal matter. Human-to-human transmission or swimming in contaminated surface waters has also been described as a source of infection. Cattle, sheep, and goats are the primary carriers of *E. coli* O157. The most commonly reported sources of contaminated food are undercooked meat, unpasteurised dairy products, lettuce and other vegetables.

More information can be found at the ECDC website [19].

Surveillance of STEC/VTEC in the EU/EEA in 2010–2012

ECDC coordinates the European surveillance of Shiga toxin/verocytotoxin-producing *Escherichia coli* (STEC/VTEC) infection, in close collaboration with a network of nominated experts, epidemiologists and microbiologists from EU/EEA countries as part of the Food- and Waterborne Diseases and Zoonoses (FWD) Network.

The scope of surveillance is defined by the general surveillance objectives for food- and waterborne diseases (see Introduction) and the EU case definition for Shiga toxin/verocytotoxin -producing *Escherichia coli* (STEC/VTEC) infection (see Annex H).

The aims and purposes of the disease-specific surveillance were discussed with the European Food- and Waterborne Diseases and Zoonoses Network. For STEC/VTEC, the suggested specific surveillance objectives are to:

- improve detection of international clusters and outbreaks of STEC/VTEC infections by setting up real-time molecular surveillance for human cases and connect/harmonise the typing methods with food, feed, and animal strains
- monitor the most virulent types of STEC/VTEC, i.e. those causing HUS, at the EU level
- monitor the incidence of cases of bloody diarrhoea caused by STEC/VTEC in selected European countries
- monitor severity of disease (hospitalisation, outcome, specimen, clinical manifestation)
- monitor antimicrobial resistance development.

The European Surveillance System (TESSy) allows the standard reporting of cases of STEC/VTEC infections with an agreed set of variables. In 2010–2012, the reporting of STEC/VTEC covered 62 variables, 27 of which were common variables for all diseases, and 35 were specific to STEC/VTEC. The common variables are presented in Table 1 in the Introduction. Additional STEC/VTEC-specific variables are presented below in Table VTEC-1. In 2012, 24 EU/EEA countries had a compulsory reporting system with full population coverage for STEC/VTEC infections, four countries had a voluntary system and two countries did not report STEC/VTEC infections to TESSy (Table VTEC-2).

Table 5.1. Enhanced dataset collected for STEC/VTEC cases, EU/EEA, 2010–2012

Variable	Description in TESSy
aaiCgene[a]	Presence of chromosome protein gene
Age in months[a]	Age of patient in months as reported in the national system for cases < 2 years of age at the time of disease onset
aggRgene[a]	Presence of enteroaggregative adhesins transcription regulator gene (aggR)
AntigenH	Flagellar (H) antigen of the antigenic formula of the pathogen which is the cause of the reported disease

Variable	Description in TESSy
AntigenO	Only somatic (O) antigen of the antigenic formula of the pathogen which is the cause of the reported disease
BetaGlucoronidaseActivity	Beta glucoronidase activity
ClinicalManifestation	Clinical manifestation other than hemolytic uremic syndrome (HUS)
Date of onset of diarrhoea[a]	Date of onset of diarrhoea.
Date of onset of HUS[a]	Date of onset of hemolytic uremic syndrome
Enterohaemolysis	Enterohaemolysis
ESBL production [a]	Production of extended spectrum beta lactamase
HUS	Haemolytic-uraemic syndrome
IntiminEaeGene	Presence of intimin (eae) gene
PhageType	Name/number of phage type of the pathogen which is the cause of the reported disease
SIR_AMP, SIR_CHL, SIR_CIP, SIR_CTX, SIR_GEN, SIR_KAN, SIR_NAL, SIR_SSS, SIR_STR, SIR_SXT, SIR_TCY	Susceptibility to 11 different antibiotics (ampicillin, chloramphenicol, ciprofloxacin, cefotaxime, gentamicin, kanamycin, nalidixic acid, sulphonamides, streptomycin, trimethoprim (co-trimoxazole), tetracyclines)
SorbitolFermenting	Ferments sorbitol
Specimen	The relevant specimen type used for diagnosis of the case
SpecificAntibodyResponse[b]	Specific antibody response for *E. coli* serogroups. (Only to be filled in for HUS cases.)
TestMethod	Laboratory method(s) used for diagnosis or further characterisation of the disease
Verotoxin1	Presence of verotoxin 1 genes (VT1)
Verotoxin1Subtype	Designation of verotoxin 1 sub-type
Verotoxin2	Presence of verotoxin 2 genes (VT2)
Verotoxin2Subtype	Designation of verotoxin 2 sub-type
VerotoxinGenes[b]	Presence of verotoxin genes
VerotoxinProduction	Confirmation ofproduction of verotoxin

[a] *Variables added in 2011 (14 Dec 2011) for enhanced surveillance for Shiga toxin/verocytotoxin-producing* Escherichia coli *infection*

[b] *Removed in 2012 reporting (information covered under variables Verotoxin 1 gene and Verotoxin 2 gene)*

National surveillance systems for STEC/VTEC

Table 5.2. Notification systems for STEC/VTEC infections cases in EU/EEA countries, 2012

Country	Reported since	Legal character[a]	Case-based/ aggregated[b]	National coverage[c]	Changes in surveillance system in 2010–2012
Austria	1947	Cp	C	Y	
Belgium	< 1999	V	C	N	
Bulgaria	Yes	Cp	A	Y	
Cyprus	2005	Cp	C	Y	
Czech Republic	2008	Cp	C	Y	
Denmark	2000	Cp	C	Y	No changes
Estonia	1958	Cp	C	Y	
Finland	1998	Cp	C	Y	
France	1996	V	C	N	
Germany	2001	Cp	C	Y	No changes
Greece	Yes	Cp	C	Y	
Hungary	1998	Cp	C	Y	
Ireland	2004	Cp	C	Y	
Italy	1990	V	C	N	
Latvia	1999	Cp	C	Y	No changes
Lithuania	2004	Cp	C	Y	
Luxembourg	2004	V	C	Y	
Malta	Yes	Cp	C	Y	
Netherlands	1999	Cp	C	Y (only O157)	Coverage of non-O157 increased
Poland	2004	Cp	C	Y	

Country	Reported since	Legal character[a]	Case-based/ aggregated[b]	National coverage[c]	Changes in surveillance system in 2010–2012
Portugal	-	-	-	-	- [d]
Romania	Yes	Cp	C	Y	
Slovakia	1990	Cp	C	Y	
Slovenia	1995	Cp	C	Y	No changes
Spain	1989	Cp	C	Y	
Sweden	2004	Cp	C	Y	
United Kingdom	No	O	C	Y	
Iceland	Yes	Cp	C	Y	
Liechtenstein	-	-	-	-	-
Norway	1995	Cp	C	Y	

[a] *Legal character: Cp=compulsory, V=voluntary, O=other*

[b] *C=case based, A=aggregated*

[c] *National coverage: Y=yes, N=no*

[d] *Not reported/no data provided*

Epidemiological situation in 2010–2012

Major findings

- The number of confirmed cases of STEC/VTEC in the EU/EEA increased significantly during 2008–2012.
- The overall notification rate in the EU/EEA in 2010–2012 was 1.7 cases per 100 000 population.
- The highest number of cases was reported in 2011 (N=9 536) due to a large outbreak of STEC O104:H4 occurring in Germany, associated with the consumption of contaminated raw sprouts.
- 86% of the confirmed STEC/VTEC cases reported in 2010-–011 were of domestic origin.
- 69% of travel-related infections were acquired in non-EU/EEA countries, in particular in Asia and Africa.
- A general increase in age-specific rates was found in all age groups and for both sexes.
- The highest notification rates for both sexes were in children aged 1 to 4 years (6 cases per 100 000) followed by infants younger than 1 year of age (4.5 cases per 100 000)
- The five most common STEC/VTEC 'O' serogroups (55% of known data) in 2010–2012 were: O157 (55%), O104 (24% in 2011), O26 (10%), O103 (3.7%) and O91 (3.0%).
- The five most common STEC/VTEC serotypes (11% of known data) in 2010–2012 were: O157:H7 (26%), O157:H- (10%), O104:H4 (16% in 2011), O26:H11 (5.8%) and O103:H2 (5.7%).
- A significant increasing trend in the number of cases was observed for serotypes O26:H11, O145:H- and O63:H6 during 2008–2012, whereas serotypes O157:H7, O157:H- and O103:H2 remained stable.
- The overall proportion of hospitalised cases remained stable between 2010 and 2012, ranging between 34% and 39%, although the completeness of reporting increased from 26% in 2010 to 38% in 2012
- The case–fatality ratio associated with STEC/VTEC cases at EU/EEA level in 2011 (0.74%) was about two times higher than in 2010 and 2012. The increase in case–fatality ratio observed at EU/EEA level was mainly driven by the large STEC O104:H4 outbreak in Germany in 2011.
- The proportion of haemolytic-uraemic syndrome (HUS) among confirmed cases ranged between 8% and 12% of cases. The most frequently isolated STEC/VTEC serotypes among HUS cases (O157:H7, O157:H-, O104:H4 and O26:H11) were mainly *stx2* positive (>78%)
- Among HUS cases, the case–fatality ratio at EU/EEA was stable during the three-year period (2010–2012), ranging from 3.2% to 4.1%
- Combined resistance to three or more antimicrobial classes (multi-drug resistance) was reported for about 22% of STEC/VTEC isolates tested (3%) during 2010–2012.

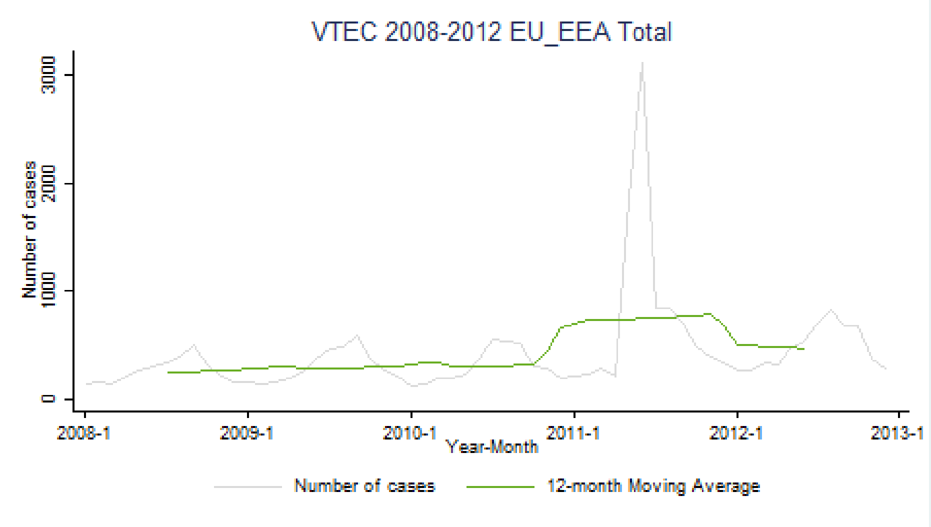
Overview of trends

During 2010–2012, a total of 18 995 confirmed cases of Shiga toxin/verocytotoxin-producing *Escherichia coli* (STEC/VTEC) infections were reported to TESSy by 26 EU Member States and two EEA countries, excluding Portugal and Liechtenstein (Table 5.3).

The number of confirmed cases of STEC/VTEC in the EU/EEA increased significantly since 2008, with the highest number of cases (N=9 536) reported in 2011 (Figure 1.1). The important increase recorded in 2011 was due to a large enteroaggregative Shiga toxin-producing *E. coli* (STEC)/VTEC O104:H4 outbreak occurred in Germany associated with the consumption of contaminated sprouts. However, a statistically significant increasing EU trend for STEC/VTEC could be observed already before the outbreak in 2008–2010. The notification rate at the EU/EEA level fell by 40% in 2012 as compared with 2011 (Table 5.3), although an increasing number of confirmed

STEC/VTEC cases were observed in 2012 in the EU/EEA countries, compared to previous years (rising 55% with 2 038 cases) from 0.9 in 2010 to 1.3 cases per 100 000 population in 2012. This was due to the increase in STEC/VTEC cases reported by most of the countries and particularly the Netherlands, Ireland and Germany (Table 5.3).

Figure 5.1. Trend in number of confirmed STEC/VTEC cases in EU/EEA countries, 2008–2012 (N=25 899)



Source: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Between 2010 and 2012, the highest number of confirmed STEC/VTEC cases was reported in Germany (N=8 086, cumulative data 2010–2012) counting for 43% of all reported cases. This was mainly due to the STEC/VTEC O104:H4 outbreak with 5 558 confirmed reported cases in 2011. The United Kingdom reported the second highest number of cases with 3 950 (cumulative data 2010–2012; 21%) following by the Netherlands with 12% (N=2 372, cumulative data) of all reported cases (Table 5.3). Overall, the highest country-specific notification rates in 2010–2012 were observed in Ireland and Sweden (> 3.5 cases per 100,000), while the lowest rates were reported in Bulgaria, Greece, Poland and Romania (≤0.01 cases per 100,000). Cyprus and Latvia reported zero STEC/VTEC cases for the whole period (2010–2012) (Table 5.3).

Apart from Germany, other seven countries experienced a peak in notification rates in 2011 (Denmark, France, Hungary, Malta, Poland, Sweden and the United Kingdom) (Table 5.3).

When comparing 2012 with 2010, a remarkable rise in rates was observed in the Netherlands (from 2.9 to 6.3 cases per 100 000) (Table 5.3, Figure 5.2). Increases in rates were also observed in Ireland (from 4.4 to 9 cases per 100 000), Germany (from 1.2 to 1.9 cases per 100 000), Sweden (from 3.6 to 5 cases per 100 000), Austria (from 1.05 to 1.54 cases per 100 000) and Norway (from 1.07 to 1.5 cases per 100 000). However, in the last two countries, the total number of cases reported was quite low. A minor raise was reported by the United Kingdom (from 1.8 to 2.1 cases per 100 000) (Table 5.3, Figure 5.2).

Country-specific trends in number of confirmed STEC/VTEC cases were calculated from 2008 to 2012. The greatest increase in trends was observed in the Netherlands, followed by Sweden and Ireland (p-value <0.01). Only Malta showed a significant decreasing trends in STEC/VTEC infections from 2008 to 2012 (p-value <0.01) (Figure 5.3).

It is worth noting, however, that in a country with a small population, even low numbers of reported cases can lead to a relative overrepresentation.

Table 5.3. Confirmed STEC/VTEC cases and notification rates (per 100 000 population) by country in the EU and EEA, 2010–2012

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	88	1.05	120	1.43	130	1.54
Belgium*	84	-	100	-	105	-
Bulgaria^	0	0.00	1	0.01	0	0.00
Cyprus	0	0.00	0	0.00	0	0.00
Czech Republic	1	0.01	7	0.07	9	0.09

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Denmark	178	3.22	215	3.87	193	3.46
Estonia	5	0.37	4	0.30	3	0.22
Finland	21	0.39	27	0.50	30	0.56
France*	103	-	221	-	208	-
Germany	955	1.17	5 558	6.81	1 573	1.93
Greece	1	0.01	1	0.01	0	0.00
Hungary	7	0.07	11	0.11	3	0.03
Ireland	197	4.41	275	6.02	412	8.99
Italy*	33	-	51	-	50	-
Latvia	0	0.00	0	0.00	0	0.00
Lithuania	1	0.03	0	0.00	2	0.07
Luxembourg	7	1.39	14	2.74	21	4.00
Malta	1	0.24	2	0.48	1	0.24
Netherlands	478	2.88	845	5.07	1049	6.27
Poland	3	0.01	5	0.01	1	0.00
Portugal	-	-	-	-	-	-
Romania	2	0.01	2	0.01	1	0.00
Slovakia	10	0.18	5	0.09	9	0.17
Slovenia	20	0.98	25	1.22	29	1.41
Spain	18	0.04	20	0.04	32	0.07
Sweden	334	3.58	477	5.07	472	4.98
United Kingdom~	1 110	1.80	1501	2.42	1339	2.13
EU total	**3 657**	**0.98**	**9 487**	**2.59**	**5 672**	**1.51**
Iceland	2	0.63	2	0.63	1	0.31
Liechtenstein	-	-	-	-	-	-
Norway	52	1.07	47	0.96	75	1.50
EU/EEA total	**3 711**	**0.98**	**9 536**	**2.57**	**5 748**	**1.50**

** Sentinel surveillance. Population coverage unknown so notification rate not calculated*

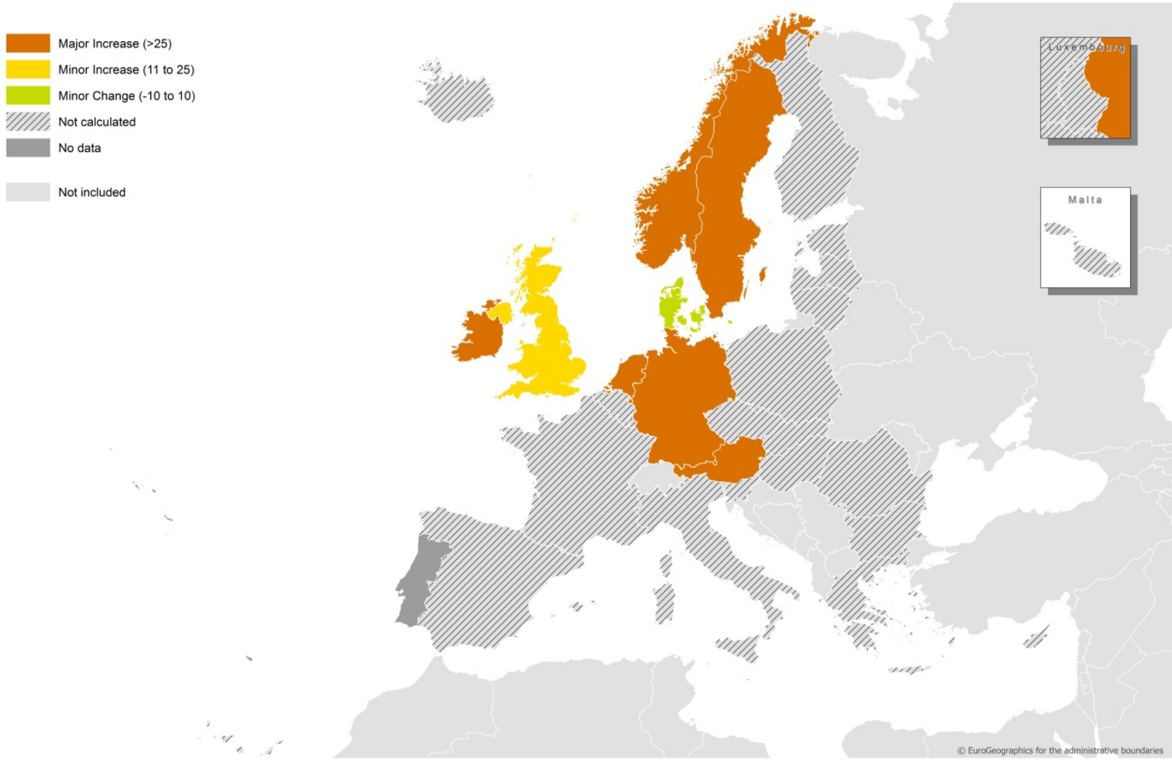
^ Aggregated reporting

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

*** For each year shown, notification rates were calculated, with the exception of countries with unknown population coverage. Also excluded were populations of countries which did not report data. Populations of countries which reported 0 cases were included.*

– Not reported/not calculated

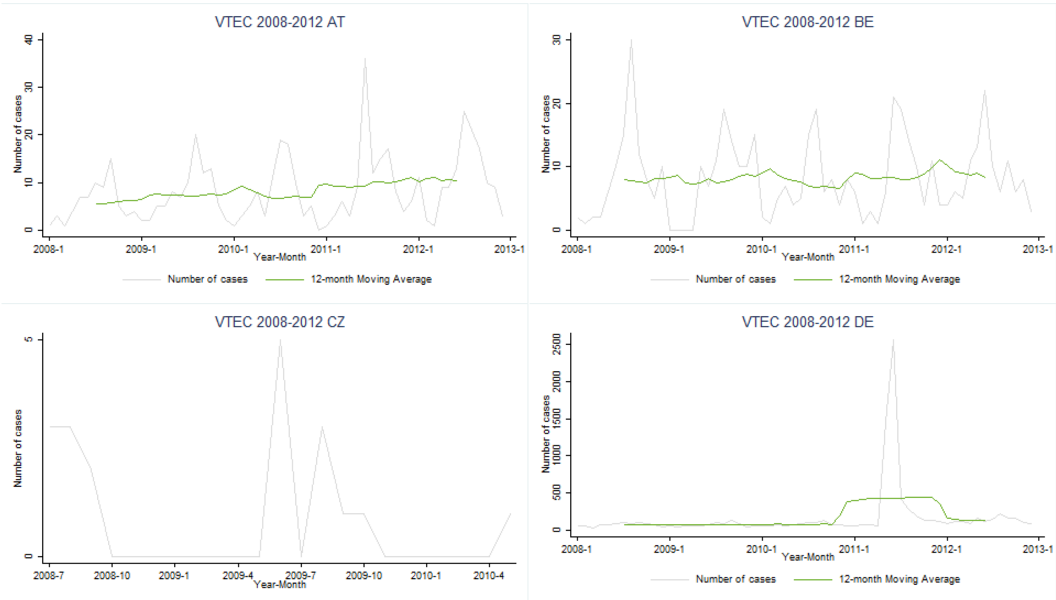
Figure 5.2. Percentage change in notification rates of STEC/VTEC cases in EU/EEA countries, 2010–2012

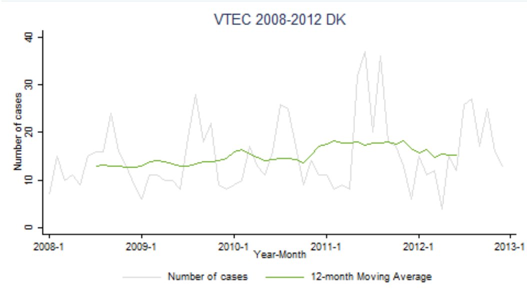


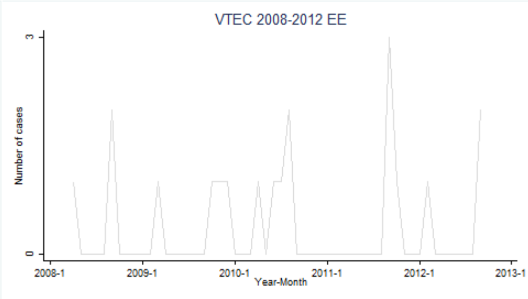
Not calculated: Country-specific percentage changes in notification rates were not calculated if the number of confirmed cases reported for one or more years during 2010–2012 was lower than 25, if sentinel surveillance systems had unknown population coverage, or if there was incomplete reporting for one of the reporting years.

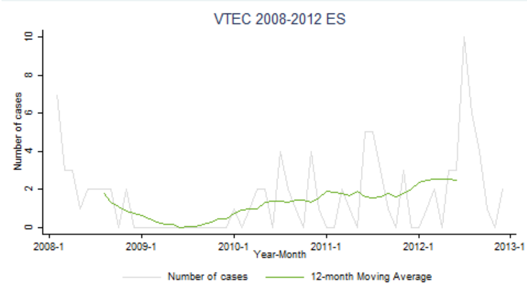
Source: The European Surveillance System (TESSy) data, 2010–2012

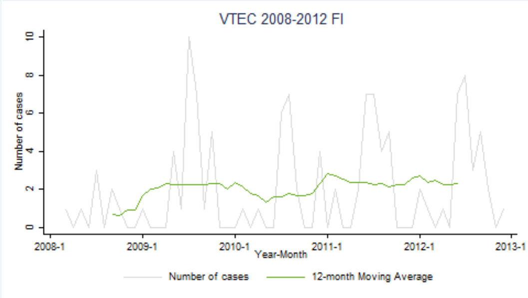
Figure 5.3. Trend in number of confirmed STEC/VTEC cases by EU/EEA country, 2008–2012

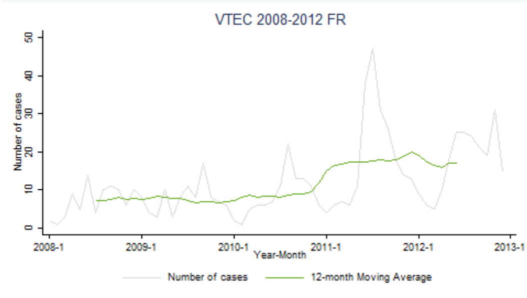


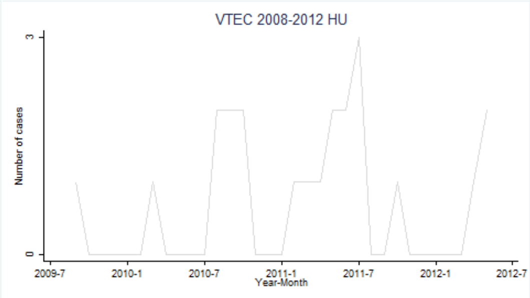

VTEC 2008-2012 DK
Number of cases
Year-Month
Number of cases
12-month Moving Average

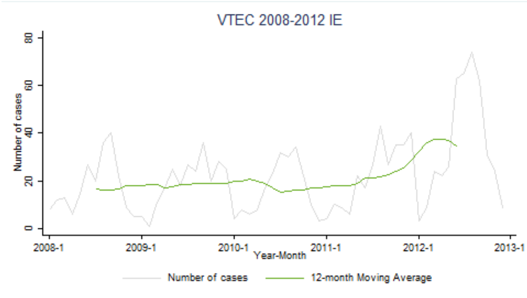

VTEC 2008-2012 EE
Number of cases
Year-Month

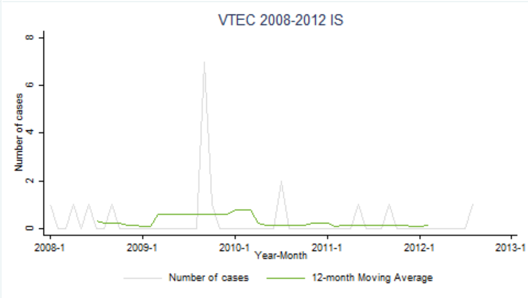

VTEC 2008-2012 ES
Number of cases
Year-Month
Number of cases
12-month Moving Average

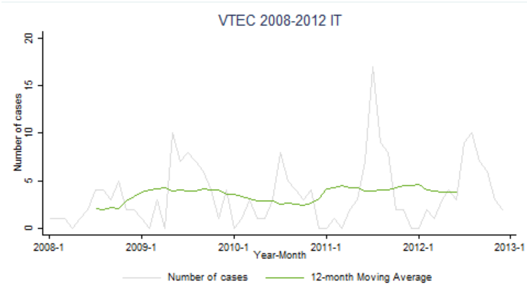

VTEC 2008-2012 FI
Number of cases
Year-Month
Number of cases
12-month Moving Average

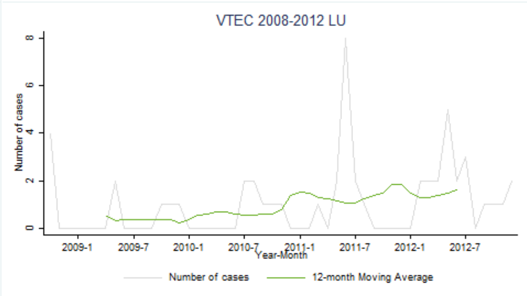

VTEC 2008-2012 FR
Number of cases
Year-Month
Number of cases
12-month Moving Average

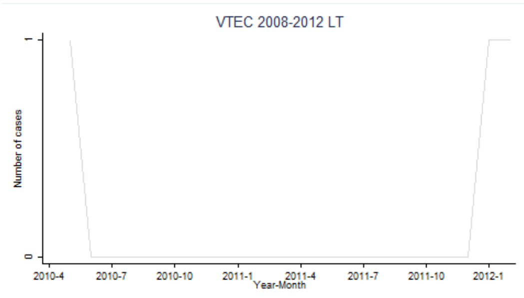

VTEC 2008-2012 HU
Number of cases
Year-Month

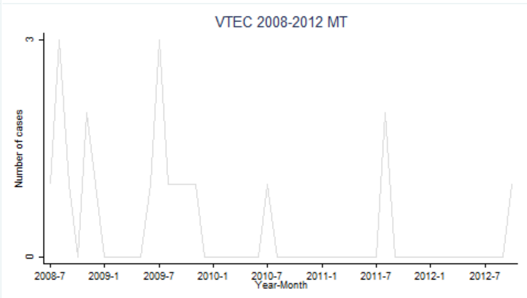

VTEC 2008-2012 IE
Number of cases
Year-Month
Number of cases
12-month Moving Average

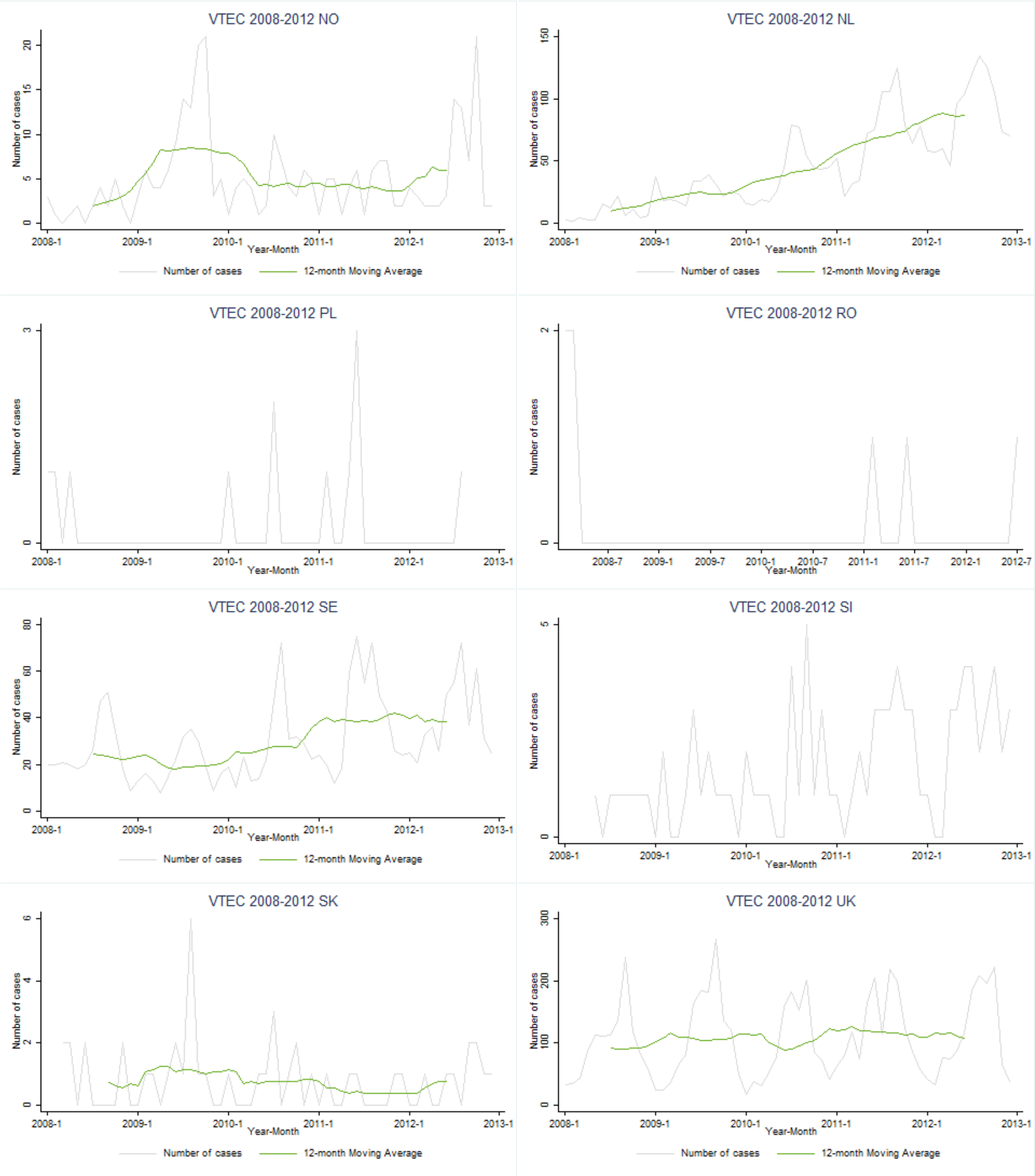

VTEC 2008-2012 IS
Number of cases
Year-Month
Number of cases
12-month Moving Average


VTEC 2008-2012 IT
Number of cases
Year-Month
Number of cases
12-month Moving Average


VTEC 2008-2012 LU
Number of cases
Year-Month
Number of cases
12-month Moving Average


VTEC 2008-2012 LT
Number of cases
Year-Month


VTEC 2008-2012 MT
Number of cases
Year-Month



Country codes: see page xiv

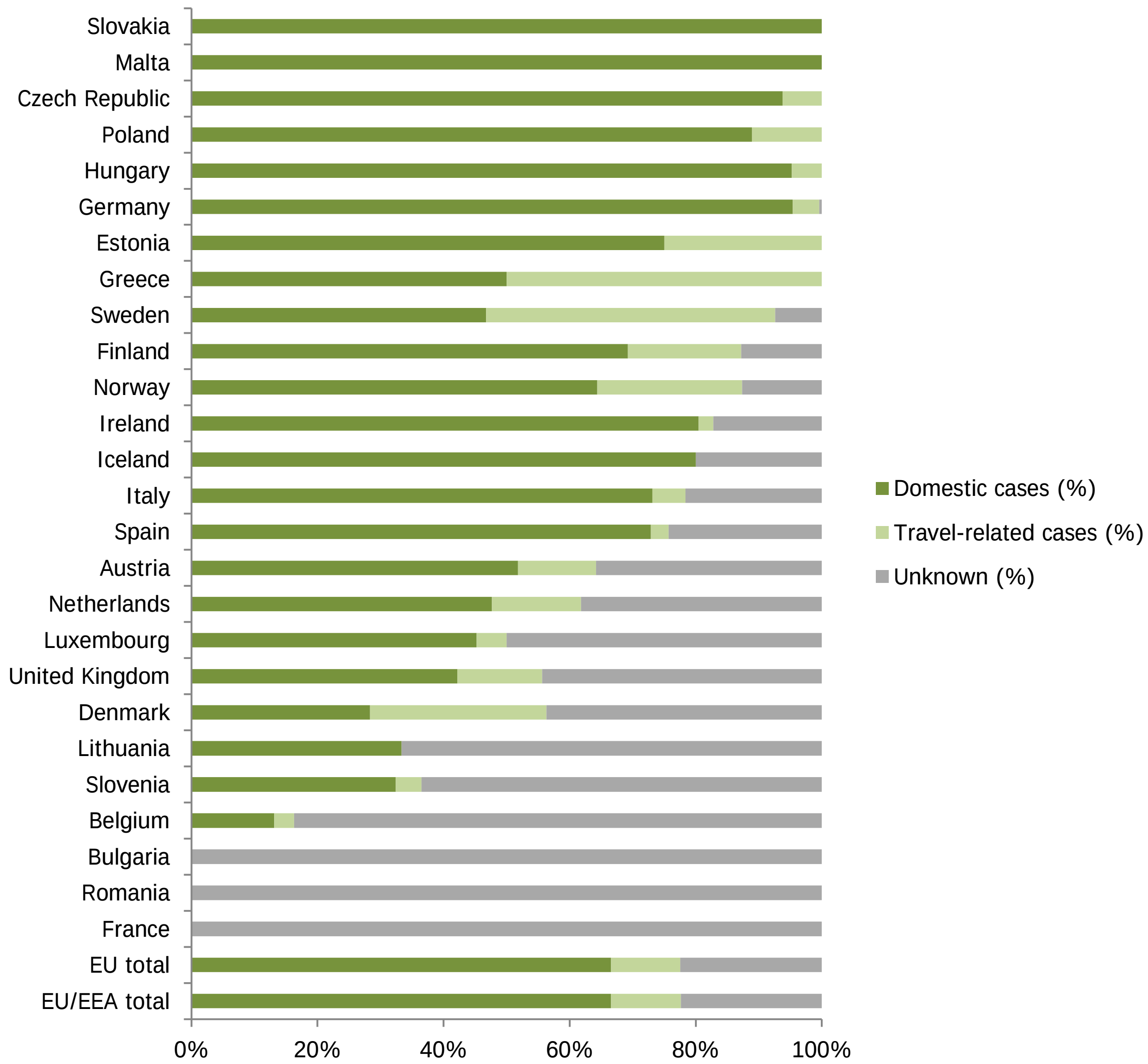
Country-specific trends were not calculated if less than five confirmed cases were reported per month during the period 2008–12. Please note that graphs are on different scales.

Origin of the infection

Within the three-year period from 2010 to 2012, 25 out of 28 countries reported data on the origin of infection (domestic/travel related) for 14 749 confirmed cases (78%, pooled data). Three countries reported information only for cases notified in one or two years in 2010–2012. The information on the origin of infection was reported for more than 90% of confirmed cases in 11 countries, while four countries reported the information for less than 40% of confirmed cases (Figure 5.4; Annex E: Table E5.1).

The proportion of domestic versus travel-associated cases varied markedly between countries, with highest proportion of domestic cases reported in Germany, Czech Republic, Hungary, Malta, Poland and Slovakia, although the last five countries reported a very low number of total cases (Figure 5.4; Annex E: Table E5.1). Denmark, Sweden and Norway reported the highest proportion of travel-associated infections compared with other reporting countries. A high proportion of infection acquired abroad was recoded also in Greece and Estonia, but the total number of confirmed cases reported was very low (Figure 5.4; Annex E: Table E5.1).

Figure 5.4. Proportion of confirmed STEC/VTEC infections cases by origin of infection (domestic/travel- related) as reported by EU/EEA countries, 2010–2012 (N=18 994)



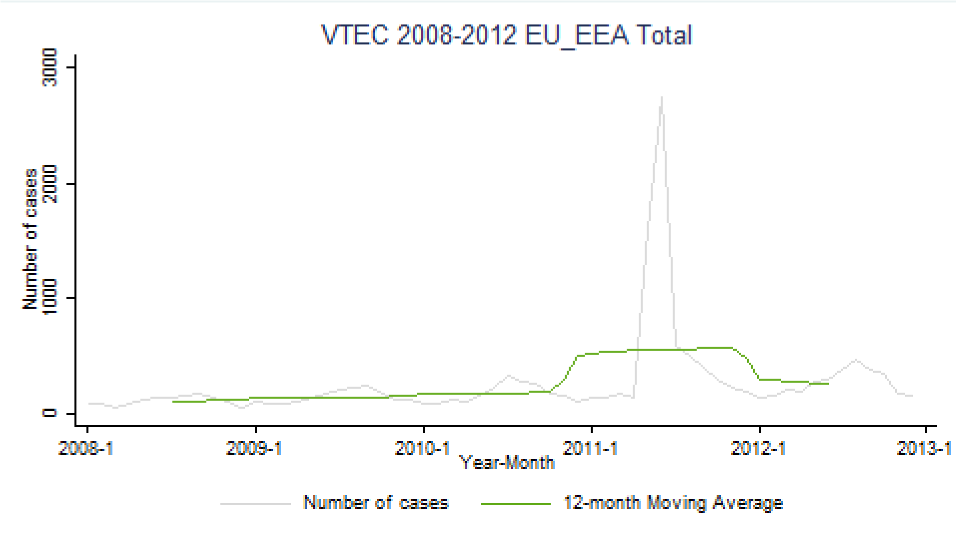
Domestic cases

Among cases for which the information was available (n=14 749, cumulative data 2010–2012), the majority of STEC/VTEC infections reported at the EU/EEA level during 2010–2012 were domestically acquired (86%) (Annex E: Table E5.1).The trend in reported domestic STEC/VTEC cases increased since 2008 (p-value<0.05) (Figure 5.5; Annex E: Table E5.2).

Three countries (Greece, Latvia and Lithuania) reported confirmed domestic cases for only one or two years from 2010–2012 and were excluded in the trend analyses.

During 2008–2012, the highest increase in number of domestic cases was reported by the United Kingdom, followed by the Netherlands (p-value<0.01). Significant increases were also observed in Austria, Ireland and Sweden (p-value<0.01). Over the five-year period, notification rates for domestically-acquired STEC/VTEC infections only slightly decreased in Malta (p-value<0.001), though the total number of cases reported by Malta was very low.

Figure 5.5. Trend in number of confirmed domestic STEC/VTEC infections cases by EU/EEA country, 2008–2012 (N=15 566)



Source: Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Italy, Luxembourg, Malta, the Netherlands, Poland, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Travel-related cases

Among cases for which the information was available (n=14 749, cumulative data 2010–2012), about 14% of confirmed STEC/VTEC infections had origin abroad (Annex E: Table E5.1). The trend in annual number of confirmed travel-related cases slightly increased during 2008–2012 (p-value<0.05) (Figure 5.6; Annex E: Table E5.3). However, the number of reported cases decreased by 4 % in 2012 compared with 2011.

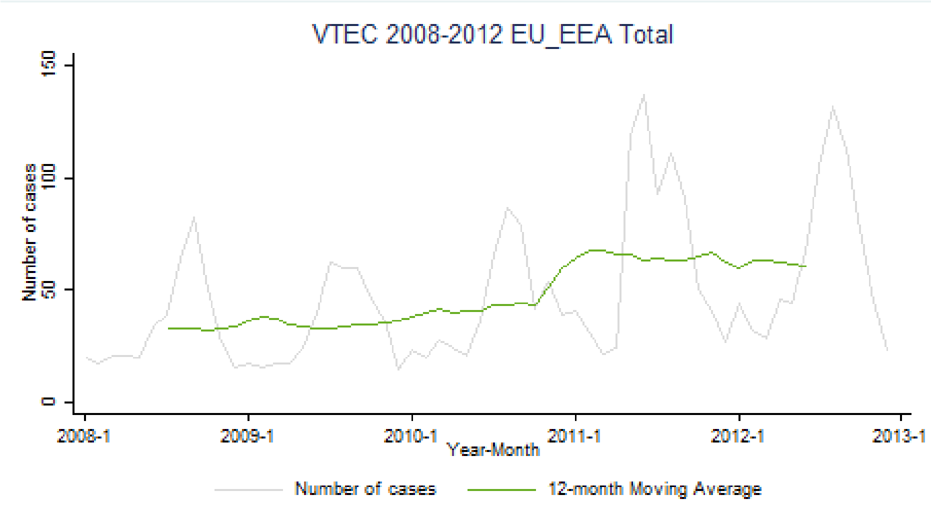
Ten countries (Cyprus, Greece, Hungary, Latvia, Lithuania, Luxemburg, Malta, Poland, Slovakia and Iceland) reported notified travel-related cases for only one or two years in 2010–2012, and were excluded in the trend analyses.

Over the five-year period from 2008 to 2012, country-specific trends in confirmed travel-related STEC/VTEC cases increased in the Netherlands, Germany and Sweden (p-value<0.001). Austria also reported a slight rise in notifications of travel-related infections, though the number of confirmed travel-related cases was low. In 2008–2012, none of the reporting countries showed a significant decrease in the number of travel-related STEC/VTEC infections.

For the 2 107 travel-related infections reported between 2010 and 2012, data on suspected country of infection were available for 92% confirmed cases (n=1 932).

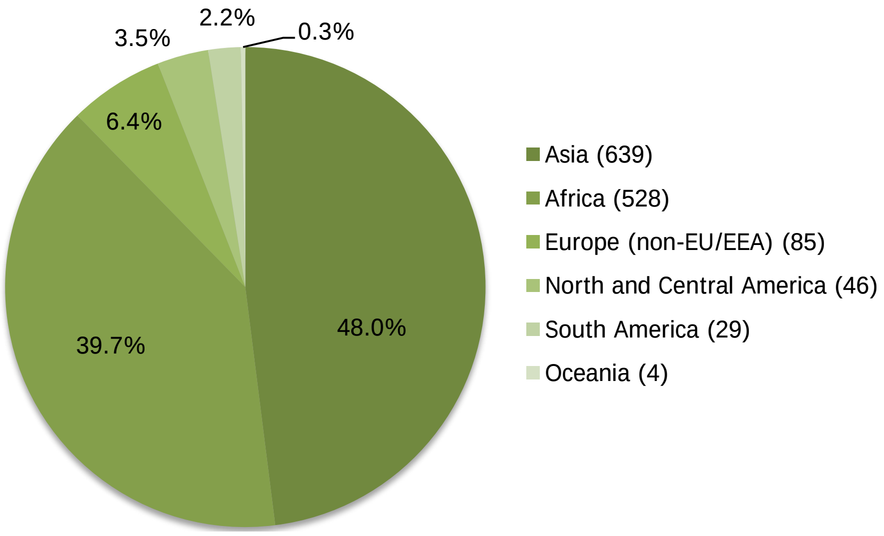
More than half of all travel-related infections were acquired in non-EU/EEA countries (69%), in particular in Asia (n=639) and Africa (n=528) (Figure 5.7). Overall, the most frequently reported countries of infection in travel-related cases were Turkey and Egypt (Figure 5.8).

Figure 5.6. Trend in number of confirmed travel-related STEC/VTEC infections cases by EU/EEA country, 2008–2012 (N=2 886)



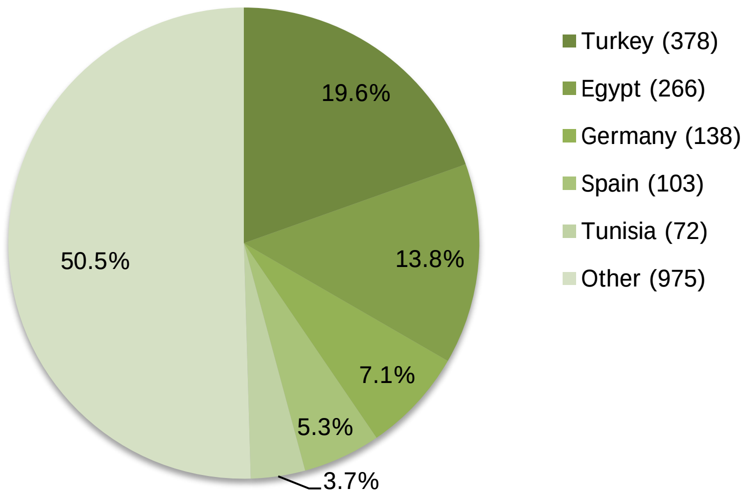
Source: Belgium, Czech Republic, Denmark, Estonia, Finland, Germany, Ireland, Italy, Luxembourg, the Netherlands, Poland, Slovenia, Spain, Sweden, United Kingdom; EEA country: Norway

Figure 5.7. Origin of travel-related STEC/VTEC infections acquired in non-EU/EEA countries by geographical regions, as reported by EU/EEA countries, 2010–2012



Source: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, the Netherlands, Poland, Slovenia, Spain, Sweden, United Kingdom; EEA country: Norway

Figure 5.8. Five most frequently reported countries of infection in confirmed travel-related STEC/VTEC cases as reported by EU/EEA countries, 2010–2012



Source: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, the Netherlands, Poland, Slovenia, Spain, Sweden, United Kingdom; EEA country: Norway

Age and sex

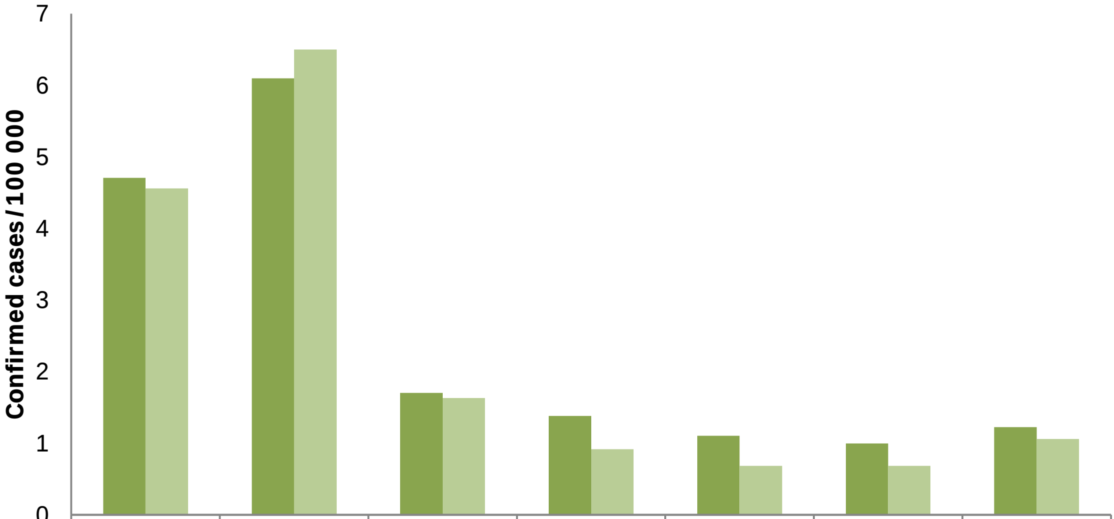
During 2010–2012, all countries reported data on age and sex and the information was available for 99% of confirmed STEC/VTEC cases (n=18 896).

Among reported STEC/VTEC cases with known data for sex and age, children below 15 years accounted for 48% of cases in 2010 and 44% in 2012, while in 2011 this group represented only 30% of total confirmed STEC/VTEC cases (Annex E: Table E5.4). Due to the O104:H4 outbreak in 2011, the notification rates showed three- to five-fold increase in age groups older than 15 years, particularly in women aged 25–44 years, and in both sexes over 65 years.

Overall in 2010–2012, children aged between 1 and 4 years presented the highest notification rate for both males and females (>6 cases per 100 000), followed by toddlers younger than one year of age (>4.5 cases per 100 000), while in the older age groups the notification rates were substantially lower when comparing with the youngest age-groups (<2 cases per 100 000) as in previous years (Figure 5.9; Annex E: Table E5.4).

Some differences were observed in notification rates between sexes (Figure 5.9; Annex E: Table E5.4). In 2010–2012, the male-to-female ratio was 0.8:1 and a female predominance was observed in those older than 15 years of age. The sex ratio was slightly higher for males only in the age group 1–4 years (1.1:1) and showed normal variations in the age groups <1 year (0.97:1) and 5–14 years (0.96:1) (Figure 5.9; Annex E: Table E5.4).

Figure 5.9. Notification rates of confirmed STEC/VTEC cases by age group and sex in EU/EEA countries, 2010–2012 (N=18 897)

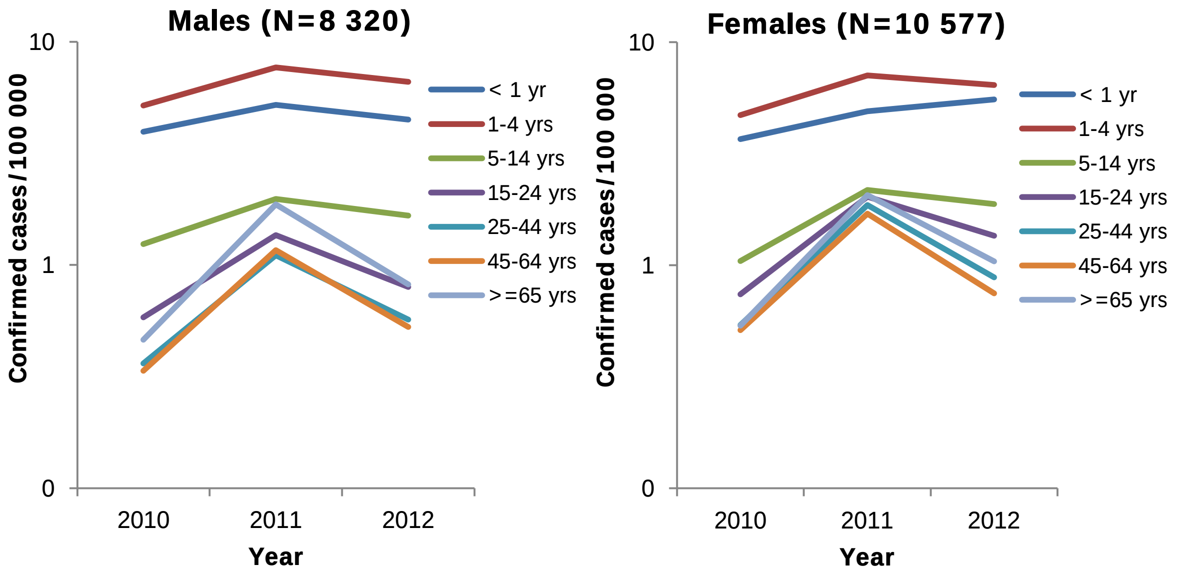


	< 1 yr	1–4 yrs	5–14 yrs	15–24 yrs	25–44 yrs	45–64 yrs	≥ 65 yrs
Females	4.7	6.1	1.7	1.4	1.1	1.0	1.2
Males	4.6	6.5	1.6	0.9	0.7	0.7	1.1

Source: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Due to the differences in notification rates between sexes, three-year trends were described separately (Figure 5.10; Annex E: Table E5.4). During 2010–2012, a general increase in age-specific rates was found in all age groups and for both sexes. Notification rates peaked in all age groups in 2011 except for females younger than one year of age (Figure 5.10; Annex E: Table E5.4).

Figure 5.10. Semi-logarithmic graph showing trends in notification rates of confirmed STEC/VTEC cases by age groups and sex in EU/EEA countries, 2010–2012 (N=18 897)



Source: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

STEC/VTEC serotypes

Isolates of STEC/VTEC were identified by 'O' (lipopolysaccharide) antigens and 'H' (flagella) antigens. The combination of the 'O' and 'H' types represented the serotype of an *E. coli* strain. During the three-year period from 2010 to 2012, 24 EU/EEA countries (22 EU countries plus Iceland and Norway) provided data on the 'O' (lipopolysaccharide) antigen for 10 329 (54.4%) confirmed STEC/VTEC infections, whereas information on full serotype on VTEC isolates were reported by 15 countries (14 EU countries plus Norway) for 2 001 confirmed cases (10.5% of total confirmed cases 2010–2012).

Five out of 24 reporting countries (Estonia, Finland, Greece, Lithuania and Malta) provided data on the 'O' antigen only for one or two years in 2010–2012. Overall 251 STEC/VTEC 'O' serogroups were reported at EU/EEA level and the proportion of untypable (NT) or unknown/untypable (UNK/NT) was 12% for the period 2010–2012. The 20 most frequently reported 'O' serogroups during the three-year period accounted for 94% (n=9 664) of the total STEC/VTEC isolates with known data on serogroups (Annex E: Table E5.5). More than half of the reported *E. coli* 'O' serogroups were O157 (Annex E: Table E5.5). In 2011, the O157 serogroup represented a lower proportion of cases (48%) and a marked increase was observed for the serogroup O104, accounting for 24% of the total of serogroups reported (n=1 066), mainly due to the O104:H4 outbreak occurred in Germany (Annex E: Table E5.5).

During the three-year surveillance period a constant increase was reported for the majority (13; 65%) of the 20 most commons serogroups including the serogroup O26 (56%), O103 (30%), O91 (120%) and O145 (72%). In 2012, a slight decrease in reporting was observed for serogroup O5, O63, O174 and O177. Other commonly reported STEC/VTEC serogroups at EU/EEA level, such as O117, O125 and O128, remained stable during 2010–2012

Altogether, 15 countries (14 EU countries plus Norway) were able to provide data on STEC/VTEC flagellar H antigens and three countries (Luxembourg, Romania and the United Kingdom) reported the information for only one or two years in 2010–2012. Overall, the completeness for this variable was very low (11% of total confirmed cases). The 20 most frequently reported 'H' antigen during the three-year period from 2010 to 2012 accounted for 97% (n=2041) of the total STEC/VTEC isolates with known data on flagellar antigen (Annex E: Table E5.6). The most common STEV/VTEC flagellar antigen type was H7, accounting for about 29% of all confirmed STEC/VTEC cases with data on 'H' antigen in 2010–2012 (Annex E: Table E5.6). This flagellar type is commonly found together with serogroup O157. Non-motile strains (H-) represented about 26% of all isolates with data on flagellar H antigens reported in 2010–2012, and their proportion increased from 25% in 2010 to 31% in 2012 (Annex E: Table E5.6).

During the three-year surveillance period a slight decrease in reporting was noted for antigens H2 and H6, whereas antigen H21 increased from 2.7% in 2010 to 4.4% in 2012 (Annex E: Table E5.6). The reporting of antigens H25 and H28 also increased during 2010–2012, though the total number of isolates reported was very low (Annex E: Table E5.6). The flagellar antigen H4, uncommon in Europe (0.5% in 2010 and 0.7% in 2012) peaked in 2011, representing the 16.5% of all STEC/VTEC isolates with data on 'H' antigens (Annex E: Table E5.6); this was due to the O104:H4 German outbreak which occurred in 2011. The other reported flagellar antigen types accounted each for 2% or less of all isolates with data on flagellar H antigens (Annex E: Table E5.6). The proportion of untypeable or unknown/untypeable in 2010–2011 was 25%.

The 20 most commonly reported STEC/VTEC serotypes in EU/EEA countries in 2010–2012 are shown in Figure 5.11 and listed in Table 5.4. Overall, the proportion of untypeable or unknown/untypeable in 2010–2011 was 27% in the three-year surveillance period.

Table 5.4. Distribution of the 20 most commonly reported STEC/VTEC serotypes in confirmed cases, EU/EEA countries, 2010–2012

Serogroups	2010		2011		2012		Total 2010–2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
O157:H7	162	29.6	179	23.6	187	26.9	528	26.4
O157:H-	53	9.7	60	7.9	84	12.1	197	9.8
O104:H4	0	0.0	120	15.8	2	0.3	122	6.1
O26:H11	32	5.9	40	5.3	45	6.5	117	5.8
O103:H2	42	7.7	36	4.7	36	5.2	114	5.7
O63:H6	19	3.5	26	3.4	12	1.7	57	2.8
O145:H-	11	2.0	12	1.6	29	4.2	52	2.6
O117:H7	21	3.8	13	1.7	13	1.9	47	2.3
O91:H-	15	2.7	4	0.5	27	3.9	46	2.3
O26:H-	9	1.6	14	1.8	23	3.3	46	2.3
O146:H21	4	0.7	16	2.1	17	2.4	37	1.8

Serogroups	2010		2011		2012		Total 2010–2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
O128:H2	10	1.8	7	0.9	8	1.1	25	1.2
Orough:H-	8	1.5	9	1.2	7	1.0	24	1.2
O111:H-	5	0.9	14	1.8	4	0.6	23	1.1
O76:H19	4	0.7	6	0.8	10	1.4	20	1.0
O91:H14	2	0.4	5	0.7	11	1.6	18	0.9
O145:H34	5	0.9	8	1.1	5	0.7	18	0.9
O125:H6	3	0.5	6	0.8	5	0.7	14	0.7
O5:H-	2	0.4	9	1.2	3	0.4	14	0.7
O146:H28	2	0.4	5	0.7	6	0.9	13	0.6
Other	138	25.2	169	22.3	162	23.3	469	23.4
Total known	**547**	**100.0**	**758**	**100.0**	**696**	**100.0**	**2001**	**100.0**
Unknown/missing/NT*	3 163	85.3	8 778	92.1	5 052	87.9	16 993	89.5
Total reported	**3 710**		**9 536**		**5 748**		**18 994**	

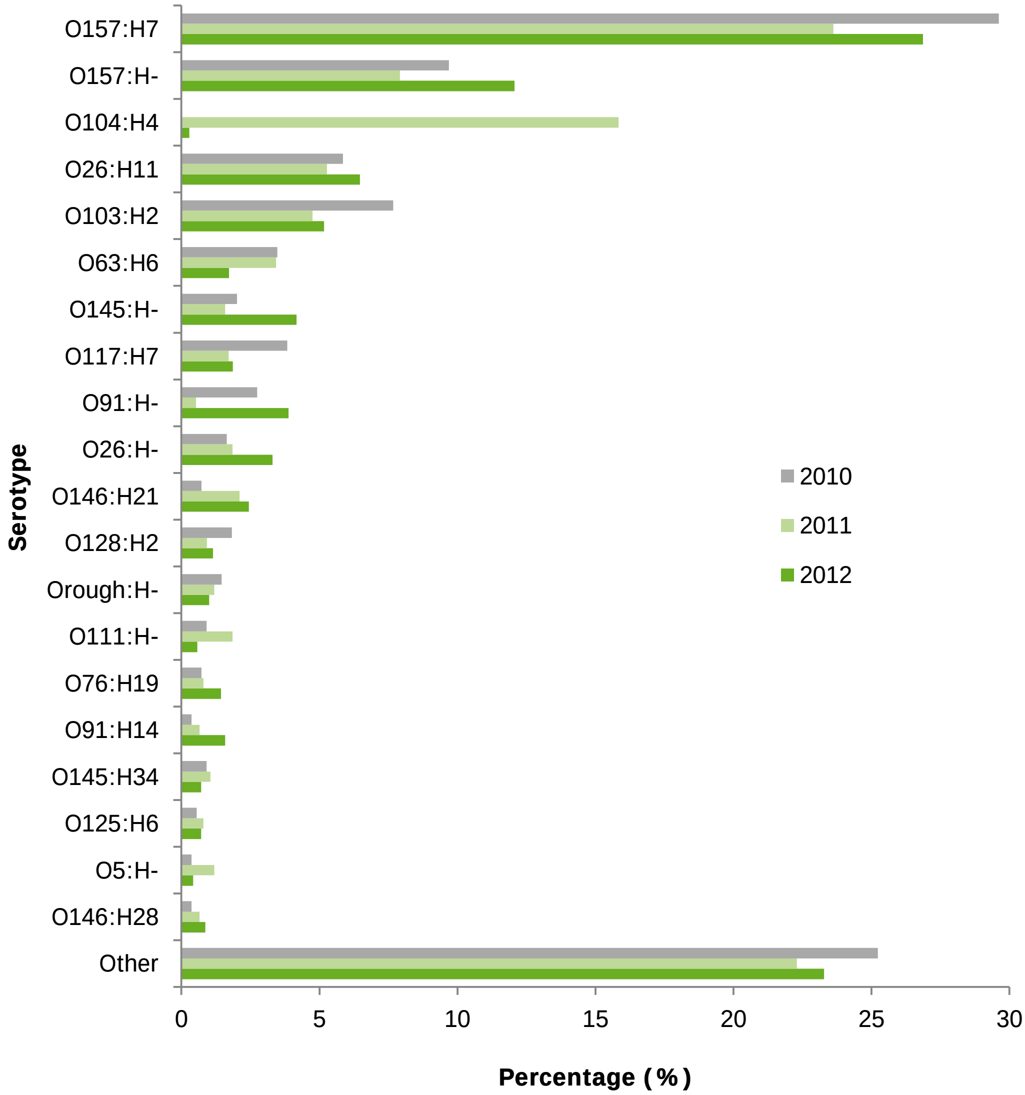
** NT=serologically untypable*

Source: Austria, Belgium, Czech Republic, Denmark, France, Hungary, Ireland, Luxembourg, the Netherlands, Poland, Romania, Spain, Sweden, United Kingdom; EEA country: Norway

The five most common STEC/VTEC serotypes were O157:H7, O157:H-, O104:H4, O26:H11 and O103:H2 (Figure 5.11; Table 5.4). STEC/VTEC O157:H7 was the most prevalent serotype reported by EU/EEA countries in the three-year period from 2010 to 2012, accounting for 26% of all typed isolates; in combination with serotype O157:H-, they accounted for about 36% of all typed isolates in 2010–2012 (Table 5.4).

The proportion of STEC/VTEC O157:H7 among the 20 most commonly reported serotypes slightly decreased during the three-year period (Figure 5.12), while the reporting of serotype O157:H- increased from 9.7% in 2010 to 12.1% in 2012(Figure 5.11; Table 5.4). Serotype O26:H11 increased slightly from about 5.9% to 6.5% in three years, whereas serotype O103:H2 decreased (from 7.7% to 5.2%) in 2010–2012. The 2011 peak in reporting of O104:H4 serotype reflects the outbreak associated with the consumption of contaminated sprouts. A general increase was found in the proportion of reported non-motile serotypes in 2012 as compared with 2010, with the exception of serotypes O rough:H- and O111:H- that showed a minor decrease (Figure 5.11; Table 5.4). The proportional changes must be interpreted with caution as the actual numbers are relatively small.

Figure 5.11. Distribution of the 20 most commonly reported STEC/VTEC serotypes in confirmed cases as reported in 2010 (n=547), in 2011 (n=758) and in 2012 (n=696) by EU/EEA countries



Source: Austria, Belgium, Czech Republic, Denmark, France, Hungary, Ireland, Luxembourg, the Netherlands, Poland, Romania, Spain, Sweden, United Kingdom; EEA country: Norway

Further characterisation of STEC/VTEC serotypes

The virulence characteristics of the reported STEC/VTEC serotypes were evaluated in terms of presence of the *eae* gene, encoding the intimin protein, as well as *vtx1* and *vtx2* genes, encoding the main classes of verocytotoxins termed VT1 and VT2.

Altogether, 20 countries (19 EU countries plus Norway) provided data on STEC/VTEC virulence genes of which six countries (Ireland, Poland, Romania, Spain, Sweden and the United Kingdom) reported the information for only one or two years in 2010–2012. Information on the presence of the *eae* gene and *vtx1* and *vtx2* genes was reported for 3 053 isolates with the full serotype[5] available (16.1% of total confirmed cases 2010–2012 of total confirmed cases 2010–2012). The 20 most commonly reported STEC/VTEC serotypes in EU/EEA countries in 2010–2012 by intimin (*eae*) subtypes and Shiga toxin genes (*stx*1 and *stx*2) are listed in the Table 5.5.

More than half (57%) of the reported STEC/VTEC serotypes with the information available (n=3 053 pooled data in 2010–2012) were intimin gene (*eae*)-positive (Table 5.5). Four out of the top 5 reported STEC/VTEC serotypes in

[5] *Please note that German data on virulence characteristic of STEC/VTEC isolates were provided from a different source, DE-NRZ-VTEC, not DE-SURVNET@RKI-7.1*

2010–2012 (O157:H7, O157:H-, O26:H11 and O103:H2) were *eae* positive (≥99%), while serotype O104:H4 was mainly intimin gene (*eae*)-negative (99%) (Table 5.5). All serotypes O145:H-, O26:H-, O63:H6, O111:H-, O145:H34 and O125:H6 for which the information was reported were intimin gene (*eae*)-positive, though the number of isolates was very low (Table 5.5). Among intimin gene (*eae*)-positive STEC/VTEC serotypes, 63% of O157:H- were Shiga toxin gene *stx*1- and *stx*2-positive (Table 5.5). Serotypes O157:H7 (61%) and O145:H- (89%) were mainly Shiga toxin gene 2 (*stx*2)-positive (Table 5.5), whereas most of serotypes O103:H2 (98%) and O26:H11 (64%) were *stx*1 positive(Table 5.5).

The *eae*-negative STEC/VTEC serotypes accounted for 43% of the reported serotypes with known data (Table 5.5). Apart from serotype O104:H4, serotypes O91:H-, O91:H14, Orough:H-, O146:H21, O146:H28, O117:H7, O128:H2 and O76:H19 were mostly intimin gene (*eae*)-negative (>89%) (Table 5.5). Serotypes O91:H, O117:H7 and O91:H14 were mainly *stx*1 positive (>85%), whereas serotypes O104:H4 and O146:H28 were mostly *stx*2 positive (>95%). Serotypes O146:H21 and O128:H2 were more often *stx*1 and *stx*2 positive (over 49%) than *stx*1 positive (less than 27%) (Table 5.5).

The 20 most commonly reported STEC/VTEC O-antigen groups with virulence characterisation are shown in Annex E: Table E5.7. Information was reported for 7 712 isolates with the serogroup available (40.6 % of total confirmed cases 2010–2012). Eighty percent of the reported cases were intimin gene (*eae*)-positive.

Table 5.5. Shiga toxin genes of 20 most commonly reported STEC/VTEC serotypes by intimin (*eae*) subtypes, EU/EEA,2010–2012 (N=3 053)

Serotypes	Intimin (*eae*) positive (1 728)							Intimin (*eae*) negative (1 325)						
	stx1 positive		*stx2* positive		*stx1* & *stx2* positive		Total (N)	*stx1* positive		*stx2* positive		*stx1* & *stx2* positive		Total (N)
	N	%	N	%	N	%		N	%	N	%	N	%	
O157:H7	12	2.5	295	61.2	175	36.3	**482**	-	-	-	-	-	-	**-**
O157:H-	22	8.2	76	28.4	170	63.4	**268**	0	0.0	1	50.0	1	50.0	**2**
O104:H4	0	0.0	0	0.0	2	100.0	**2**	0	0.0	144	99.3	1	0.7	**145**
O26:H11	145	64.4	60	26.7	20	8.9	**225**	2	100.0	0	0.0	0	0.0	**2**
O103:H2	202	98.1	1	0.5	3	1.5	**206**	1	50.0	0	0.0	1	50.0	**2**
O63:H6	0	0.0	57	100.0	0	0.0	**57**	-	-	-	-	-	-	**-**
O145:H-	8	10.1	70	88.6	1	1.3	**79**	-	-	-	-	-	-	**-**
O117:H7	1	100.0	0	0.0	0	0.0	**1**	43	97.7	1	2.3	0	0.0	**44**
O91:H-	-	-	-	-	-	-	**-**	233	86.9	2	0.7	33	12.3	**268**
O26:H-	38	56.7	21	31.3	8	11.9	**67**	-	-	-	-	-	-	**-**
O146:H21	-	-	-	-	-	-	**-**	21	26.9	13	16.7	44	56.4	**78**
O128:H2	0	0.0	1	25.0	3	75.0	**4**	6	17.1	12	34.3	17	48.6	**35**
Orough:H-	10	83.3	0	0.0	2	16.7	**12**	72	71.3	14	13.9	15	14.9	**101**
O111:H-	24	60.0	9	22.5	7	17.5	**40**	-	-	-	-	-	-	**-**
O76:H19	0	0.0	0	0.0	1	100.0	**1**	28	73.7	0	0.0	10	26.3	**38**
O91:H14	-	-	-	-	-	-	**-**	42	97.7	0	0.0	1	2.3	**43**
O145:H34	0	0.0	15	100.0	0	0.0	**15**	-	-	-	-	-	-	**-**
O125:H6	0	0.0	12	100.0	0	0.0	**12**	-	-	-	-	-	-	**-**
O5:H-	16	94.1	0	0.0	1	5.9	**17**	2	33.3	0	0.0	4	66.7	**6**
O146:H28	-	-	-	-	-	-	**-**	0	0.0	36	94.7	2	5.3	**38**
Other serotypes*	106	44.2	108	45.0	26	10.8	**240**	172	32.9	203	38.8	148	28.3	**523**
Total	**584**	**33.8**	**725**	**42.0**	**419**	**24.2**	**1 728**	**622**	**46.9**	**426**	**32.2**	**277**	**20.9**	**1 325**

– Not reported/not calculated

** 'Other serotypes' includes 72 Intimin (eae) positive serotypes and 201 Intimin (eae) negative serotypes.*

Source: Austria, Belgium, Czech Republic, Denmark, France, Germany (Source: DE-NRZ-VTEC), Hungary, Ireland, Luxembourg, the Netherlands, Poland, Romania, Spain, Sweden, United Kingdom; EEA country: Norway

The 20 most commonly reported STEC/VTEC serotypes in EU/EEA countries in 2010–2012 by HUS syndrome and Shiga toxin genes *stx1* and *stx2* are listed in Table 5.6. Altogether, 15 countries (14 EU countries and Norway) provided data on HUS syndrome among STEC/VTEC cases, including information on O-antigen and serotype and Shiga toxin genes.

In the three-year period from 2010 to 2012, data on STEC/VTEC strains characterisation were reported for about 18% of all confirmed cases with information on HUS syndrome (N=15 083).

Among HUS cases (N=1 597, pooled data 2010–2012), information on strains characterisation (STEC/VTEC serotype and Shiga toxin genes) was available for 11% of the total reported. Overall, 33 serotypes were described, although 11 of the 20 most commonly reported serotypes were responsible for about 87% of HUS cases for which the information on characterisation was known (Table 5.6). Among HUS negative cases (N=13 486, pooled data 2010–2012), information on strains characterisation was available for 19% of the total reported. Overall, 252 serotypes were described, however the 20 most commonly reported serotypes were responsible for 75% of HUS negative cases for which the information was known (Table 5.6).

During 2010–2012, serotype O157:H7 was the most commonly reported in both groups, accounting for 36% and 11% of HUS and non-HUS cases, respectively (Table 5.6). Other serotypes frequently reported in both groups were O157:H-, O104:H4 and O26:H11, representing altogether the 44% and 27% of HUS and non-HUS cases, respectively (Table 5.6). The most frequently isolated STEC/VTEC serotypes among HUS cases (O157:H7, O157:H-, O104:H4 and O26:H11) were mainly *stx2* positive (>78%) (Table 5.6).

Serotype O104:H4 strains, originating mainly from a single outbreak, were *stx*2 positive both in HUS and non-HUS cases, and serotype O157:H7 was more often *stx2* positive (61%) than *stx*1 and *stx*2 positive (37%) (Table 5.6). Serotype O26:H11 was mainly *stx*1 positive (68%) rather than *stx*2 positive (25%) and serotypeO157:H-more often *stx*1 and *stx*2 positive (68%) than *stx*2 positive (23%) (Table 5.6).All confirmed STEC/VTEC cases due to serotypes O103:H2 and O91:H- were HUS negative and *stx*1 positive (>89%) (Table 5.6). Serotypes O91:H- accounted for 10% and serotype O103:H2 for about 8% of all reported non-HUS cases with information on serotype and Shiga toxins genes(Table 5.6).

The 20 most commonly reported STEC/VTEC O-antigen groups with HUS and virulence characterisation are shown in Annex E: Table E5.8. In the three-year period from 2010 to 2012, data on STEC/VTEC strains characterisation were reported for 39% (6 316 cases) of all confirmed cases with information on HUS syndrome and virulence. Majority of the reported cases (92%) were HUS negative. Among HUS cases and non-HUS cases 34 and 118 serogroups were described, respectively. However the 20 most commonly reported serogroups were responsible for 95% of the cases in both groups (Annex E: Table E5.8).

Table 5.6. Shiga toxin genes of 20 most commonly reported STEC/VTEC serotypes by HUS syndrome, EU/EEA countries, 2010–2012 (N=2 670)

Serotype	HUS positive (173)							HUS negative (2 497)						
	*stx*1 positive		*stx*2 positive		*stx*1 & *stx*2 positive		Total (N)	*stx*1 positive		*stx*2 positive		*stx*1 & *stx*2 positive		Total (N)
	N	%	N	%	N	%		N	%	N	%	N	%	
O157:H7	0	0.0	51	82.3	11	17.7	**62**	5	1.9	161	61.0	98	37.1	**264**
O157:H-	0	0.0	22	84.6	4	15.4	**26**	22	10.6	47	22.7	138	66.7	**207**
O104:H4	0	0.0	36	100.0	0	0.0	**36**	0	0.0	205	98.6	3	1.4	**208**
O26:H11	1	7.1	11	78.6	2	14.3	**14**	129	67.5	47	24.6	15	7.9	**191**
O103:H2	-	-	-	-	-	-	**-**	185	97.4	1	0.5	4	2.1	**190**
O63:H6	0	0.0	1	100.0	0	0.0	**1**	0	0.0	40	100.0	0	0.0	**40**
O145:H-	0	0.0	1	100.0	0	0.0	**1**	7	11.9	51	86.4	1	1.7	**59**
O117:H7	-	-	-	-	-	-	**-**	28	96.6	1	3.4	0	0.0	**29**
O91:H-	-	-	-	-	-	-	**-**	224	89.2	2	0.8	25	10.0	**251**
O26:H-	0	0.0	4	100.0	0	0.0	**4**	33	60.0	15	27.3	7	12.7	**55**
O146:H21	-	-	-	-	-	-	**-**	19	29.7	8	12.5	37	57.8	**64**
O128:H2	0	0.0	0	0.0	1	100.0	**1**	6	18.8	9	28.1	17	53.1	**32**
Orough:H-	-	-	-	-	-	-	**-**	79	72.5	14	12.8	16	14.7	**109**
O111:H-	0	0.0	3	75.0	1	25.0	**4**	22	66.7	5	15.2	6	18.2	**33**
O76:H19	-	-	-	-	-	-	**-**	26	74.3	0	0.0	9	25.7	**35**
O91:H14	1	100.0	0	0.0	0	0.0	**1**	36	97.3	0	0.0	1	2.7	**37**
O145:H34	-	-	-	-	-	-	**-**	0	0.0	14	100.0	0	0.0	**14**
O125:H6	-	-	-	-	-	-	**-**	0	0.0	9	100.0	0	0.0	**9**
O5:H-	1	100.0	0	0.0	0	0.0	**1**	15	75.0	0	0.0	5	25.0	**20**
O146:H28	-	-	-	-	-	-	**-**	0	0.0	30	96.8	1	3.2	**31**
Other Serotypes*	0	0.0	14	63.6	8	36.4	**22**	222	35.9	249	40.2	148	24.0	**619**
Total	**3**	**1.7**	**143**	**82.7**	**27**	**15.6**	**173**	**1 058**	**42.4**	**908**	**36.4**	**531**	**21.3**	**2 497**

– Not reported/not calculated

** 'Other serotypes' includes 13 HUS positive serotypes and 232 HUS negative serotypes.*

Source: Austria, Belgium, Czech Republic, Denmark, France, Germany (Source: DE-NRZ-VTEC), Hungary, Ireland, the Netherlands, Poland, Romania, Spain, Sweden, United Kingdom; EEA country: Norway

Serogroup O157 was separately analysed for sorbitol fermenting (SF) ability in HUS and non-HUS cases (Table 5.7). Altogether, 9 EU/EEA countries were able to provide data. In the three-year period from 2010 to 2012, information on HUS syndrome and SF ability was reported for 257 and 182 confirmed cases of serotype O157:H7 and O157:H-, respectively (Table 5.7). HUS cases accounted for 13% of all reported O157:H7 and O157:H- cases with information on HUS syndrome and sorbitol fermenting activity (N=439). Among sorbitol fermenting (SF) strains (n=31), HUS cases accounted for 26%, whereas among non SF strains (n=408) only 12% had HUS (Table 5.7). Sorbitol fermenting strains mainly belonged to serotype O157:H- among both HUS and non-HUS cases whereas non SF strains were mostly O157:H7, especially among HUS cases (Table 5.7).

Table 5.7. Sorbitol-fermenting ability of STEC/VTEC serogroup O157 by HUS syndrome, EU/EEA countries, 2010–2012 (N=439)

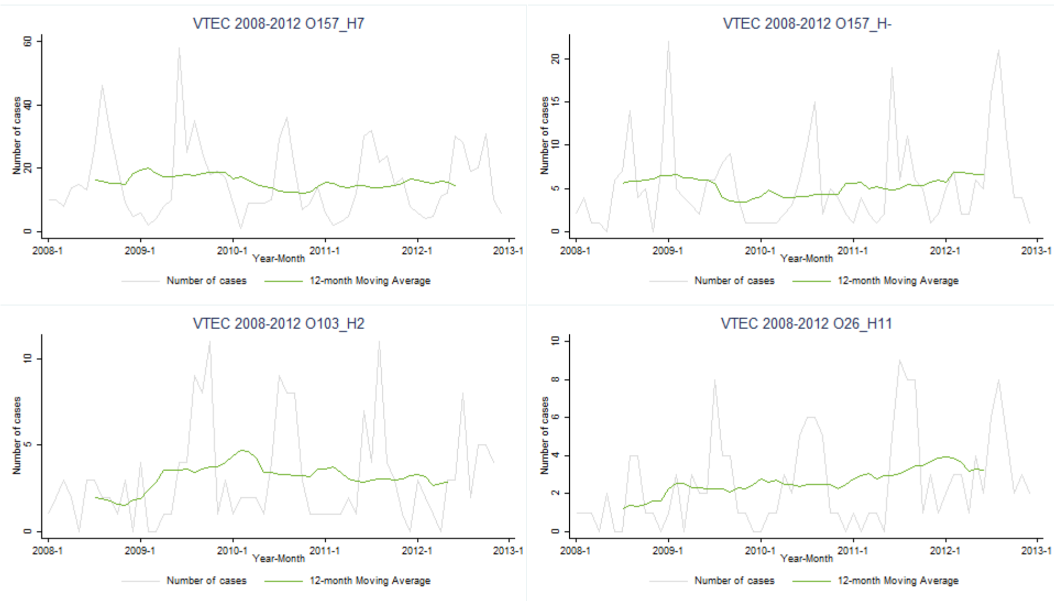
Serotype	HUS positive (56)				HUS negative (383)			
	Sorbitol fermenting (SF)		Non-sorbitol fermenting (NSF)		Sorbitol fermenting (SF)		Non-sorbitol fermenting (NSF)	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
O157:H7	1	12.5	42	87.5	2	8.7	212	58.9
O157:H-	7	87.5	6	12.5	21	91.3	148	41.1
Total	**8**	**100**	**48**	**100**	**23**	**100**	**360**	**100**

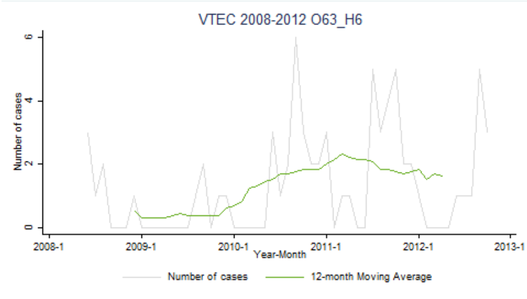
Source: Austria (from 2011), Belgium, Czech Republic, Germany, the Netherlands (only 2011), Poland (only 2010-2011), Romania (only 2010-2011) and Spain; EEA country: Norway

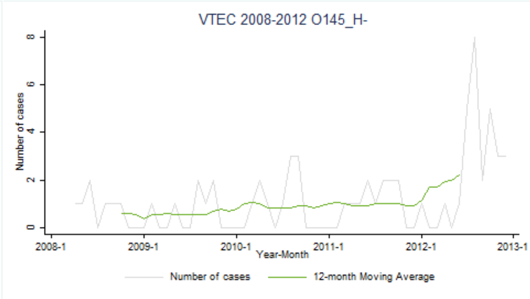
Trends by serotypes

Trends in number of reported cases were calculated from 2008 to 2012 for the six most commonly reported STEC/VTEC serotypes in 2012: O157:H7, O157:H-, O26:H11, O103:H2, O145:H- and O63:H6, and results are shown in Figure 5.12. Isolation of serotypes O157:H7, O157:H- and O103:H2 remained stable over the five-year period, while a significant increase was observed for serotypes O26:H11, O63:H6 and O145:H- (p-value<0.05) (Figure 5.12).

Figure 5.12. Trends in number of confirmed cases of six selected STEC/VTEC serotypes, (N=1 759; O157:H7 N=966, O157:H- N=321, O103:H2 N=182, O26:H11 N=155, O63:H6 N=69 and O145:H- N=66), EU/EEA countries, 2008–2012







Source: Austria, Belgium, Czech Republic, Denmark, France, Hungary, Ireland, Luxembourg, the Netherlands, Poland, Romania, Spain, Sweden, United Kingdom; EEA country: Norway

Serotypes by age group

The age distribution of confirmed STEC/VTEC cases was described for the five most commonly reported STEC/VTEC serotypes in 2012 (O157:H7, O157:H-, O26:H11, O103:H2 and O145:H-). The two most common serotypes O157:H7 and O157:H- were spread across all age groups and no significant differences were observed in their distribution, with the exception of adults aged between 25 and 64 years, where serotype O157:H7 was predominant (Table 5.8). During 2010–2012, about 60% of cases caused by serotype O26:H11 were younger than five year of age and about 20% were older than 45 years (Table 5.8). Serotype O103:H2 was mainly isolated from cases under the age of 15 year (66% of total reported O103:H2). Infections due to serotype O145:H- occurred especially in aged 1–4 years and 15–24 years (42% and 21% of total O145:H- reported, respectively).

Table 5.8. Age distribution of the five most commonly reported serotypes*, EU/EEA countries, 2010–2012 (N=1 002)

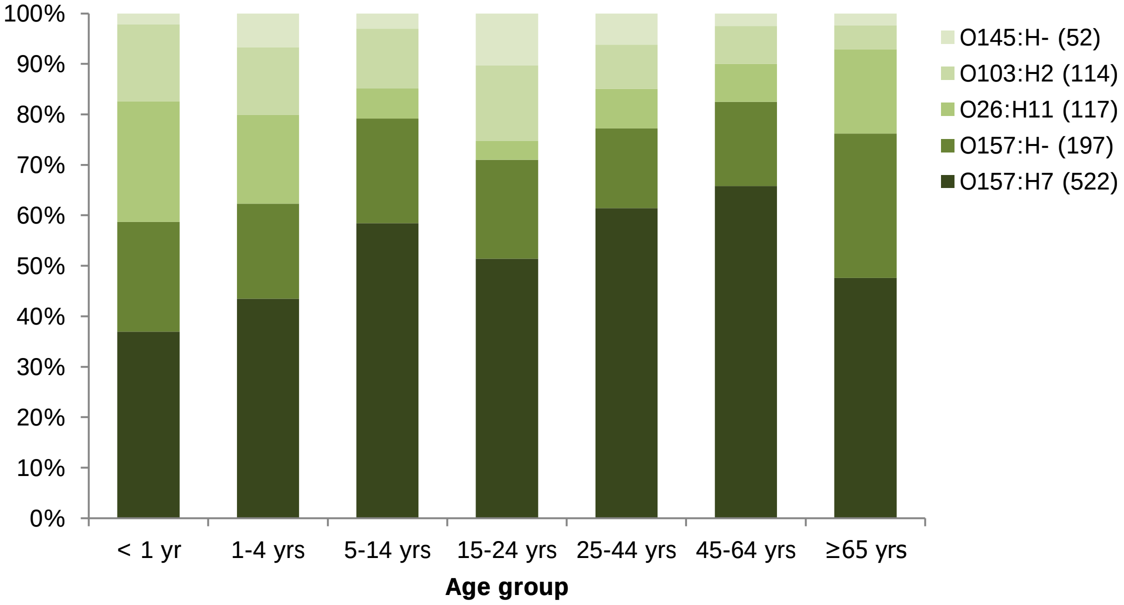
Age groups	O157:H7		O157:H-		O26:H11		O103:H2		O145:H-	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
< 1 yr	17	3.3	10	5.1	11	9.4	7	6.1	1	1.9
1–4 yrs	143	27.4	62	31.5	58	49.6	44	38.6	22	42.3
5–14 yrs	118	22.6	42	21.3	12	10.3	24	21.1	6	11.5
15–24 yrs	55	10.5	21	10.7	4	3.4	16	14.0	11	21.2
25–44 yrs	70	13.4	18	9.1	9	7.7	10	8.8	7	13.5
45–64 yrs	79	15.1	20	10.2	9	7.7	9	7.9	3	5.8
≥ 65 yrs	40	7.7	24	12.2	14	12.0	4	3.5	2	3.8
Total	**522**	**100.0**	**197**	**100.0**	**117**	**100.0**	**114**	**100.0**	**52**	**100.0**

** In 2012 reporting*

Source: Austria, Belgium, Czech Republic, Denmark, France, Hungary, Ireland, Luxembourg, the Netherlands, Poland, Romania, Spain, Sweden, United Kingdom; EEA country: Norway

With regard to the relative distribution of selected STEC/VTEC serotypes, the risk of infection by serotype O157:H7 was highest in all age groups, peaking in the age group 45–64, where it accounts for 66% of all reported cases (Figure 5.13; Annex E: Table E5.9). Among infants, 37% of cases was covered by serotype O157:H7, 24% by serotype O26:H11 and 22% by serotype O157:H- (Figure 5.13; Annex E: Table E5.9). Serotype O157:H- was responsible for 30% of cases older than 65 year of age and serotype O26:H11 was isolated at the same proportion in cases aged 1–4 years and older than 65 years (about 20% of cases) (Figure 5.13; Annex E: Table E5.9). Serotype O103:H2 was isolated from 13 % of cases aged less than 25 years, whereas it covered only 7% of cases over the age of 25 year (Figure 5.13; Annex E: Table E5.9). The serotype O145:H- was responsible for 10% of cases among young adults between 15 and 24 year of age (Figure 5.13; Annex E: Table E5.9).

Figure 5.13. Relative distribution of the five most commonly reported serotypes* by age groups as reported by EU/EEA countries, 2010–2012 (N=1 002)



** 2012 reporting*

Source: Austria, Belgium, Czech Republic, Denmark, France, Hungary, Ireland, Luxembourg, the Netherlands, Poland, Romania, Spain, Sweden, United Kingdom; EEA country: Norway

Seasonality by serotypes

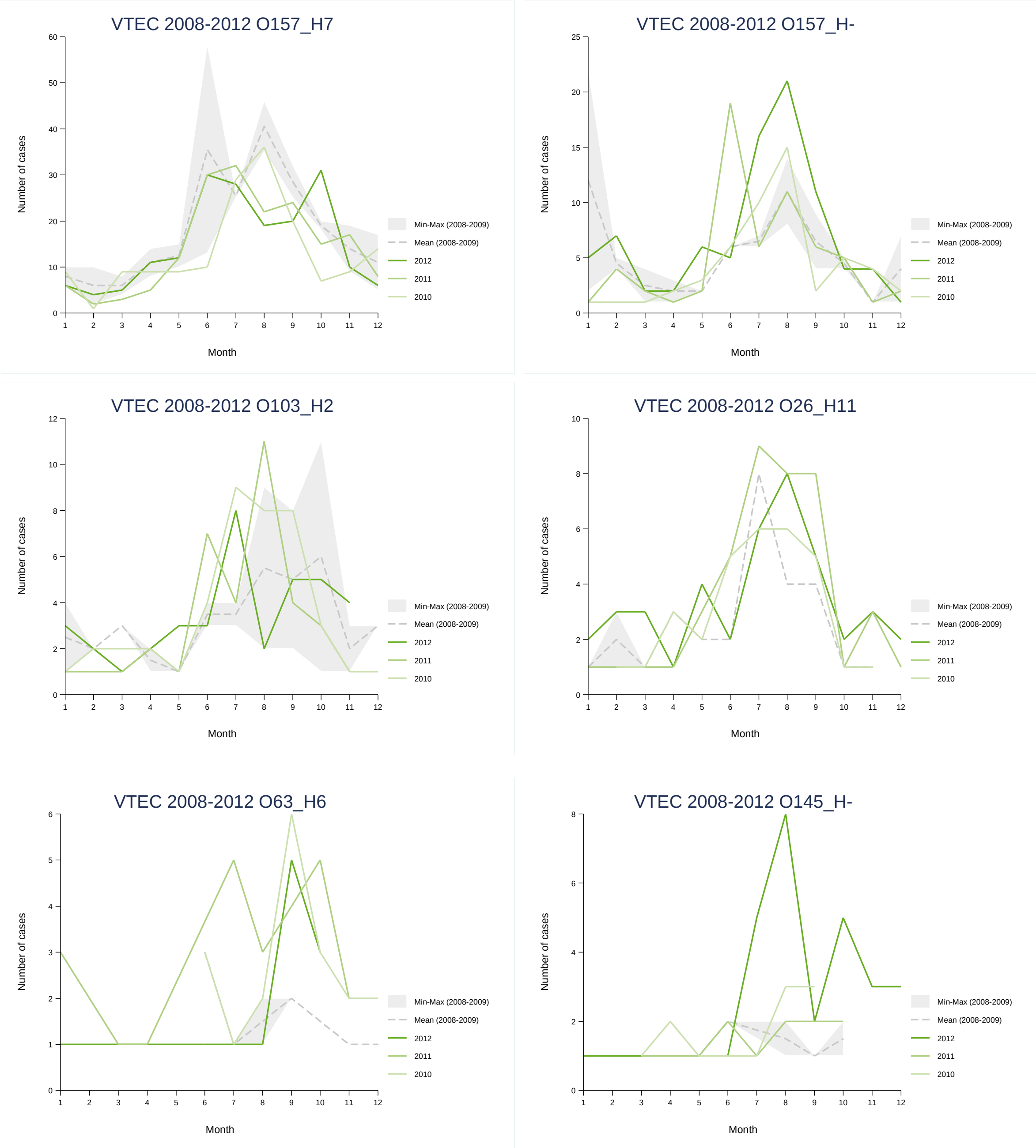
Seasonality was analysed for the six most commonly reported STEC/VTEC serotypes in 2012 (O157:H7, O157:H-, O26:H11, O103:H2, O145:H- and O63:H6) (Figure 5.14).

Serotypes O157:H7 and O157:H- showed some seasonality, with a general increase in reported cases during the summer (Figure 5.14). STEC/VTEC cases of serotype O157:H7 start increasing in spring and seem to have a peak between June and August; in 2012, a second peak of cases in October was also recorded. The lowest number of cases was notified in February and some variability when comparing data with the previous two years (2008–2009) was observed during late summer and autumn (Figure 5.14).The majority of STEC/VTEC infections caused by serotype O157:H- usually occur in August, however in 2011, cases peaked in June (Figure 5.14). A minor increase of O157:H- cases was also reported during winter (November–February), though some variability was found when comparing data with the period 2008–2009 (Figure 5.14).

Serotypes O103:H2 and O26:H11 also showed some seasonality (Figure 5.14), although the number of reported cases by season was low and interpretations should be made with caution. Cases of serotype O26:H11 peaked between July and September and smaller increases between November and February were also reported (Figure 5.14). The seasonal distribution of serotype O103:H2 was characterised by a high variability when comparing data with the period 2008–2009. During 2010–2012, cases mostly occurred between June and August, whereas in the previous period (2008–2009) cases peaked between August and October (Figure 5.14).

Cases of serotypes O63:H6 and O145:H- did not show any clear seasonal pattern during 2010–2012, although the number of reported cases by season was very limited which suggests that any interpretations should be made with appropriate caution (Figure 5.14).

Figure 5.14. Seasonal distribution of six selected STEC/VTEC serotypes (N=1 759; O157:H7 N=966, O157:H- N=321, O103:H2 N=182, O26:H11 N=155, O63:H6 N=69 and O145:H- N=66), EU/EEA countries, 2008–2012



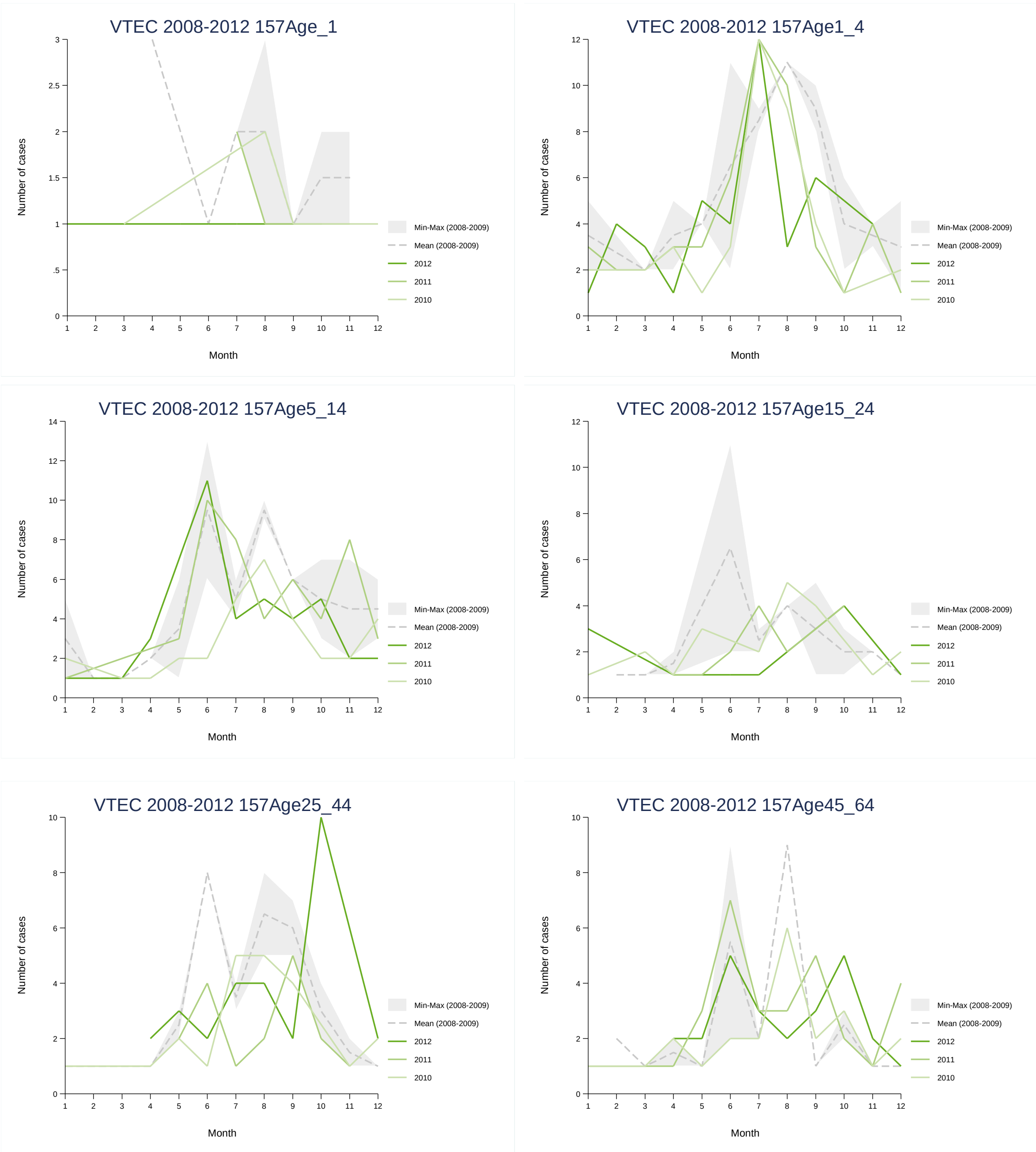
Source: Austria, Belgium, Czech Republic, Denmark, France, Hungary, Ireland, Luxembourg, the Netherlands, Poland, Romania, Spain, Sweden, United Kingdom; EEA country: Norway

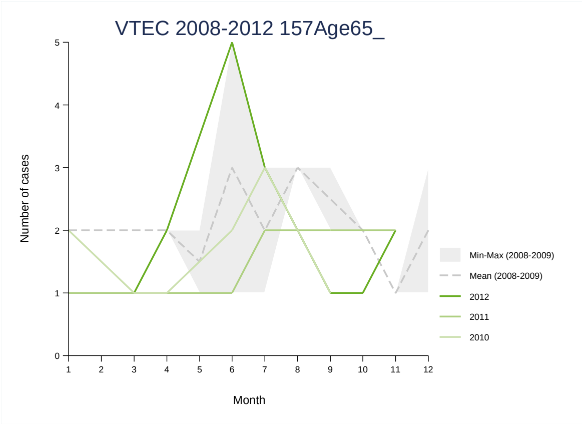
Seasonality by serotype and age group

Seasonality by age group was analysed for the most commonly reported serotypes but too few cases were reported for serotypes other than O157:H7 to properly evaluate the seasonal pattern by age group. Results on seasonal analysis for serotype O157:H7 are shown in figure 5.15.

A clear summertime seasonal pattern was observed in children aged 1 to 4 years. The number of cases started increasing in April and peaked in July (Figure 5.15). Most of cases between 5 and 14 years of age occurred in summertime, peaking in June. However, in 2011 an increase of cases was reported in November and a high variability was observed when comparing data with the period 2008–2009 (Figure 5.15). Children less than one year of age, adults aged 15–44 years and older than 65 showed no clear seasonality, due to the low number of cases reported (Figure 5.15).Two peaks were recorded in those aged between 45 and 64 years, one in late spring/early summer and the second in fall. The increase of case during autumn was not observed in 2008–2009 (Figure 5.15).

Figure 5.15. Seasonal distribution of STEC/VTEC serotype O157:H7 by age groups (N=9 184), EU/EEA countries, 2008–2012





Source: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Romania, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Severity

The severity of STEC/VTEC was evaluated by analysing at the hospitalisation ratio, the proportion of HUS cases, the symptoms in HUS cases, and the proportion of deaths due to STEC/VTEC infection (outcome) among all confirmed STEC/VTEC cases, as well as in HUS cases, by calculating the case–fatality ratio. The specimen type used for diagnosis of the infection was also analysed. Relative confidence intervals (95% CI) were calculated when analysing the hospitalisation ratio and the case–fatality ratio (CFR) and results were described on a country basis (Annex E: Tables E5.10, E5.9, E5.13).

Hospitalisation

Hospitalisation data were first added to EU-level surveillance for STEC/VTEC in 2009. During 2010–2012, the information on hospitalisation was reported for only 28% of confirmed STEC/VTEC cases. The number of reporting countries increased from 11 in 2010 to 16 in 2012 (Annex E: Table E5.10).

At EU/EEA level, the proportion of hospitalised cases remained quite stable over the three-year period to 2011, ranging between 34% (CI 95%:32%–36%) and 38.8% (CI 95%: 35.7%–42%) (Table 5.9). The highest hospitalisation ratios (80-100 % of cases hospitalised) were observed in countries that reported either a low number of confirmed STEC/VTEC cases or a low proportion cases for which the information on hospitalisation was known (Belgium, Estonia, Greece, Italy, Romania and Poland) (Annex E: Table E5.10). It indicates that the surveillance systems in these countries focus on more severe cases.

Table 5.9. Hospitalisation ratio of confirmed STEC/VTEC cases in EU/EEA countries, 2010–2012

Hospitalisation	Year		
	2010	2011	2012
Number of confirmed cases	3710	9536	5748
Confirmed cases covered (%)[1]	25.6	22.8	38.1
Hospitalised cases	369	737	800
Hospitalisation ratio (%)[2] (confidence interval 95%)	38.8 (35.7–42.0)	34.0 (32.0–36.0)	36.5 (34.5–38.6)

[1] The proportion (%) of confirmed cases for which information on hospitalisation was available.

[2] Calculated as number of hospitalised cases of the confirmed cases for which this information was available.

Source: Austria, Belgium, Czech Republic, Estonia, Greece, Hungary, Ireland, Italy, Lithuania (from 2011), Malta (only 2011), the Netherlands (from 2011), Poland, Romania, Slovenia (from 2011), United Kingdom; EEA country: Norway

Haemolytic uremic syndrome (HUS)

Altogether, 21 countries (20 EU countries plus Norway) provided data on HUS among STEC cases during 2010–2012(Annex E: Table E5.11). HUS information was available for 79% of the total STEC/VTEC cases reported during 2010–2012 (Table 5.10). Overall, in 2010–2012, HUS syndrome was reported in about 11% of the cases with known data. The proportion of HUS cases among reported STEC/VTEC infections peaked in 2011 (12%), although the completeness for this variable was higher in this reporting year (Table 5.11; Annex E: Table E5.11). The proportion of HUS syndrome among STEC/VTEC cases at EU/EEA level remained relatively unchanged, at around 90%in 2010 and 2012 (Table 5.10).

At country level, the proportion of HUS cases notably increased in 2011 in Germany and in Hungary, though in Hungary very few confirmed STEC/VTEC cases were reported (Annex E: Table E5.11). A rise in the proportion of

HUS syndrome in 2011 was also observed in Slovenia and Norway, although completeness for this variable was lower in 2011 compared with 2010 and 2012 (Annex E: Table E5.11).

Table 5.10. HUS syndrome among reported STEC/VTEC cases, EU/EEA, 2010–2012

HUS	2010		2011		2012		Total	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
Yes	231	8.2	1011	11.9	356	9.5	1 598	10.6
No	2 601	91.8	7 513	88.1	3 372	90.5	13 486	89.4
Total known	**2 832**	**100.0**	**8 524**	**100.0**	**3 728**	**100.0**	**15 084**	**100.0**
Unknown/missing	879	23.7	1 012	10.6	2 020	35.1	3 911	20.6
Total reported	**3 711**		**9 536**		**5748**		**18 995**	

Source: Austria, Belgium, Czech Republic, Denmark, Estonia (from 2011), France, Germany, Greece, Hungary, Ireland, Italy, Malta (only 2010-2011), the Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA country: Norway

Seventeen countries reported data on symptoms in HUS and non-HUS cases during 2010–2012. The proportion of cases with bloody diarrhoea was about two times higher in HUS than non-HUS cases (Table 5.11). Among HUS cases in 2012, the proportion of cases with bloody diarrhoea was lower (57%) than in 2010 and 2011 (75% and 80%, respectively) (Annex E: Table E5.12a). Among HUS negative cases, a higher proportion of cases with bloody diarrhoea (44%) were reported in 2011 as compared with 2010 and 2012 (26% and 28%, respectively) (Annex E: Table E5.12b).

Table 5.11. Symptoms reported for STEC/VTEC-related HUS and non-HUS cases, EU/EEA, 2010–2012

Symptom	HUS positive cases		HUS negative cases		Total STEC/VTEC cases	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
Bloody diarrhoea	746	75.1	4 101	37.0	4 847	40.1
Diarrhoea	248	24.9	6 992	63.0	7 240	59.9
Total	**994**	**100.0**	**11 093**	**100.0**	**12 087**	**100.0**

Source: Austria, Belgium, Czech Republic, Denmark, Germany, Greece, Hungary, Ireland, Italy, Malta, the Netherlands, Poland, Romania, Slovenia, Spain, United Kingdom; EEA country: Norway

Outcome

Twenty countries (19 EU countries plus Iceland and Norway) reported data on outcome (alive/dead) in 2010–2012 for 68% of confirmed STEC/VTEC cases (Table 5.12, Annex E: Table E5.13). The proportion of unknown data (including missing data) was approximately 40% in 2010 and 2012, and approximately 20% in 2011 (Table 5.12). To estimate the case–fatality ratios, only countries that reported information on outcome for at least one case were included. Only cases with known outcome were considered. Case–fatality ratio was calculated as the number of deaths/number of cases with a known outcome.

Based on known data only, the case–fatality ratio associated with STEC/VTEC cases at the EU/EEA level in 2011 was about two times higher than in 2010 and 2012, although this difference was not statistically significant (Table 5.12). The increase in CFR observed at the EU/EEA level was mainly driven by Germany where the number of deaths drastically rose from 2 in 2010 (CFR: 0.21; 95%CI: 0.03–0.76) to 50 in 2011 (CFR: 0.92; 95%CI: 0.68–1.21) (Annex E: Table E5.13). Among HUS cases, the case–fatality ratio in the EU/EEA was stable during the three-year period from 2010 to 2012, ranging between 3.2%–4.1% (Table 5.13).

Table 5.12. Number of deaths and case–fatality ratio of confirmed STEC/VTEC cases in EU/EEA countries, 2010–2012

Outcome	Year		
	2010	2011	2012
Number of confirmed cases	3 710	9 536	5 748
Confirmed cases covered (%)[1]	56.8	78.9	58.7

Outcome	Year		
	2010	2011	2012
Number of deaths	8	56	12
Case–fatality ratio (%)[2] (confidence interval 95%)	0.38 (0.16–0.75)	0.74 (0.56–0.97)	0.36 (0.18–0.62)

[1] The proportion (%) of confirmed cases for which information on death was available.

[2] Calculated as number of fatal cases of the confirmed cases for which this information was available.

Source: Austria, Belgium (from 2012), Czech Republic, Denmark, Estonia, France(from 2012), Germany, Greece(from 2011), Hungary, Ireland, Italy, Lithuania (from 2011), Malta, the Netherlands, Poland, Romania, Slovakia, Slovenia, United Kingdom; EEA country: Norway

Table 5.13. Number of deaths and case–fatality ratio of confirmed STEC/VTEC-related HUS cases in EU/EEA countries, 2010–2012

Outcome for HUS cases	Year		
	2010	2011	2012
Number of confirmed cases	231	1 011	356
Confirmed cases covered (%)[1]	53.0	80.6	43.5
Number of deaths	5	31	5
Case–fatality ratio (%)[2] (confidence interval 95%)	4.1 (1.3–9.3)	3.8 (2.6–5.4)	3.2 (1.1–7.4)

[1] The proportion (%) of confirmed cases for which information on death was available.

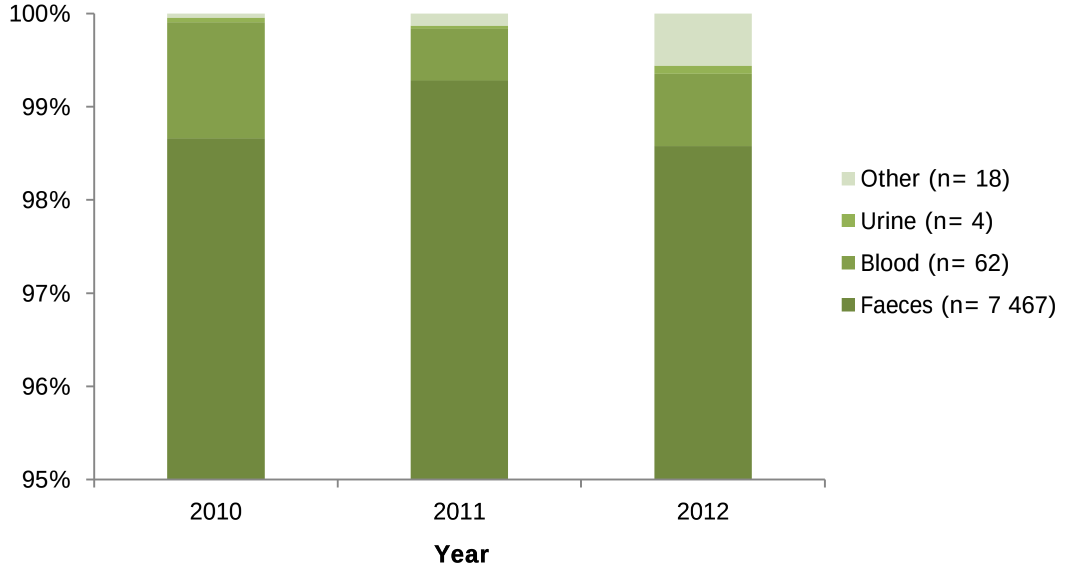
[2] Calculated as number of fatal cases of the confirmed cases for which this information was available.

Source: Austria, Belgium (from 2012), Czech Republic, Denmark, France (from 2012), Germany, Hungary, Ireland, Italy, the Netherlands, Poland, Slovenia, United Kingdom; EEA country: Norway

Isolation by specimen type

Information on specimen type was reported by 22 countries (20 EU countries plus Iceland and Norway) for a total of 7 551 (40%) confirmed STEC/VTEC cases in 2010–2012. The distribution of specimen types used for laboratory confirmation of STEC/VTEC infections did not differ significantly during 2010–2012 (Annex E: Table E5.14). The most common diagnostic specimen was faeces, representing the 99% of all specimen types reported in 2010–2012 (n=7 467, pooled data). The second most frequently reported specimen was blood, however this was in very low numbers 0.01% (n=62, pooled data in 2010–2012). Information on distribution of specimen type is presented in Figure 5.16.

Figure 5.16. Distribution of confirmed STEC/VTEC cases diagnosed from different specimen type as reported by EU/EEA countries in 2010–2012 (N=7 551)



Source: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Greece, Hungary, Italy, Lithuania, Luxemburg, Malta, the Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, United Kingdom; EEA country: Norway

Antimicrobial resistance

During 2010–2012, antimicrobial susceptibility testing (AST) results were submitted by 13 countries (12 EU/EEA countries) for only 596 STEC/VTEC isolates (3% of total reported in 2010–2012). Belgium, Slovenia, Spain and the United Kingdom reported 89% of isolates with AST results. The information provided was marginally more complete among some antimicrobials; data on ampicillin and ciprofloxacin were reported for more than 98% of isolates with data available, whereas about 78% of isolates had information on streptomycin and kanamycin (Table 5.14). The interpretation on the antimicrobial susceptibility testing submitted by EU/EEA countries in 2010–2012 is shown in Table 5.14 by antimicrobial agents. The number of isolates tested and the proportion of resistant isolates are presented.

On the whole, the highest resistance level among STEC/VTEC isolates was reported for streptomycin, sulfonamides, ampicillin and tetracyclines for which more than 20% of tested strain showed resistance to in 2010–2012 (Table 5.14). Among countries reporting AST results on 20 or more isolates, the highest proportion of resistant strains to ampicillin was reported by the United Kingdom (28%), followed by Belgium (23%), Spain (22%) and Slovenia (15%). The percentage of isolates resistant to ampicillin was below 10% in only Luxembourg (Table 5.14). Spain reported the highest proportion of resistant STEC/VTEC isolates to streptomycin, sulphonamides and tetracyclines (35%, 35% and 33%, respectively), followed by Belgium (26%, 23% and 19% respectively) (Table 5.14).

Altogether, countries reported levels of resistance to trimethoprim (co-trimoxazole) of about 16% and to kanamycin of about 9% (Table 5.14). Among countries reporting SIR information on 20 or more isolates, the highest level of resistance to trimethoprim (co-trimoxazole) were reported by United Kingdom (23%) and Spain (20%). Belgium reported the highest proportion of resistant isolates to kanamycin (13%), followed by Slovenia (9%) (Table 5.14). Overall, less than 6% of tested isolates showed resistance against cefotaxime, gentamicin, chloramphenicol, ciprofloxacin and nalidixic acid (Table 5.14). Among countries reporting SIR information on 20 or more isolates, Slovenia and Spain reported about 5% and 6% of strains resistant to nalidixic acid, respectively. A low level of resistance to chloramphenicol was reported by Belgium (5%) followed by Spain (4%). The percentage of isolates resistant to ciprofloxacin and cefotaxime was below 2% in Slovenia, Spain and the United Kingdom. No strains resistant to gentamicin were reported in Hungary, Luxembourg, Slovenia and the United Kingdom during the three-year period (Table 5.14).

Combined resistance to three or more antimicrobial agents (multi-drug resistance) was reported for about 22% (n=131) of STEC/VTEC isolates during 2010–2012 (Table 5.15). Overall, the highest proportion of multi-drug resistant (MDR) strains (2.2%) was reported for three specific antibiogram combinations: AKSuST (ampicillin, kanamycin, sulphonamides, streptomycin and tetracyclines), SuST (sulphonamides, streptomycin and tetracyclines) and AKSuSTmT (ampicillin, kanamycin, sulphonamides, streptomycin, trimethoprim and tetracyclines) (Table 5.16). Information on origin of infection was available for 39 MDR cases (30%). Infections with MDR strains were mostly acquired domestically (85%) and only six cases were related to travel (four cases to other European countries and two cases outside Europe). Information on HUS was reported for 106 MDR cases (81%). MDR strains were mostly isolated from HUS negative cases (86%). About 50% of all MDR cases was due to serogroup O157, in particular, serotype O157:H7 accounted for 33% and O157:H for 17%. No particular association were observed between multi-drug resistance and *stx* genes, *vtx1* (73%) and *vtx2* (71%) were evenly distributed and 44% of the strains showed both genes. Ninety per cent of MDR strains were reported by Belgium, Spain and Slovenia, thus any interpretation of results should be made with caution.

Table 5.14. Resistance of STEC/VTEC isolates to different antimicrobial agents by EU/EEA countries, 2010–2012

Antimicrobial agent	Ampicillin		Chloramphenicol		Ciprofloxacin		Cefotaxime		Gentamicin		Kanamycin		Nalidixic acid		Sulphonamides		Streptomycin		Trimethoprim (co-trimoxazole)		Tetracyclines	
Country	Res** (%)	Total* (N)	Res** (%)	Total* (N)	Res** (%)	Total* (N)	Res** (%)	Total* (N)	Res** (%)	Total* (N)	Res** (%)	Total* (N)	Res** (%)	Total* (N)	Res** (%)	Total* (N)	Res** (%)	Total* (N)	Res** (%)	Total* (N)	Res** (%)	Total* (N)
Belgium	22.6	283	4.6	282	6.7	282	7.1	281	6.0	282	12.8	282	2.1	283	23.0	283	25.5	282	12.8	180	19.1	282
Greece	100.0	1	-	-	0.0	1	100.0	1	-	-	-	-	100.0	1	-	-	100.0	1	100.0	1	100.0	1
Hungary	22.2	18	5.9	17	0.0	18	0.0	18	0.0	17	0.0	17	5.6	18	0.0	18	5.9	17	5.9	17	11.1	18
Lithuania	0.0	2	0.0	2	0.0	2	0.0	2	0.0	2	-	-	-	-	-	-	-	-	0.0	2	-	-
Luxembourg	9.5	21	0.0	21	0.0	21	0.0	21	0.0	21	0.0	21	0.0	21	14.3	21	14.3	21	14.3	21	9.5	21
Malta	25.0	4	-	-	25.0	4	-	-	25.0	4	-	-	-	-	-	-	-	-	25.0	4	-	-
Poland	50.0	6	0.0	6	0.0	6	50.0	6	0.0	6	0.0	6	50.0	6	66.7	6	66.7	6	50.0	6	66.7	6
Romania	20.0	5	0.0	5	0.0	5	0.0	5	0.0	5	20.0	5	0.0	5	60.0	5	40.0	5	40.0	5	40.0	5
Slovakia	80.0	5	-	-	0.0	3	0.0	3	0.0	3	-	-	-	-	-	-	-	-	-	-	20.0	5
Slovenia	15.2	66	1.5	66	0.0	66	1.5	66	0.0	66	9.1	66	4.5	66	19.7	66	16.7	66	4.5	66	15.2	66
Spain	21.7	69	4.3	69	0.0	69	1.4	69	4.3	69	1.4	69	5.8	69	34.8	69	34.8	69	20.3	69	33.3	69
United Kingdom	28.1	114	0.0	2	0.0	111	0.0	2	0.0	45	-	-	0.0	62	-	-	-	-	22.9	105	0.0	1
Iceland	0.0	2	-	-	0.0	2	0.0	2	0.0	2	-	-	-	-	-	-	-	-	0.0	2	-	-

Antimicrobial agent	Ampicillin		Chloramphenicol		Ciprofloxacin		Cefotaxime		Gentamicin		Kanamycin		Nalidixic acid		Sulphonamides		Streptomycin		Trimethoprim (co-trimoxazole)		Tetracyclines	
Country	Res** (%)	Total* (N)	Res** (%)	Total* (N)	Res** (%)	Total* (N)	Res** (%)	Total* (N)	Res** (%)	Total* (N)	Res** (%)	Total* (N)	Res** (%)	Total* (N)	Res** (%)	Total* (N)	Res** (%)	Total* (N)	Res** (%)	Total* (N)	Res** (%)	Total* (N)
Total	23.0	596	3.8	470	3.4	590	5.5	476	4.0	522	9.4	466	3.4	531	23.9	468	25.3	467	15.7	478	20.9	474

**Total indicates the total number of isolates with SIR information available*

*** Res (%) = Proportion of resistant strains (total number of resistant strains out of all the tested strains)*

– Not reported/not calculated

Table 5.15. Multidrug resistance of STEC/VTEC isolates to antimicrobials, EU/EEA countries, 2010–2012

Resistance profile	2010		2011		2012		2010–2012	
	Res* (N)	Res* (%)	Res* (N)	Res* (%)	Res* (N)	Res* (%)	Res* (N)	Res* (%)
Susceptible to all	73	39.7	93	49.7	47	20.4	213	35.4
Multidrug resistant [a]	42	22.8	43	23.0	46	20.0	131	21.8
Others**	69	37.5	51	27.3	137	59.6	257	42.8
Total~	**184**	**100.0**	**187**	**100.0**	**230**	**100.0**	**601**	**100.0**

** Res= Number and proportion of resistant strains (total number of resistant strains out of all the tested strains)*

a 'Multidrug resistant' includes isolates classified as 'intermediate' and 'resistant' to three or more antimicrobial classes.

*** Others includes isolates classified as 'intermediate' and 'resistant' to less than three antimicrobial classes*

~Total indicates the total number of isolates with multidrug information available

Source: Belgium, Estonia, Greece, Hungary, Lithuania, Luxembourg, Malta, Poland, Romania, Slovakia, Slovenia, Spain, United Kingdom; EEA countries: Iceland

Table 5.16. Multidrug resistance profiles of STEC/VTEC isolates, EU/EEA countries, 2010–2012

Antimicrobial agent	Resistant type	2010			2011			2012			2010–2012		
		Res** (N)	Total* (N)	Res** (%)	Res** (N)	Total* (N)	Res** (%)	Res** (N)	Total* (N)	Res** (%)	Res** (N)	Total* (N)	Res** (%)
AMP, KAN, SSS, STR, TCY	AKSuST	2	184	1.1	2	187	1.1	9	230	3.9	13	601	2.2
SSS, STR, TCY	SuST	4	184	2.2	2	187	1.1	7	230	3.0	13	601	2.2
AMP, SSS, STR, TCY	ASuST	1	184	0.5	2	187	1.1	7	230	3.0	10	601	1.7
AMP, SSS, STR	ASuS	0	184	0.0	3	187	1.6	3	230	1.3	6	601	1.0
AMP, CIP, NAL, CTX, GEN, KAN, STR	ANCtGKS	5	184	2.7	0	186	0.0	0	230	0.0	5	600	0.8
AMP, CIP, NAL, CTX, GEN, KAN	ANCtGK	4	184	2.2	0	186	0.0	0	230	0.0	4	600	0.7
AMP, CIP, NAL, CTX,SSS,STR, STX, TCY	ANCtSuSTmT	0	184	0.0	4	186	2.2	0	230	0.0	4	600	0.7
CIP, NAL, CTX, GEN	NCtG	3	184	1.6	0	186	0.0	0	230	0.0	3	600	0.5
AMP, KAN, SSS, STR, STX, TCY	AKSuSTmT	2	184	1.1	9	187	4.8	0	128	0.0	11	499	2.2
AMP, SSS, STR, STX TCY	ASuSTmT	1	184	0.5	5	187	2.7	4	128	3.1	10	499	2.0
SSS, STR, STX, TCY	SuSTmT	2	184	1.1	2	187	1.1	2	128	1.6	6	499	1.2
AMP, SSS, STR, STX	ASuSTm	1	184	0.5	2	187	1.1	0	128	0.0	3	499	0.6
	Total	**25**			**31**			**32**			**88**		
Other multidrug resistant isolates~		17			12			14			43		
Total multidrug resistant		**42**			**43**			**46**			**131**		

~ Others includes isolates classified as 'intermediate' and 'resistant' to other specific antibiogram profiles

** Total indicates the total number of isolates with multidrug information available*

*** Res= Number and proportion of resistant strains (total number of resistant strains out of all the tested strains)*

Source: Belgium, Estonia, Greece, Hungary, Lithuania, Luxembourg, Malta, Poland, Romania, Slovakia, Slovenia, Spain, United Kingdom; EEA countries: Iceland

Discussion

The EU/EEA notification rate of STEC/VTEC infections increased significantly between 2008 and 2012, confirming the trend observed in Europe since 2006 [1-4]. Overall, 18 994 confirmed STEC/VTEC cases were reported between 2010 and 2012. An important increase in STEC/VTEC cases was recorded in 2011, due to a large enteroaggregative Shiga toxin-producing *E. coli* STEC/VTEC outbreak caused by serotype O104:H4, primarily occurring in Germany but having cases in an additional 15 countries [1-4, 5, 6, 7]. An increasing number of confirmed STEC/VTEC cases were observed in 2012 possibly as an effect of increased awareness and improved capacity in EU/EEA countries following the outbreak [8]. Several countries showed a continuous upward five-year trend, and only one country observed a significant decreasing trend in 2008–2012.

The 2011 outbreak was associated with the consumption of contaminated raw sprouted seeds and affected more than 3 800 persons in Germany and over 100 cases in additional 15 countries in Europe and North America [1-2]. Cases involved in the outbreak were predominantly adults, mainly women [4,9]. The O104:H4 strain is usually rare in Europe and was previously considered of limited pathogenic potential in humans due to its low occurrence. This serotype proved to be highly virulent on the occasion of the 2011 outbreak, presenting features common to the enteroaggregative *E. coli* (EAEC) pathotype and being responsible for the largest HUS outbreak ever reported [5-7, 9-10-]

The European data reported in 2011 reflected the occurrence of this large outbreak. Compared with 2010 and 2012 data, a lower proportion of younger cases was reported and a female predominance was observed in the age-group older than 15 years of age. In 2011, the proportion of reported HUS cases among STEC/VTEC infection peaked to 12% and the proportion of cases with bloody diarrhoea among HUS negative cases was about twice higher than in 2010 and 2012. At the EU/EEA level, in 56 STEC/VTEC-related deaths reported in 2011 and, based on known data only, the associated CFR was about two times higher than in 2010 and 2012. In 2010–2012, reported strains of serotype O104:H4 were mainly intimin gene (*eae*)-negative and *stx*2 positive in both HUS and non-HUS cases.

The STEC/VTEC O104:H4 outbreak highlighted the need for improving hygiene and prevention in food of non-animal origin, leading to changes in the European legislation on food hygiene related to VTEC. In particular, changes included the enforcement of existing rules and the introduction of specific rules for sprouts, such as traceability of sprouts and seeds, import certification approval of sprouts establishments, and setting of VTEC food safety criterion for sprouts [3-4]. However, even without the 2011 data, the European Union trend for STEC/VTEC *Escherichia coli* infections increased significantly during 2008–2010 [2].

The increase in the number of reported cases in 2012 compared with 2010 may be partially explained by a generally increased awareness of the disease, as well as increased detection and reporting by countries as a result of the 2011 outbreak. The greatest country-specific increase in the trend of confirmed STEC/VTEC cases was observed in Ireland and in the Netherlands. The increase in Ireland in the last few years has primarily been due to non-O157 VTEC cases, and has coincided with continuing changes in diagnostics in primary hospital laboratories during this time [18]. In the Netherlands, the increase is in part caused by more laboratories testing for all VTEC instead of VTEC O157 only, and the introduction of PCR for VTEC detection [2,11]. Also, a steady increase was seen in the reporting of travel-related cases compared to domestically-acquired infections, although only 14% of cases with known origin were related to travel. Most of the imported cases could be traced to non-EU countries, mainly to Egypt and Turkey. The highest proportions of travel-related cases were observed in Denmark (28%), Norway (23%) and Sweden (46%).

Confirmed STEC/VTEC cases showed a clear seasonality, characterised with sharp peaks of a six-month period occurring during warmer months. In 2012, a second smaller increase of serotype O157:H7 cases was recorded in October and a minor increase of O157:H- cases was reported during winter. A summertime seasonal pattern of STEC/VTEC infections with a lesser peak in autumn has been described in Europe [12].

STEC/VTEC infections constitute a major public health concern, because of the severe illnesses that they can cause, such as haemorrhagic colitis and haemolytic uraemic syndrome (HUS), especially among children and the elderly [3- 4,13-14,]. During 2010–2012, children younger than five years presented the highest notification rates in both sexes. Information on HUS was available for 79% of the total STEC/VTEC cases reported during 2010–2012. At the EU/EEA level, HUS was reported for 11% of confirmed STEC/VTEC cases. As described in the literature, between five and eight percent of STEC/VTEC cases are expected to progress to HUS, although it seems to be highly dependent on the type of toxin produced by the strain and higher rates have been reported during outbreaks [15]. In 2010–2012, HUS syndrome was more commonly reported in cases with bloody diarrhoea compared with cases without blood in their faeces. These finding are in agreement with data described in the literature [6,13].

During 2010–2012, averages of 37% of STEC/VTEC cases were hospitalised. The completeness of reporting for this variable increased from 26% in 2010 to 38% in 2012. Nevertheless, the hospitalisation ratio remained stable, suggesting the reliability and validity of data reported. The observed differences in the hospitalisation ratios at country level are mainly related to differences in the national surveillance systems

The CFR in the EU/EEA was stable in 2010 and 2012. In 2011 the CFR was 0.38 % and eight deaths were reported. The CFR doubled to 0.74 and 56 deaths were notified in 2011. Among HUS cases, there was an almost 4.5-fold increase from 230 to 1 011cases in 2011 compared with the number of confirmed HUS cases reported in 2010. Only 20% of deaths and 30% of HUS cases were reported to be due to STEC/VTEC O104 in 2011. However, Germany reported most deaths and HUS cases in 2011 with unknown serotype, and the majority was expected to have been caused by the outbreak strain (9). Similarly, the number of deaths among the HUS increased five-fold in 2011 compared to 2010 from 5 cases to 31 cases. Only seven cases were reported as due to STEC/VTEC O104, and over 70% of the cases were reported with unknown serotype by Germany. The case–fatality ratio remained stable ranging between 3.2% in 2012 and 4.1% in 2010 among HUS cases, which is in agreement with the range described in the literature [6, 15].

As in previous years [1-4], the most commonly reported serogroup was O157, covering more than half of all confirmed STEC/VTEC infections reported in 2010–2012. This may be explained by the use of certain diagnostic methods that focus on the detection of this particular serogroup [2, 4, 16]. Serogroup O104 was the second most common serogroup in 2011 due to the large outbreak. Other commonly reported STEC/VTEC serogroups were O26, O103, O91 and O145, with constant increases throughout the three-year period from 2010 to 2012. These might be true increases in these serogroups or possible results from increased detection of serogroups other than O157 as an impact of the STEC/VTEC O104:H4 outbreak (8).

In 2010–2012, the confirmed STEC/VTEC cases at EU/EA level were mostly caused by serotypes O157:H7, O157:H-, O104:H4, O26:H11 and O103:H2. Serotypes O157:H7 and O157:H- are the most commonly reported STEC/VTEC serotypes in North America and Europe [6, 13, 15]. In 2010–2012, STEC/VTEC O157:H7 and O157:H- were the most prevalent serotypes reported by EU/EEA countries, accounting together for about 36% of all typed isolates in the three-year period. However, between 2008 and 2012, a steady increase was noted for serotype O26:H11, and significant sharp increases have also been reported for serotypes O145:H- and O63:H6, whereas trends in number of cases due to serotypes O157:H7 and O157:H- remained stable. During 2010–2012, a general increase was found in the proportion of reported non-motile serotypes. The observed increases may be partially explained by an improvement in the detection of non-O157 serotypes, however the emergence of new virulent strains belonging to serotypes O26:H11/H– has been described in Europe [7-8, 17-18].

Serotype O157:H7 was the most dominant across all age groups in 2010–2012 and those aged between 25 and 64 years presented the highest notification rate for this serotype. About 80% of STEC/VTEC infections reported in those younger than five year of age were due to serotypes O157:H7, O26:H11 and O157:H-. Serotype O103:H2 was mainly isolated from cases in those aged younger than 25 years, and serotype O145:H- from young adults between 15 and 24 year of age. Serotypes O157:H- and O26:H11 together were responsible for about 45% of reported cases older than 65 year of age.

The virulent characteristics of the STEC/VTEC serotypes were evaluated in terms of presence of the *eae* gene, encoding the intimin protein, as well as *vtx1* and *vtx2* genes, encoding the main classes of verocytotoxins termed VT1 and VT2. In 2010–2012, information on the full serotype and the presence of the *eae* gene and *vtx1* and *vtx2* genes was available for only 16% of STEC/VTEC isolates and the majority of serotypes were intimin gene (*eae*)-positive.

Serotypes O157:H7, O157:H-, O26:H11 and O103:H2 were overwhelmingly *eae* positive; among those, most serotypes O157:H- were verocytotoxins gene *vtx*1- and *vtx*2-positive, whereas most serotypes O103:H2 and O26:H11 were *stx*1 positive. Strains of serotypes O157:H7 were mainly *vtx*2-positive. Information on strains characterisation (STEC/VTEC serotype and verocytotoxins genes) was available for 11% of the total HUS cases reported in 2010–2012. The most frequently isolated STEC/VTEC serotypes among HUS cases (O157:H7, O157:H-, O104:H4 and O26:H11) were mainly *vtx*2 positive, and all confirmed STEC/VTEC cases due to serotypes O103:H2 and O91:H-were HUS negative and *vtx*1 positive(>89%).

Antimicrobial resistance data were provided for 11 different classes. During 2010–2012, data on antimicrobial resistance were reported for only 596 STEC/VTEC isolates (3% of total reported in 2010–2012), mainly by Belgium, Slovenia, Spain and the United Kingdom. The information provided was marginally more complete among some antimicrobials. The surveillance of antimicrobial resistance for STEC/VTEC is much debated and its value is questioned due to the recommendation of avoiding treatment of STEC/VTEC cases with antibiotics as this may cause more severe symptoms. Overall, the highest resistance level among STEC/VTEC isolates was reported for streptomycin, sulphonamides, ampicillin and tetracyclines. Some level of resistance to trimethoprim (co-trimoxazole) and kanamycin was also observed, whereas a low proportion of isolates showed resistance to cefotaxime, gentamicin, chloramphenicol, ciprofloxacin and nalidixic acid. The proportion of multidrug-resistant isolates remained stable (about 22%) during 2010–2012.

The main reservoirs for VTEC/STEC bacteria are ruminants like cattle, goats and sheep, but it can also be found in a number of other animal species [3, 13]. STEC/VTEC infections are mainly acquired by three primary and one secondary transmission pathway: consumption of contaminated food (mainly beef meat and products and dairy products, but also vegetables and fruits), or water (primarily through untreated, contaminated water supplies) and by direct contact with animals, their faeces and contaminated soil [3, 13, 16]. Essentially almost any vehicle in contact with faeces is a potential source of STEC/VTEC infection. The secondary transmission pathway is person-to-person contact [3, 13, 16]. In 2012, the human pathogenic VTEC serogroups isolated from bovine meat and cattle samples included VTEC O157, O26, O91, O103 and O145 [2].

The majority of reported infections in humans are sporadic cases [2, 13-14, 16], however several outbreaks were reported during 2010–2012. In 2010, 12 EU/EEA countries reported 75 food-borne outbreaks caused by STEC strains. The largest verified food-borne outbreak was reported by Romania in 2010, associated with red meat products [2, 3]. In 2011, 12 EU/EEA countries reported a total of 60 food-borne outbreaks, of which the largest was the O104:H4 outbreak, associated with the consumption of contaminated raw sprouts. In 2012, nine EU/EEA countries reported 41 food-borne outbreaks that represented 0.8 % of the total number of reported food-borne outbreaks in the EU in 2012 [2]. Twelve out of 41 reported outbreaks were supported by strong evidence: six outbreaks were associated with the consumption of contaminated bovine meat and products; pig meat was the food vehicle reported in two outbreaks linked to temporary mass catering. Each of the remaining four outbreaks were associated with raw milk, herbs and spices, mixed food, and other or mixed red meat [2]. Moreover, 10 VTEC waterborne outbreaks were reported, all by Ireland, and seven were reported to be linked to private water supplies or wells [2].

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6 Typhoid and paratyphoid fever in the EU/EEA, 2010–2012

Typhoid and paratyphoid fever

Salmonellosis is an infection caused by *Salmonella* (*S. enterica*) bacteria. The *Salmonella* species is divided into more than 2 500 serovars. Typhoid and paratyphoid fever are systemic infections caused by *Salmonella enterica* subsp. *enterica* serovar *S.* Typhi (*S.* Typhi) and subsp. *enterica* serovar *S.* Paratyphi (*S.* Paratyphi A, B, and C) respectively.

Symptoms associated with typhoid fever include prolonged fever, severe headache, nausea, diarrhoea, stomach pain, spleen enlargement, malaise, rash and sometimes endocarditis and meningitis. In adults, typhoid fever causes constipation more often than diarrhoea. The clinical picture varies from mild to severe symptoms and untreated typhoid fever can be life-threatening. Unapparent and mild illnesses occur, particularly in endemic areas. The incubation period of typhoid fever varies from three days to over 60 days, usually ranging between eight to 14 days.

Paratyphoid fever has the same symptoms and clinical picture as typhoid fever, but the course of disease is milder and symptoms are less severe. Paratyphoid fever is caused mainly by *S.* Paratyphi A and B. The incubation period of paratyphoid fever is one to 10 days.

Typhoid and paratyphoid *Salmonella* infection is transmitted between humans only. Humans can be short- or long-term carriers of these bacteria. The organism can be isolated from blood early in the disease, and from urine and faeces after the first week. Transmission of the infection is by the faecal-oral route, person-to-person contact or through contaminated water or food. Typhoid/paratyphoid fever is uncommon in the EU/EEA. Infections are mainly sporadic and associated with travel to endemic areas outside the EU.

More information can be found at the ECDC website [33].

Surveillance of typhoid and paratyphoid fever in the EU/EEA in 2010–2012

ECDC coordinates the European surveillance of typhoid and paratyphoid fever, in close collaboration with a network of nominated experts, epidemiologists and microbiologists from EU/EEA countries as part of the Food- and Waterborne Diseases and Zoonoses (FWD) Network.

The scope of surveillance is defined by the general surveillance objectives for food- and waterborne diseases (see Introduction) and the EU case definition for typhoid and paratyphoid fever (see Annex H).

The aims and purposes of the disease-specific surveillance were discussed with the European Food- and Waterborne Diseases and Zoonoses Network. For typhoid and paratyphoid fever the suggested specific surveillance objectives are to:

- monitor the importation of typhoid and paratyphoid fever from non-EU countries
- monitor the severity of disease (hospitalisation, bloodstream infections)
- monitor antimicrobial resistance (AMR) development.

The reporting of salmonellosis, including typhoid and paratyphoid fever, to The European Surveillance System (TESSy) currently features the standard reporting of cases, including data on serotypes (serovars). The monitoring of antimicrobial resistance (AMR) has been reviewed and ECDC has launched a new protocol for harmonised monitoring of AMR in human *Campylobacter* and *Salmonella* infections [1]. The human AMR data for non-typhoid salmonellosis is published annually together with European Food Safety Agency (EFSA) in a European Summary report. The AMR data for serovars *S*. Typhi and *S*. Paratyphi (Paratyphi A, B, C and any Paratyphi without further specification) are included in this report.

In 2010–2012, the reporting of salmonellosis covered 46 variables, 27 of which were common variables for all diseases, while 19 were specific for *Salmonella*. The common variables are presented in the Table 1 of the Introduction. Additional *Salmonella*-specific variables are presented below in Table TYPH-1. In 2012, 23 EU/EEA countries had a compulsory reporting system with full population coverage for Typhi and Paratyphi infections, four countries had a voluntary system and three countries did not report typhoid and paratyphoid fever to TESSy (Table 6.2).

Table 6.1. Enhanced dataset collected for *Salmonella* infections, EU/EEA, 2010–2012

Variable	Description in TESSy
AntigenH1	Flagellar (H) antigen –phase 1 –of the antigenic formula of the pathogen which is the cause of the reported disease
AntigenH2	Flagellar (H) antigen –phase 2 –of the antigenic formula of the pathogen which is the cause of the reported disease
AntigenO	Somatic (O) antigen of the antigenic formula of the pathogen which is the cause of the reported disease
IsolateReferenceNumber	The reference number currently used by the reference laboratory
Pathogen	Species or genus of the pathogen which is the cause of the reported disease
Phagetype	Name/number of phage type of the pathogen which is the cause of the reported disease
Serotype	Serotype of the pathogen which is the cause of the reported disease
SIR_AMP, SIR_CHL, SIR_CIP, SIR_CTX, SIR_GEN, SIR_KAN, SIR_NAL, SIR_SSS, SIR_STR, SIR_SXT, SIR_TCY	Susceptibility to 11 different antibiotics (ampicillin, chloramphenicol, ciprofloxacin, cefotaxime, gentamicin, kanamycin, nalidixic acid, sulphonamides, streptomycin, trimethoprim (co-trimoxazole), tetracyclines)
Specimen	The relevant specimen type used for diagnosis of the case

National surveillance systems for typhoid and paratyphoid fever

Table 6.2. Notification systems for typhoid and paratyphoid fever cases in EU/EEA countries, 2012

Country	Reported since	Legal character[a]	Case-based/ aggregated[b]	National coverage[c]	Changes in surveillance system in 2010–2012
Austria	1947	Cp	C	Y	
Belgium	<1999	V	C	N	
Bulgaria	1921	-	-	-	No changes
Cyprus	Yes	Cp	C	Y	
Czech Republic	2008	Cp	C	Y	
Denmark	1979	Cp	C	Y	No changes
Estonia	1945	Cp	C	Y	
Finland	1995	Cp	C	Y	No changes
France	1986	V	C	Y	No changes
Germany	2001	Cp	C	Y	
Greece	Yes	Cp	C	Y	
Hungary	1959	Cp	C	Y	
Ireland	1948	Cp	C	Y	
Italy	1990	Cp	C	-	Incomplete reporting for 2012
Latvia	1946	Cp	C	Y	No changes
Lithuania	1962	Cp	C	Y	
Luxembourg	2004	V	C	Y	
Malta	Yes	Cp	C	Y	
Netherlands	-	Cp	C	Y	
Poland	1961	-	-	-	-4
Portugal	Yes	Cp	C	Y	
Romania	Yes	Cp	C	Y	
Slovakia	1954	Cp	C	Y	
Slovenia	1949	Cp	C	Y	No changes
Spain	1982	V	C	N (population coverage 25%)	
Sweden	1969	Cp	C	Y	
United Kingdom	No	O	C	Y	
Iceland	Yes	Cp	C	Y	

Country	Reported since	Legal character[a]	Case-based/ aggregated[b]	National coverage[c]	Changes in surveillance system in 2010–2012
Liechtenstein	Yes	-	-	-	
Norway	1975	Cp	C	Y	-

[a] Legal character: Cp=compulsory, V=voluntary, O=other

[b] C=case based, A=aggregated

[c] National coverage: Y=yes, N=no

[d] Not reported/no data provided

Epidemiological situation in 2010–2012

Major findings

- A significant decreasing five-year trend in number of all confirmed cases was observed at the EU/EEA level from 2008 to 2012.
- Typhoid and paratyphoid fever are rare diseases in Europe, the overall notification rates in 2010–2012 were 0.18 and 0.13 per 100 000 population for S. Typhi and S. Paratyphi, respectively.
- The majority of all typhoid fever cases (80%) and of paratyphoid fever cases (70%) were reported by only five countries (France, Germany, Italy, the Netherlands and the United Kingdom).
- Most of the typhoid/paratyphoid fever infections (>85%) are related to travel and acquired outside EU/EEA countries, mainly on the Indian subcontinent.
- In the three-year surveillance period from 2010 to 2012, the highest proportion of cases was due to *S.* Typhi (57%), followed by *S.* Paratyphi A (31%) and *S.* Paratyphi B (9%), Paratyphi B (5.2%) whereas *S.* Paratyphi C was rare (<1%).
- The seasonal pattern showed a clear main increase in cases during September/October and a smaller rise in April/May, most likely related to travelling abroad during the holiday period.
- Children aged 1–4 years and young adults 15–-24 years of age presented the highest notification rates of *S.* Typhi and *S.* Paratyphi in 2010–2012. The lowest notification rate was observed in the age group ≥65 years.
- The highest burden in terms of number of reported cases was noted in the age group 25–44 years, accounting for 38% of total cases reported in 2010–2012, and there was a male predominance across all age groups.
- The proportion of deaths among confirmed cases of typhoid and paratyphoid fever was low at the EU/EEA level, with three deaths reported due to *S.* Typhi and two deaths due to *S.* Paratyphi in 2010-–2012.
- *S.* Typhi and *S.* Paratyphi isolates showed very high resistance level to nalidixic acid (about 70% of resistant isolates), followed by ciprofloxacin (more than 50% of resistant isolates). Combined resistance to three or more antimicrobial classes (multi-drug resistance) was reported for about almost one-third of travel-related *S.* Typhi isolates, all imported from non-EU/EEA countries.

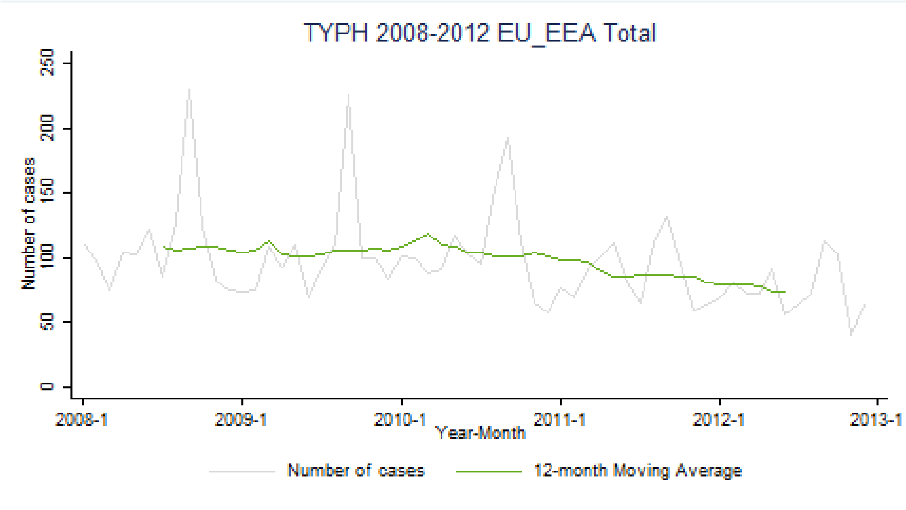
Overview of trends

From 2010 to 2012, 25 EU Member States and two EEA countries reported 3 616 cases of typhoid and paratyphoid fever to TESSy, excluding Bulgaria, Poland and Liechtenstein (Table 6.3; Table 6.4). In this report, typhoid and paratyphoid fever cases are presented separately where possible.

Trends in the number of confirmed cases of typhoid and paratyphoid fever were calculated from 2008 to 2012. Overall, during the five-year surveillance period, a significant decreasing trend was recorded at the EU/EEA level (p-value<0.01) (Figure 6.1). In country-specific five-year trends, reductions was detected in the majority of the reporting countries, particularly in Belgium, France, Sweden and the United Kingdom (p-value<0.05) (Figure 6.3).

When comparing 2012 with 2010, major decreases in rates were observed in France (from 0.34 to 0.25 cases per 100 000) and the United Kingdom (from 0.95 to 0.64 cases per 100 000 population). Minor changes in rates were found in Germany (from 0.16 to 0.12 cases per 100 000 population) and the Netherlands (from 0.43 to 0.39 cases per 100 000 population), and no country showed increases in notification rates of typhoid and paratyphoid fever between 2010 and 2012 (Figure 6.2).

Figure 6.1. **Trend in number of confirmed cases of *Salmonella* Typhi and *S.* Paratyphi* in EU/EEA countries, 2008–2012 (N=5 811)**



** Includes serovars* S. *Paratyphi,* S. *Paratyphi A,* S. *Paratyphi B, and* S. *Paratyphi C*

Source: Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Table 6.3. **Confirmed *Salmonella* Typhi cases and notification rates (per 100 000 population) by country, EU/EEA, 2010–2012**

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	17	0.20	1	0.01	6	0.07
Belgium*	26	-	25	-	16	-
Bulgaria	-	-	-	-	-	-
Cyprus	0	-	0	-	0	-
Czech Republic	4	0.04	3	0.03	2	0.02
Denmark	21	0.38	10	0.18	14	0.25
Estonia	1	0.07	0	-	1	0.07
Finland	9	0.17	5	0.09	1	0.02
France	160	0.25	146	0.22	118	0.18
Germany	71	0.09	59	0.07	58	0.07
Greece	7	0.06	5	0.04	4	0.04
Hungary	0	-	0	-	1	0.01
Ireland	9	0.20	14	0.31	8	0.17
Italy[§]	134	0.22	89	0.15	35	-
Latvia	1	0.05	0	-	0	-
Lithuania	0	-	0	-	1	0.03
Luxembourg	0	-	0	-	0	-
Malta	0	-	2	0.48	0	-
Netherlands	31	0.19	18	0.11	18	0.11
Poland	-	-	-	-	-	-
Portugal	14	0.13	11	0.11	11	0.11
Romania	1	0.005	0	-	0	-
Slovakia	1	0.02	0	-	0	-
Slovenia	2	0.10	1	0.05	1	0.05
Spain[a]	24	0.21	30	0.26	14	0.12

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Sweden	23	0.25	16	0.17	11	0.12
United Kingdom~	328	0.53	279	0.45	201	0.32
EU total**	**883**	**0.22**	**714**	**0.18**	**519**	**0.13**
Iceland	0	-	0	-	0	-
Liechtenstein	-	-	-	-	-	-
Norway	16	0.33	15	0.30	13	0.26
EU/EEA total**	**899**	**0.22**	**729**	**0.18**	**532**	**0.13**

** Sentinel surveillance. Population coverage unknown so notification rate not calculated*

§All cases reported under serotype 'typhi' without differentiate between serovars S. *typhi and* S. *paratyphi in 2010–2012. Incomplete reporting for 2012.*

a Population coverage 25%

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

*** For each year shown, notification rates were calculated, with the exception of countries with unknown population coverage. Also excluded were populations of countries which did not report data. Populations of countries which reported 0 cases were included.*

– Not reported/not calculated

Table 6.4. Confirmed *Salmonella* Paratyphi[*] cases and notification rates (per 100 000 population) by country, EU/EEA, 2010–2012

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	13	0.16	3	0.04	10	0.12
Belgium^	46	-	25	-	13	-
Bulgaria	-	-	-	-	-	-
Cyprus	1	0.12	1	0.12	1	0.12
Czech Republic	1	0.01	4	0.04	4	0.04
Denmark	18	0.33	14	0.25	15	0.27
Estonia	0	-	0	-	1	0.07
Finland	7	0.13	4	0.07	4	0.07
France	62	0.10	0	-	47	0.07
Germany	57	0.07	55	0.07	43	0.05
Greece	5	0.04	3	0.03	2	0.02
Hungary	4	0.04	0	-	0	-
Ireland	5	0.11	2	0.04	6	0.13
Italy[§]	-	-	-	-	-	-
Latvia	0	-	1	0.05	0	-
Lithuania	1	0.03	2	0.07	0	-
Luxembourg	0	-	0	-	0	-
Malta	1	0.24	0	-	0	-
Netherlands	41	0.25	38	0.23	47	0.28
Poland	-	-	-	-	-	-
Portugal	2	0.02	3	0.03	3	0.03
Romania	2	0.01	0	-	0	-
Slovakia	5	0.09	2	0.04	7	0.13
Slovenia	0	-	2	0.10	0	-
Spain[a]	13	0.11	17	0.15	11	0.10
Sweden	19	0.20	8	0.08	17	0.18
United Kingdom~	258	0.42	245	0.39	199	0.32

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
EU total**	**561**	**0.15**	**429**	**0.12**	**430**	**0.13**
Iceland	0	-	0	-	0	-
Liechtenstein	-	-	-	-	-	-
Norway	18	0.37	11	0.22	7	0.14
EU/EEA total**	**579**	**0.15**	**440**	**0.12**	**437**	**0.13**

For each year shown, notification rates were calculated, with the exception of countries with unknown population coverage. Also excluded were populations of countries which did not report data. Populations of countries which reported 0 cases were included.

[*] *Includes serovars* S. *Paratyphi,* S. *Paratyphi A,* S. *Paratyphi B, and* S. *Paratyphi C*

^Sentinel surveillance. Population coverage unknown so notification rate not calculated

[§] *All cases reported under serotype 'typhi' without differentiate between serovars* S. *typhi and* S. *paratyphi in 2010–2012. Incomplete reporting for 2012.*

[a] *Population coverage 25%*

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

– Not reported/not calculated

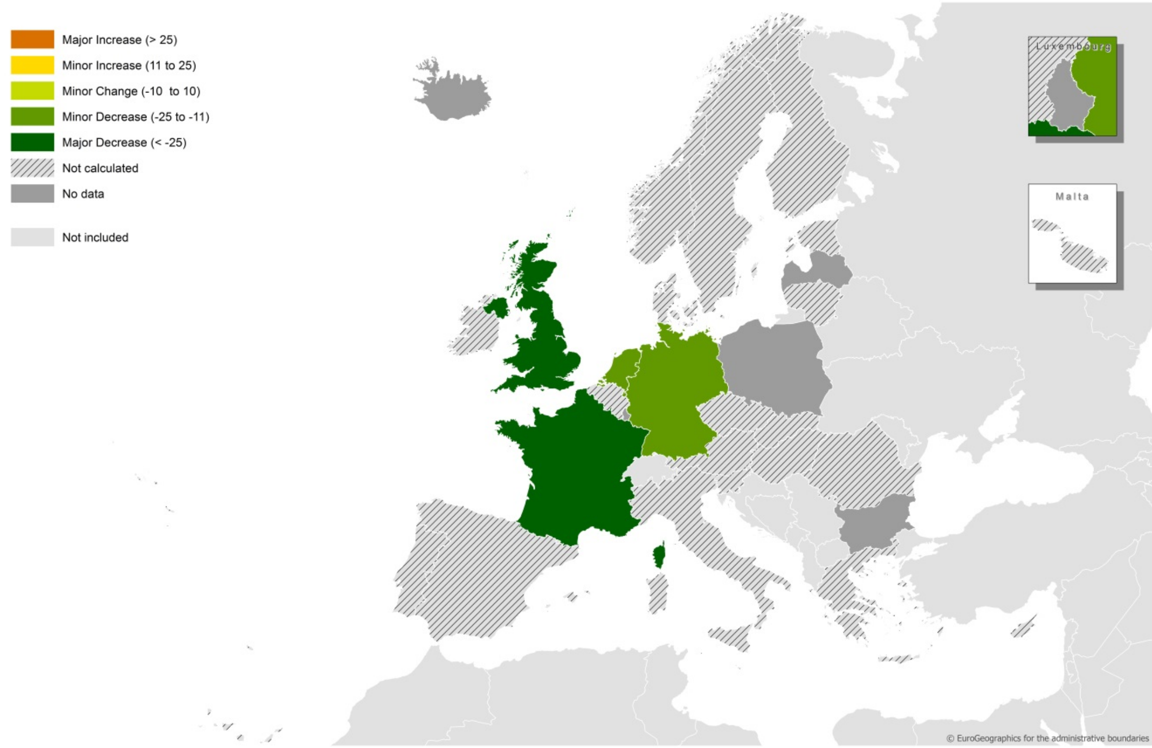
Overall, 2 160 confirmed cases of *Salmonella* Typhi and 1 436 *S.* Paratyphi cases were reported at the EU/EEA level during 2010–2012 (Table 6.3; Table 6.4).

In 2012, the number of confirmed cases of typhoid fever (*S.* Typhi) in EU/EEA countries declined by 35% as compared with 2010, from 765 to 497 cases (Italy excluded since incomplete reporting for 2012) (Table 6.3). Confirmed paratyphoid fever cases (*S.* Paratyphi) also declined by 25%, from 579 cases in 2010 to 437 cases in 2012 (Table 6.4). This was mainly a result of the decreased reporting of both typhoid and paratyphoid fever cases by France, Germany and the United Kingdom (Table 6.3 and Table 6.4).

During 2010–2012, 11 EU/EEA countries (Cyprus, Estonia, Finland, Hungary, Iceland, Latvia, Lithuania, Luxembourg, Malta, Romania and Slovakia) did not report any *S.* Typhi case or reported ≤1 cases per year (Table 6.3), whereas notification rates higher than 0.25 cases per 100 000 population were observed in Denmark, Norway and the United Kingdom (Table 6.3). Eight EU/EEA countries (Estonia, Finland, Iceland, Latvia, Luxembourg, Malta, Romania and Slovenia) did not report any *S.* Paratyphi case or reported ≤1 cases per year (Table 6.4) and Denmark, the Netherlands and the United Kingdom reported rates higher than 0.25 cases per 100 000 population (Table 6.4).

Please note that in a country with a small population even low numbers of reported cases can lead to a relative overrepresentation.

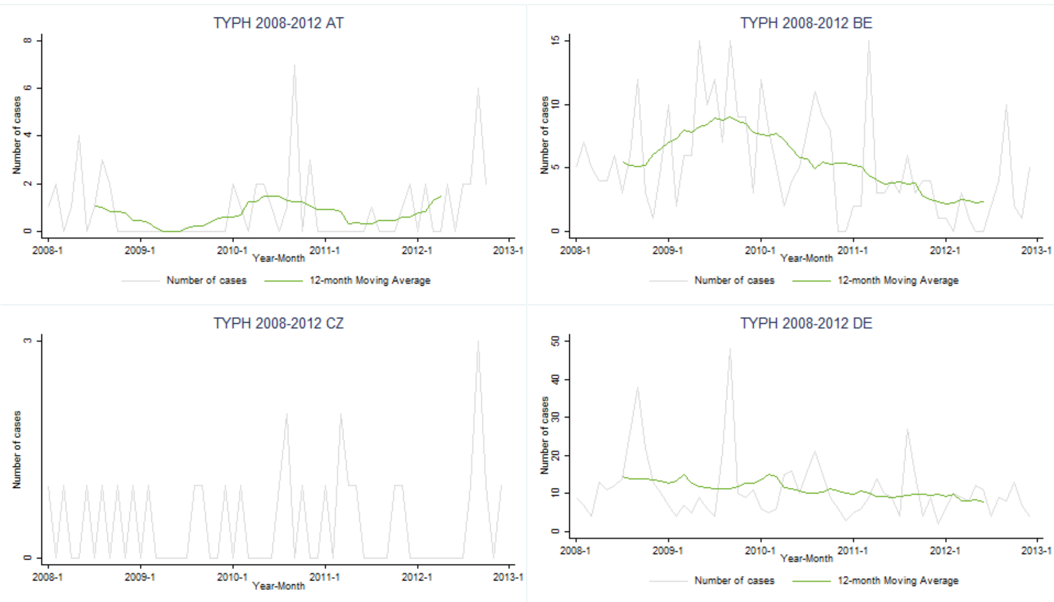
Figure 6.2. Percentage change in notification rates of typhoid and paratyphoid fever cases in EU/EEA countries, 2010–2012

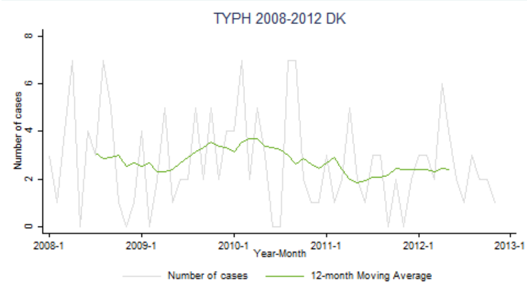


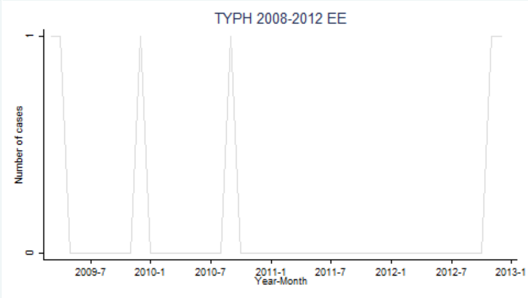
Not calculated: Country-specific percentage changes in notification rates were not calculated if the number of confirmed cases reported for one or more years during 2010–2012 was lower than 25, if sentinel surveillance systems had unknown population coverage, or if there was incomplete reporting for one of the reporting years.

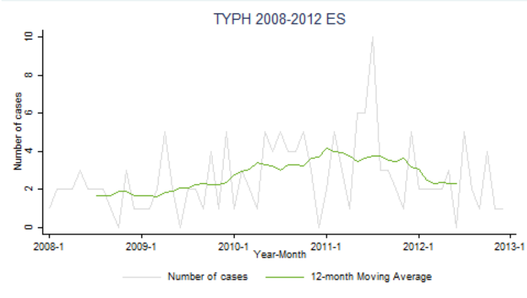
Source: The European Surveillance System (TESSy) data, 2010–2012

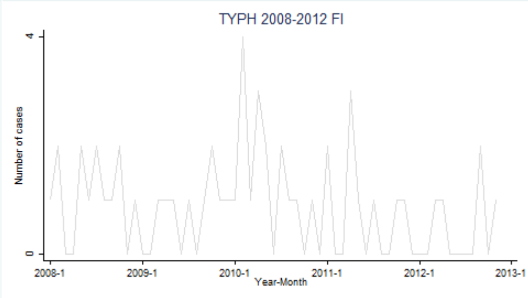
Figure 6.3. Trend in number of typhoid and paratyphoid fever cases by EU/EEA country, 2008–2012

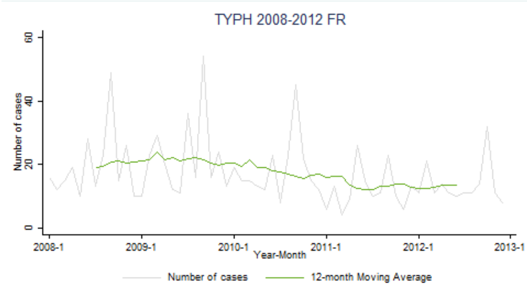


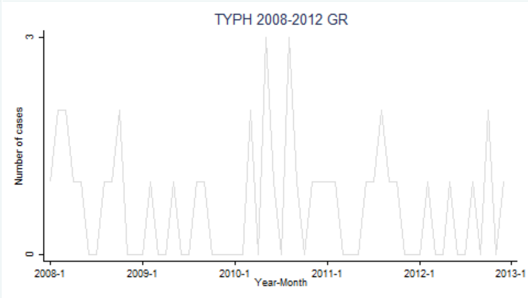

TYPH 2008-2012 DK
Number of cases
Year-Month
Number of cases
12-month Moving Average

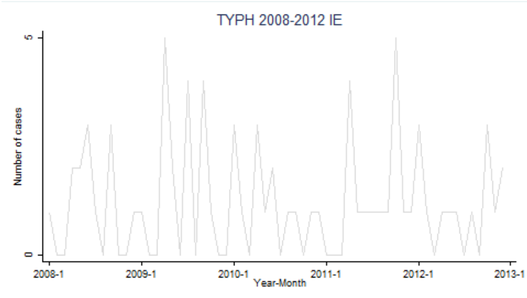

TYPH 2008-2012 EE
Number of cases
Year-Month

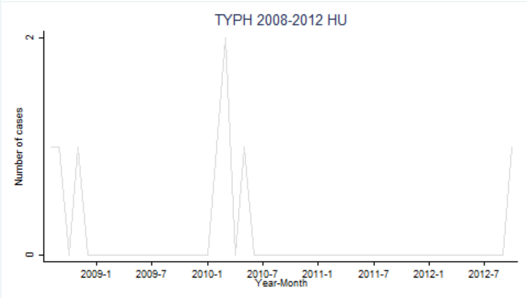

TYPH 2008-2012 ES
Number of cases
Year-Month
Number of cases
12-month Moving Average

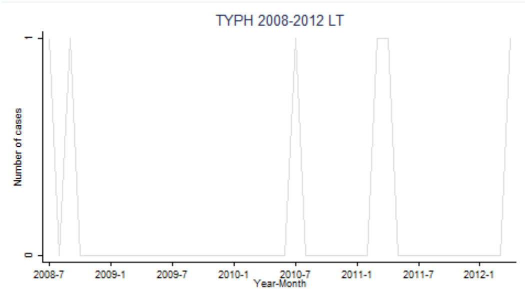

TYPH 2008-2012 FI
Number of cases
Year-Month

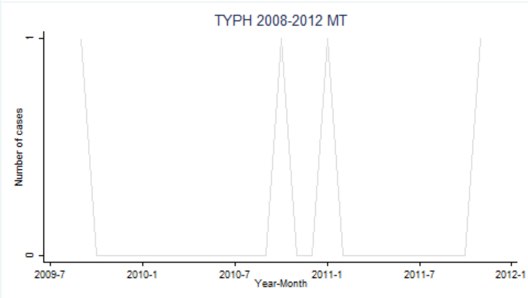

TYPH 2008-2012 FR
Number of cases
Year-Month
Number of cases
12-month Moving Average

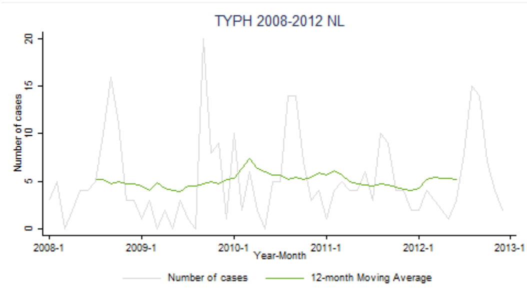

TYPH 2008-2012 GR
Number of cases
Year-Month

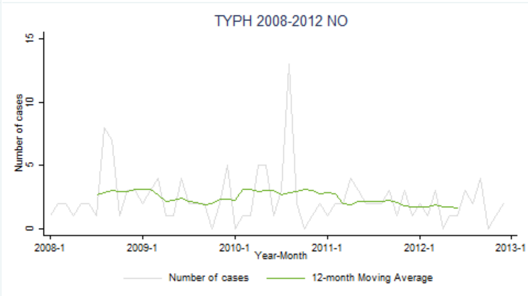

TYPH 2008-2012 IE
Number of cases
Year-Month

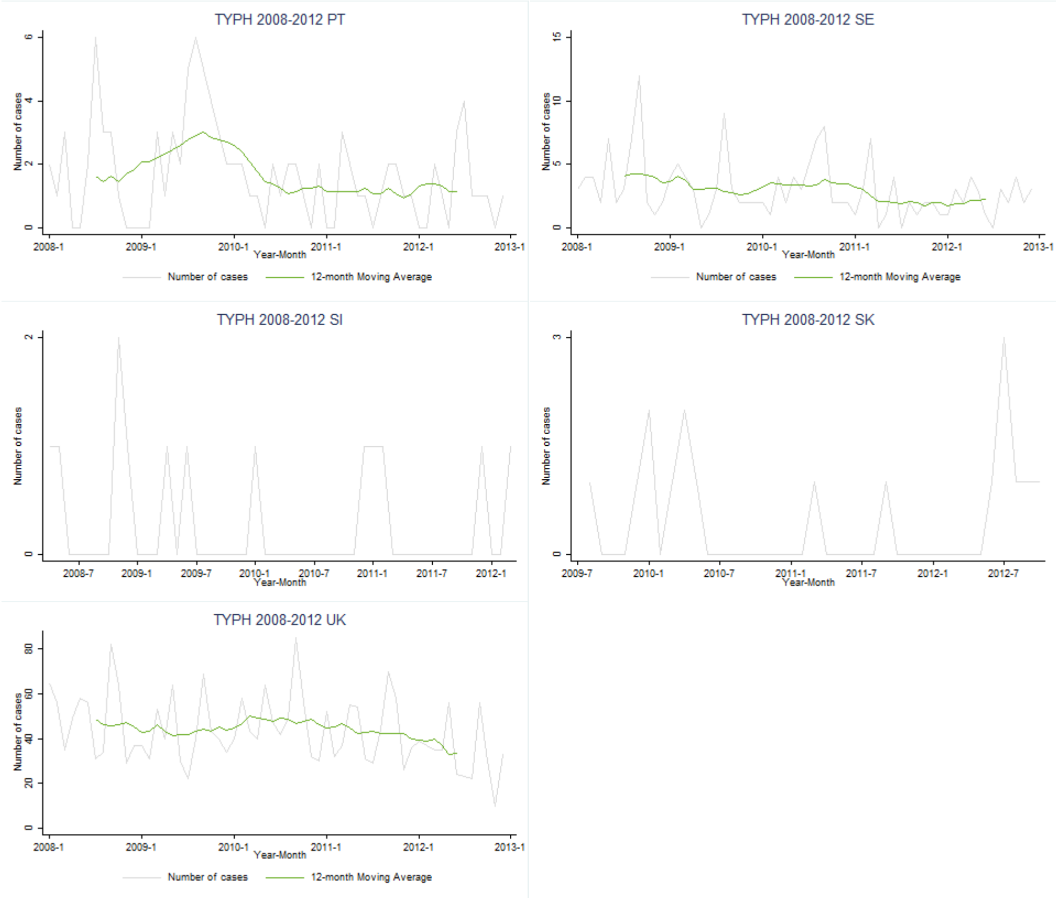

TYPH 2008-2012 HU
Number of cases
Year-Month


TYPH 2008-2012 LT
Number of cases
Year-Month


TYPH 2008-2012 MT
Number of cases
Year-Month


TYPH 2008-2012 NL
Number of cases
Year-Month
Number of cases
12-month Moving Average


TYPH 2008-2012 NO
Number of cases
Year-Month
Number of cases
12-month Moving Average



Country codes: see page xiv

Please note that graphs are on different scales.

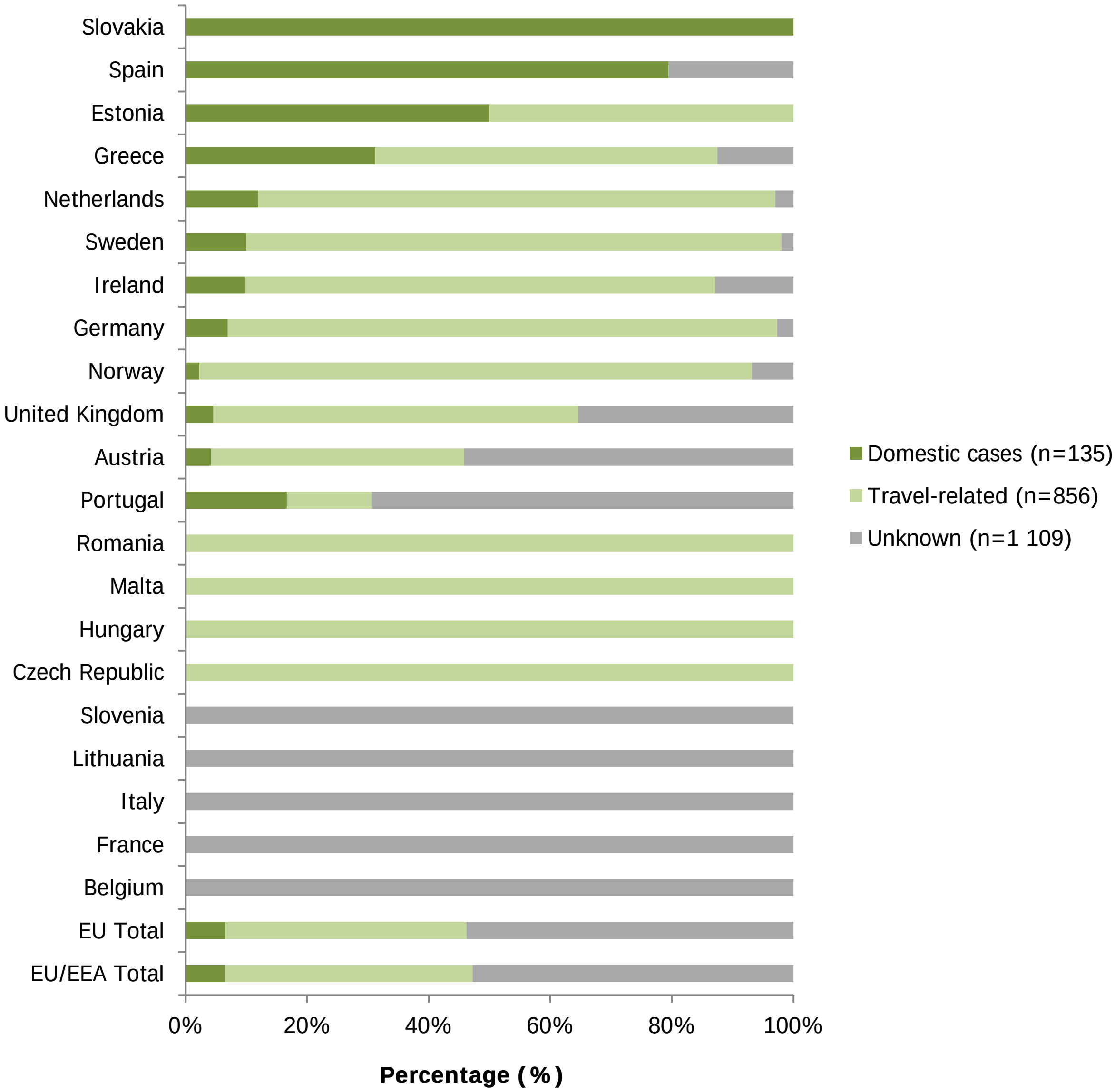
Country-specific trends were not calculated if less than five confirmed cases were reported per month during the period 2008–12.

Origin of the infection

Within the three-year period 2010–2012, data on the origin of infection were provided by 16 EU/EEA countries for 1 029 confirmed cases of typhoid fever (48%, pooled data) (Annex F: Table F6.1) and for 953 confirmed cases of paratyphoid fever (65%, pooled data) (Annex F: Table F6.2).

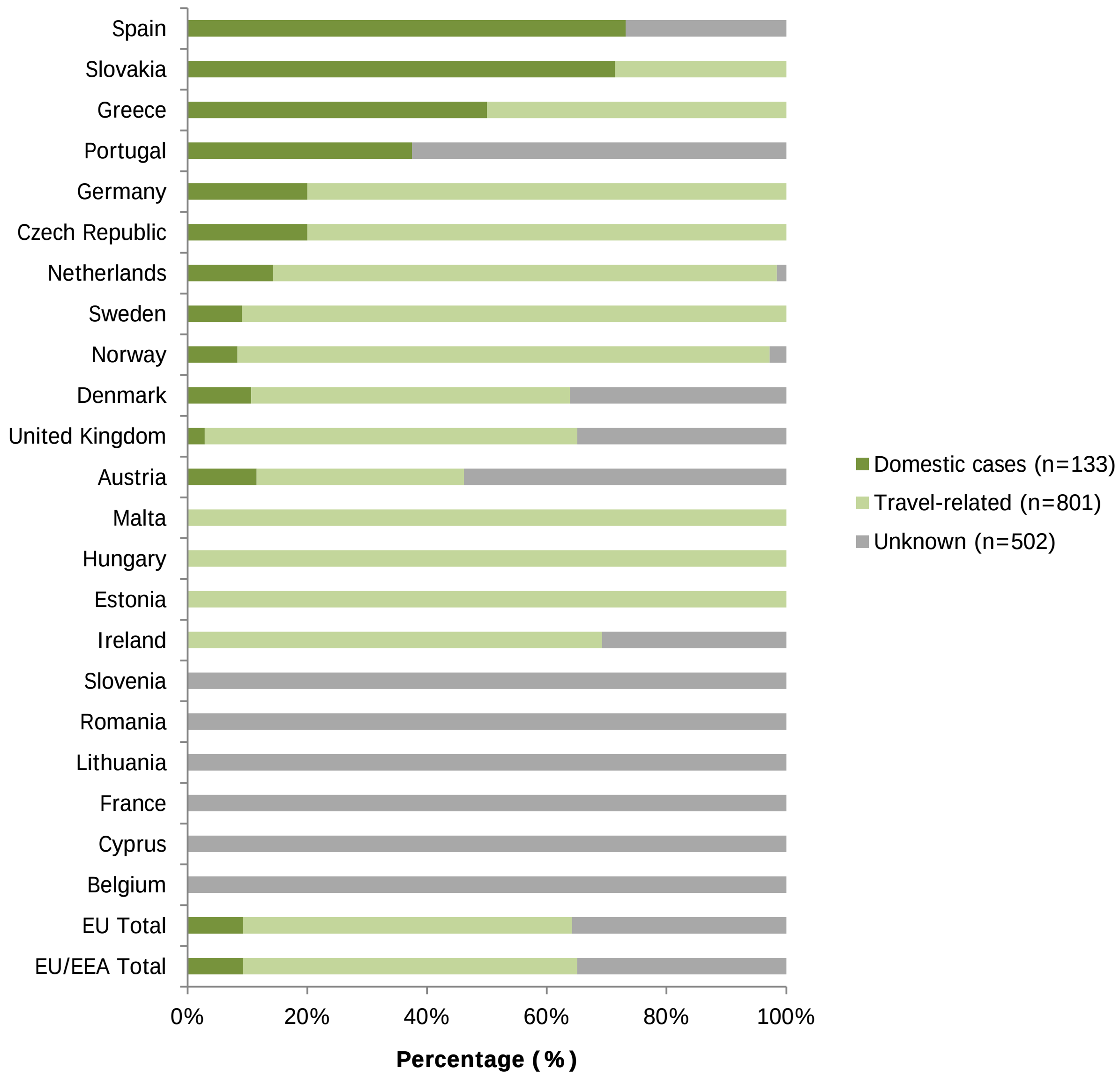
The proportion of domestic versus travel-associated cases varied markedly between countries. Travel-associated *S.* Typhi infections were predominant in most of the countries, with four countries (Czech Republic, Hungary, Malta and Romania) reporting 100% of infections acquired abroad, though the total number of confirmed *S.* Typhi cases was very low (Figure 6.4; Annex F: Table F6.1). The highest proportion of travel-related typhoid fever cases (> 80%), was found in Germany, the Netherlands, Norway, and Sweden (Figure 6.4; Annex F: Table F6.1). Spain (68 cases) and Slovakia (one cases) reported only domestically acquired *S.* Typhi infections (Figure 6.4; Annex F: Table F6.1).

Figure 6.4. Proportion of confirmed *Salmonella* Typhi cases by origin of infection (domestic/travel-related) as reported by EU/EEA countries, 2010–2012



Travel-associated *S.* Paratyphi infections (including *S.* Paratyphi A, *S.* Paratyphi B, and *S.* Paratyphi C) were predominant in most countries, with three countries (Estonia, Hungary and Malta) reporting 100% of infections acquired abroad, though the total number of confirmed *S.* Paratyphi cases was very low (Figure 6.5; Annex F: Table F6.2). Spain reported the highest proportion of domestic cases (73%), followed by Slovakia (71%) and Greece (50%), although the total number of confirmed *S.* Paratyphi cases reported was very low (Figure 6.5; Annex F: Table F6.2).

Figure 6.5. Proportion of confirmed *Salmonella* Paratyphi* cases by origin of infection (domestic/travel-related) as reported by EU/EEA countries, 2010–2012 (N=1 436)



** Includes serovars* S. *Paratyphi,* S. *Paratyphi A,* S. *Paratyphi B, and* S. *Paratyphi C*

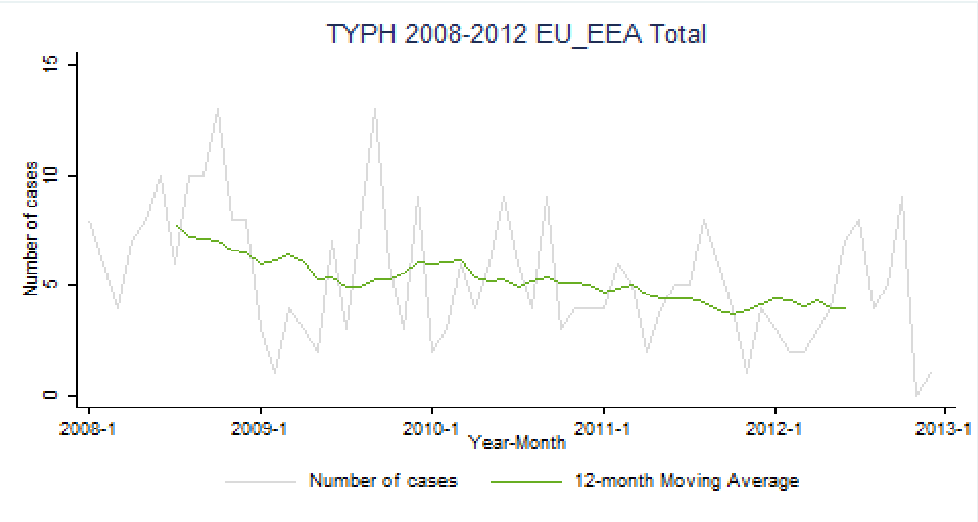
Domestic cases

During 2010–2012, 138 *S.* Typhi and 135 *S.* Paratyphi domestic cases were reported at EU/EEA level, representing both about 14% of the total cases for which the information on origin of infection was available (1 029 typhoid fever cases; 953 paratyphoid fever cases) (Annex F: Tables F6.1, F6.2, F6.3, F6.4).

At EU/EEA level, a significant decreasing trend in domestic typhoid and paratyphoid fever cases was observed since 2008 (p-value<0.01) (Figure 6.6). Majority of the country-specific trends reduced slightly or stayed stable during 2008–2012.

From 2010 to 2012 the number of domestically acquired typhoid and paratyphoid fever cases decreased by 50%, from 110 confirmed domestic cases in 2010 to 55 cases in 2010 (Annex F: Table F6.3 and 6.4).

Figure 6.6. Trend and number of confirmed domestic typhoid and paratyphoid fever cases in EU/EEA countries, 2008–2012 (N=328)



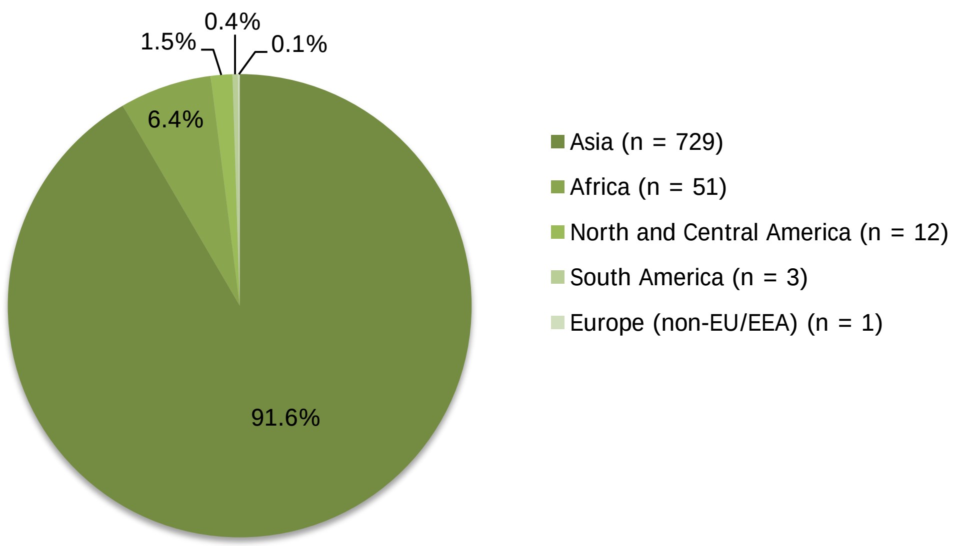
Source: Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Ireland, Latvia, Malta, the Netherlands, Slovakia, United Kingdom; EEA country: Norway

Travel-related cases

Among cases for which the information was available (1 029 typhoid fever cases; 953 paratyphoid fever cases), majority of both *S.* Typhi (891 cases) and *S.* Paratyphi (818 cases) were related to travel, accounting each for 86% of all reported infections at EU/EEA level during 2010–2012 (Annex F: Tables F6.1, F6.2, F6.5, F6.6).

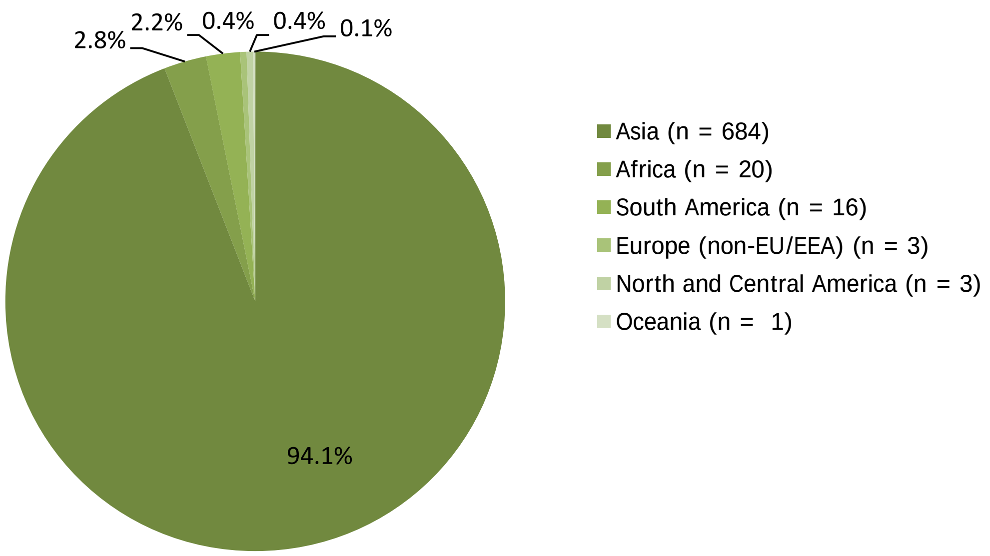
The vast majority of travel-related *S.* Typhi (n=796, 99%) and *S.* Paratyphi (n=727, 98%) infections were acquired in a non-EU country, mainly in Asia and this was true for both serovars (Figure 6.7a, b). Only six *S.* Typhi and 12 *S.* Paratyphi cases were linked with travelling to another EU/EEA country during the three-year surveillance period

Figure 6.7a. Origin of travel-related *Salmonella* Typhi infections acquired in non-EU/EEA countries by geographical regions, EU/EEA countries, 2010–2012



Source: Austria, Czech Republic, Estonia, Germany, Greece, Hungary, Ireland, Malta, the Netherlands, Portugal, Romania, Sweden, United Kingdom; EEA country: Norway

Figure 6.7b. Origin of travel-related *Salmonella* Paratyphi* infections acquired in non-EU/EEA countries by geographical regions, EU/EEA countries, 2010–2012



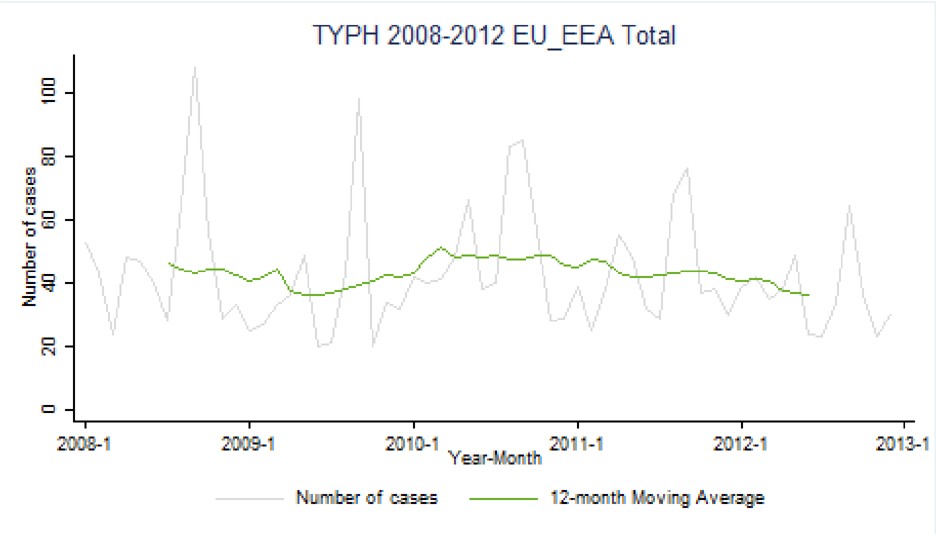
** Includes serovars* S. *Paratyphi,* S. *Paratyphi A,* S. *Paratyphi B, and* S. *Paratyphi C*

Source: Austria, Czech Republic, Denmark, Estonia, Germany, Greece, Hungary, Ireland, Malta, the Netherlands, Slovakia, Sweden, United Kingdom; EEA country: Norway

Considering together all travel-related typhoid and paratyphoid fever cases, a slightly decreasing trend in travel-associated typhoid and paratyphoid fever cases was observed from 2008 to 2012 (Figure 6.8) as in majority in the reporting countries. However, no country showed statistically significant changes in the number of reported cases.

The number of infections acquired abroad reduced by 24%, from 649 cases in 2010 to 492 cases in 2012 (Annex F: Table F6.5, F6.6).

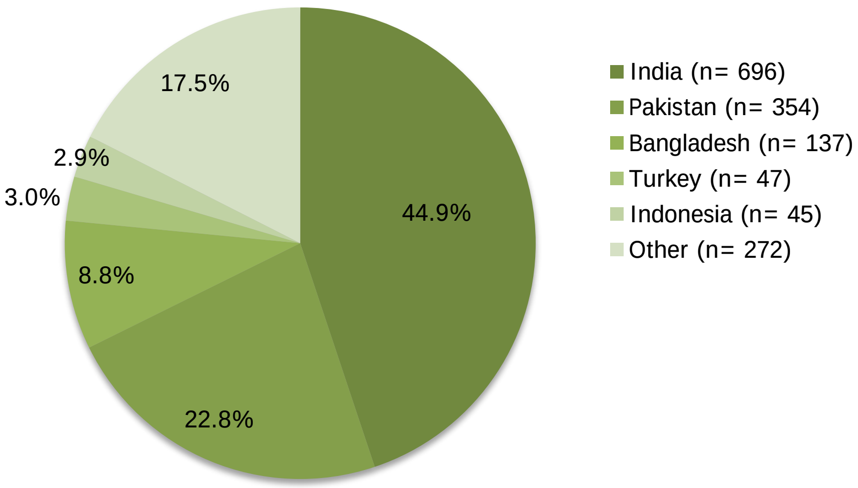
Figure 6.8. Trend and number of confirmed travel-related typhoid and paratyphoid fever cases in EU/EEA countries, 2008–2012 (N=2 560)



Source: Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Ireland, Latvia, Malta, the Netherlands, Slovakia, United Kingdom; EEA country: Norway

Information on the suspected country of infection was available for 1 551 (94%) cases reported between 2010 and 2012 and the most frequently countries of destination were India, Pakistan and Bangladesh, accounting together for 77% of the total (Figure 6.9).

Figure 6.9. Five most frequently reported countries of infection in confirmed travel-related typhoid and paratyphoid fever cases, EU/EEA countries, 2010–2012



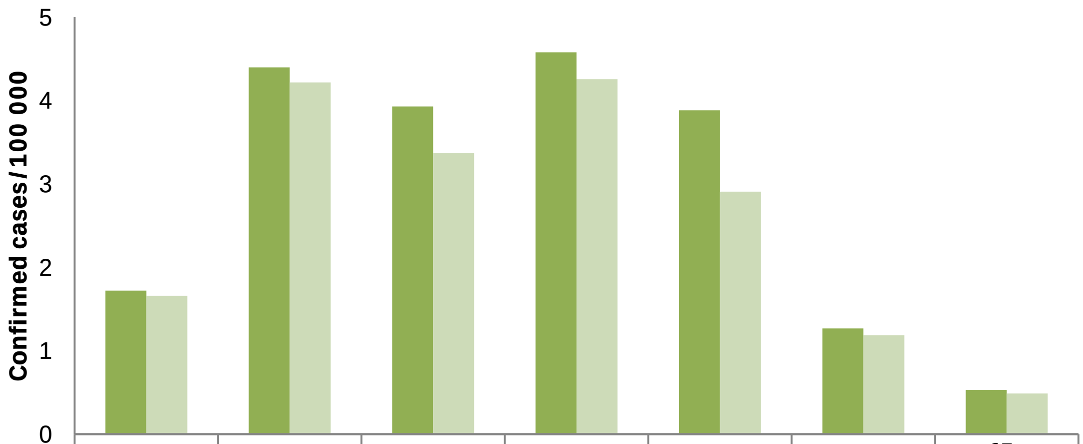
Source: Austria, Czech Republic, Denmark, Estonia, Germany, Greece, Hungary, Ireland, Malta, the Netherlands, Portugal, Romania, Slovakia, Spain, Sweden, United Kingdom; EEA country: Norway

Age and sex

During 2010–2012, data on age and sex were reported for 97% (n=3 165) of confirmed typhoid and paratyphoid fever cases by 22 EU/EEA countries (Annex F: Table F6.7). Among confirmed typhoid/paratyphoid fever cases with known data for sex and age, the highest burden in terms of number of reported cases was noted in the age group 25–44 years (n=1 217), accounting for 38% of total reported in 2010–2012 (Annex F: Table F6.7).

Overall, age groups 1–4 years and 15-24 years presented the highest notification rates for both sexes (>4.2 cases per 100 000), followed by aged 5-14 year of age (>3.4 cases per 100 000) (Figure 6.10; Annex F: Table F6.7). The lowest notification rate was observed in the age group ≥65 years (0.5 cases per 100 000) (Figure 6.10; Annex F: Table F6.7). There was some difference in notification rates between sexes. Overall, the male-to-female ratio was 1.2:1, with males showing higher rate than females across all age groups and in particular among adults aged 25-44) (Figure 6.10; Annex F: Table F6.7).

Figure 6.10. Notification rates (per 100 000 population) of confirmed typhoid and paratyphoid fever cases by age group and sex, EU/EEA, 2010–2012 (N=3 165)

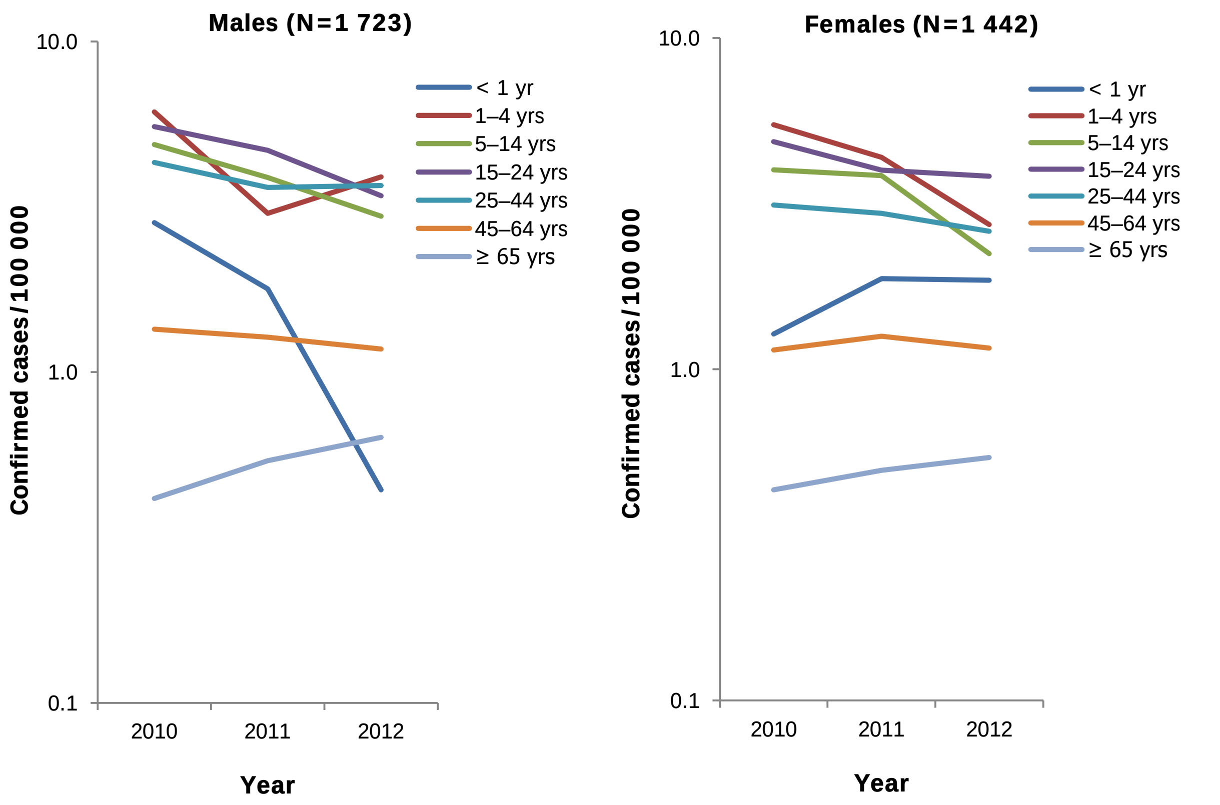


	< 1 yrs	1–4 yrs	5–14 yrs	15–24 yrs	25–44 yrs	45–64 yrs	≥ 65 yrs
Males	1.7	4.4	3.9	4.6	3.9	1.3	0.5
Females	1.7	4.2	3.4	4.3	2.9	1.2	0.5

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Lithuania, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA country: Norway

Due to the differences in notification rates between age groups in males and females, three-year trends, from 2010 to 2012, were described by sex (Figure 6.11; Annex F: Table F6.7). During 2010–2012, the notification rate was nearly stable in all age groups. The reported number of males younger than one year of age dropped from seven in 2010 to one in 2012, although the decrease was not significant (Figure 6.11; Annex F: Table F6.7).

Figure 6.11. Semi-logarithmic graph showing trends in notification rates (per 100 000 populations) of confirmed typhoid and paratyphoid fever cases by age groups and sex, EU/EEA countries, 2010–2012



Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Lithuania, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA country: Norway

Typhoid and paratyphoid fever by serovars

In the three-year surveillance period from 2010 to 2012, the highest proportion of cases was due to *S.* Typhi (56.6 %, cumulative data 2010–2012), followed by *S.* Paratyphi A (31.0%, cumulative data 2010–2012) and *S.* Paratyphi B (9.0%, cumulative data 2010–2012). Only 17 cases of *S.* Paratyphi C were reported during 2010–2012 (Table 6.5).

Table 6.5. Confirmed cases of *Salmonella* Typhi and *S.* Paratyphi, EU/EEA countries, 2010–2012

Serovar	2010		2011		2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
Salmonella Typhi	766	57.0	640	59.3	499	53.3
Salmonella Paratyphi	69	5.1	11	1.0	14	1.5
Salmonella Paratyphi A	373	27.8	329	30.5	340	36.3
Salmonella Paratyphi B	133	9.8	95	8.7	75	8.0
Salmonella Paratyphi C	4	0.3	5	0.5	8	0.9
EU/EEA total	**1 344**	**100.0**	**1 080**	**100.0**	**936**	**100.0**

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

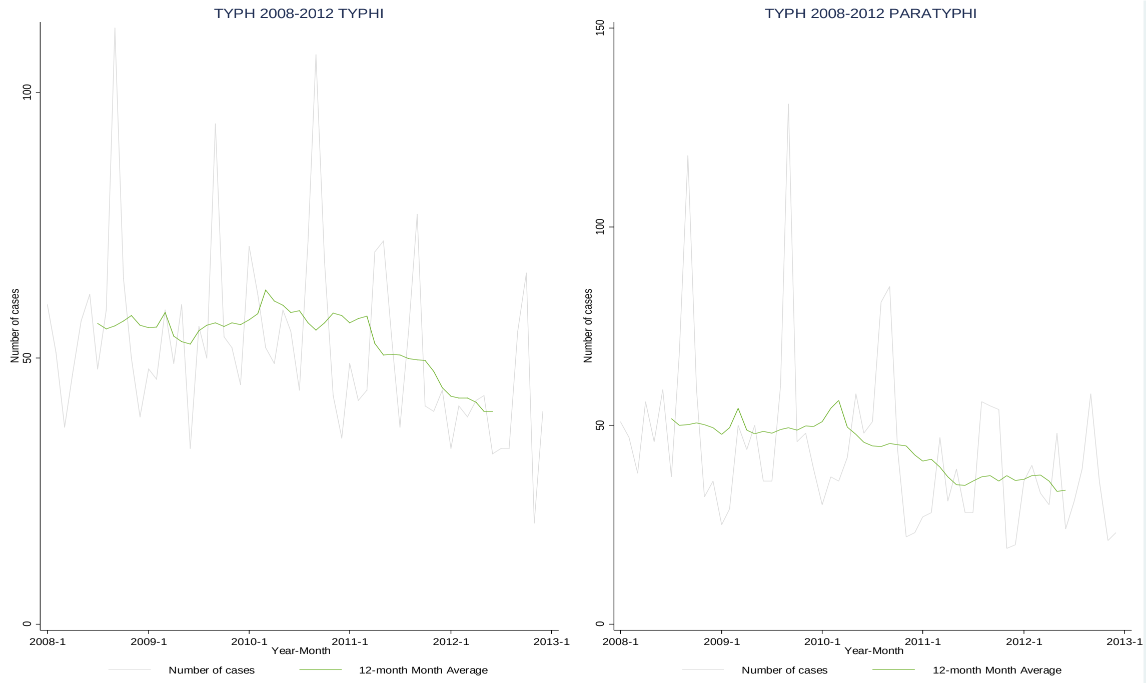
Trends in number of confirmed cases reported were calculated from 2008 to 2012 for serovars *S.* Typhi and *S.* Paratyphi (including *S.* Paratyphi A, *S.* Paratyphi B and *S.* Paratyphi C), overall and by origin of infection.

S. Typhi and *S.* Paratyphi showed a decrease between 2008 and 2012 (p-value <0.05) (Figure 6.12).

The reporting of confirmed domestic *S.* Paratyphi cases reduced during 2008–2012 (Figure 6.13). Trends for domestic *S.* Typhi cases were not calculated due to the low number of domestic reported over the five-year period the five-year period (less than 5 cases per month).

Among travel-related cases of typhoid/paratyphoid fever there was some fluctuation in trends, but the isolation of *Salmonella* serovars did not remarkably change during 2008–2012 (Figure 6.14). The proportion of unknown importation was reasonable high 59% and 52 for *S.* Typhi and *S.* Paratyphi, respectively.

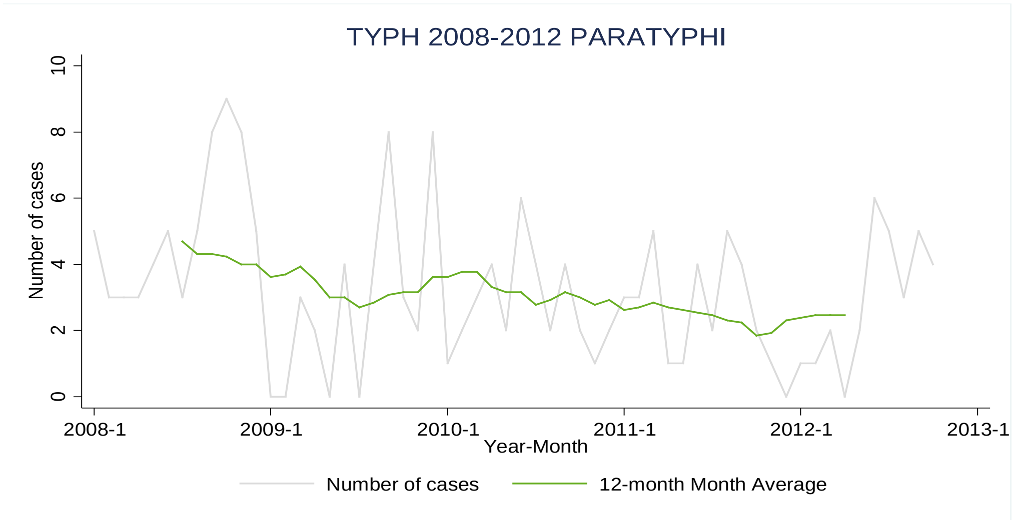
Figure 6.12. Trends in number of all confirmed cases of *Salmonella* Typhi (N=3 154) and *S.* Paratyphi* (N=2 657) serovars, EU/EEA countries, 2008–2012



** Includes serovars* S. *Paratyphi (n=261),* S. *Paratyphi A (n=1 701),* S. *Paratyphi B (n=669) and* S. *Paratyphi C (n=22)*

Source: Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

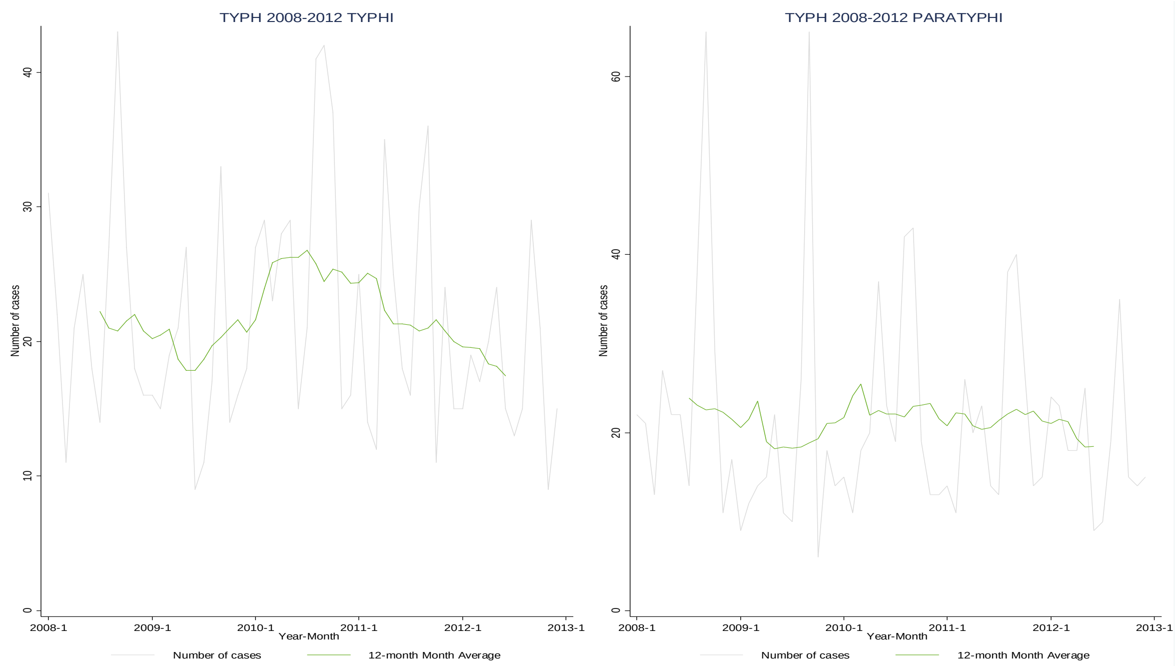
Figure 6.13. Trend in number of confirmed domestic cases of *Salmonella* Paratyphi* (N=192) serovars, EU/EEA countries, 2008–2012



** Includes serovars* S. *Paratyphi (n=37),* S. *Paratyphi A (n=56),* S. *Paratyphi B (n=88) and* S. *Paratyphi C (n=7)*

Source: Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Ireland, Latvia, Malta, the Netherlands, Slovakia, United Kingdom; EEA country: Norway

Figure 6.14. Trend in number of confirmed travel-related cases of *Salmonella* Typhi (N=1 285) and *S.* Paratyphi* (N=1 275) serovars, EU/EEA countries, 2008–2012



** Includes serovars S. Paratyphi (n=187), S. Paratyphi A (n=914), S. Paratyphi B (n=166) and S. Paratyphi C (n=8)*

Source: Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Ireland, Latvia, Malta, the Netherlands, Slovakia, United Kingdom; EEA country: Norway

Serovars by age groups

During 2010–2012, data on serovar and age were provided by 22 EU/EEA countries for 3 210 confirmed cases of typhoid and paratyphoid fever.

The age distribution of *S.* Typhi and *S.* Paratyphi A cases during 2010–2012 was significantly different across all age group, with the exception of the age group 15-24 years and cases older than 64 year of age, where no differences were observed (Table 6.6; Annex F: Table F6.8). About 20% of *S.* Paratyphi B isolates was reported in children younger than five year of age (Table 6.6; Annex F: Table F6.8), whereas 35% of all reported *S.* Paratyphi C cases were adults of the age of 65 years or older, although very low case numbers were reported (Table 6.6; Annex F: Table F6.8).

With regard to the relative distribution, *S.* Typhi was predominant in all age groups, being responsible for more than 40% of infections reported in each group (Figure 6.15; Annex F: Table F6.8). The relative proportion of *S.* Paratyphi A was highest in cases older than 15 years; on the contrary *S.* Paratyphi B was responsible for 25% of infection in infant (below 1 year) and 20% of infection in children (1–4 years), representing the second most frequently isolated serovar in these age groups (Figure 6.15; Annex F: Table F6.8).

Table 6.6. Age distribution of confirmed cases of *Salmonella* Typhi and *S.* Paratyphi* serovars, EU/EEA countries, 2010–2012 (N=3 210)

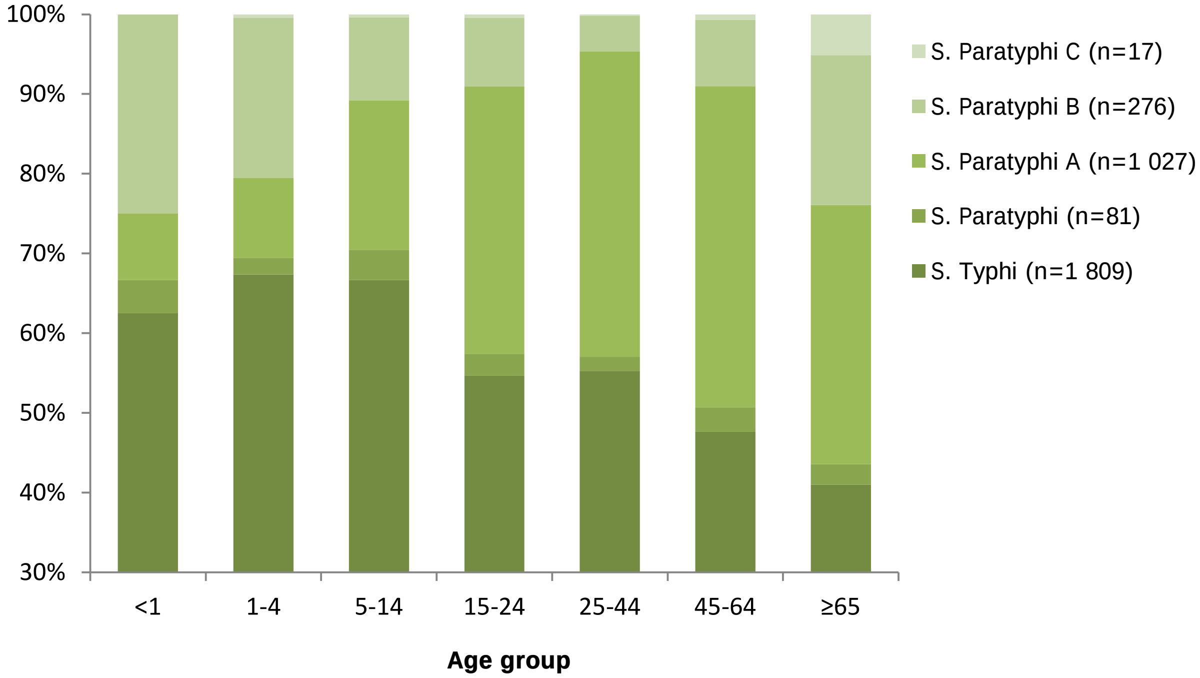
Age groups	*S.* Typhi		*S.* Paratyphi		*S.* Paratyphi A		*S.* Paratyphi B		*S.* Paratyphi C	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
<1 yr	15	0.8	1	1.2	2	0.2	6	2.2	0	0.0
1-4 yrs	161	8.9	5	6.2	24	2.3	48	17.4	1	5.9
5-14 yrs	334	18.5	19	23.5	94	9.2	52	18.8	2	11.8
15-24 yrs	368	20.3	18	22.2	226	22.0	58	21.0	3	17.6
25-44 yrs	682	37.7	22	27.2	473	46.1	55	19.9	2	11.8

Age groups	*S.* Typhi		*S.* Paratyphi		*S.* Paratyphi A		*S.* Paratyphi B		*S.* Paratyphi C	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
45-64 yrs	201	11.1	13	16.0	170	16.6	35	12.7	3	17.6
≥ 65 yrs	48	2.7	3	3.7	38	3.7	22	8.0	6	35.3
Total	**1 809**	**100.0**	**81**	**100.0**	**1 027**	**100.0**	**276**	**100.0**	**17**	**100.0**

** Includes serovars* S. *Paratyphi,* S. *Paratyphi A,* S. *Paratyphi B, and* S. *Paratyphi C*

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Ireland, Lithuania, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA country: Norway

Figure 6.15. Relative distribution of confirmed cases of *Salmonella* Typhi and *S.* Paratyphi* serovar by age groups as reported by EU/EEA countries, 2010–2012 (N=3 210)



** Includes serovars* S. *Paratyphi,* S. *Paratyphi A,* S. *Paratyphi B, and* S. *Paratyphi C*

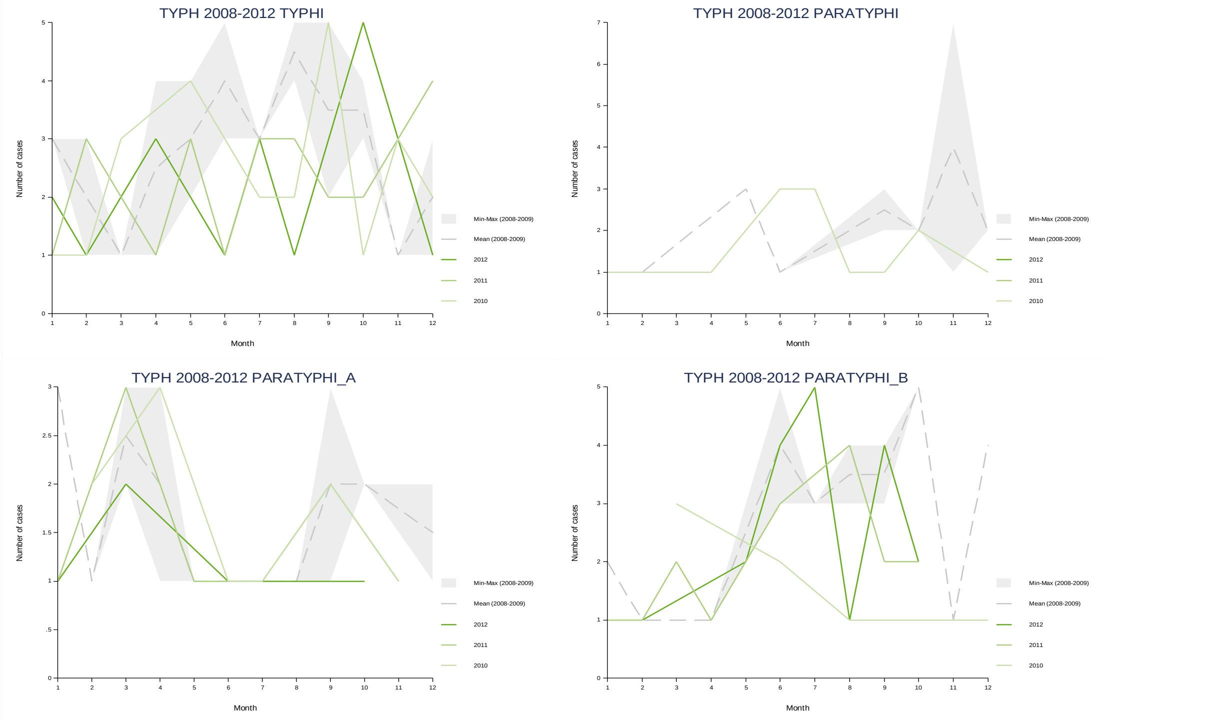
Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Ireland, Lithuania, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA country: Norway

Seasonality by serovar

The seasonality was analysed for serovars *S.* Typhi and *S.* Paratyphi (reported as Paratyphi, Paratyphi A or Paratyphi B) by origin of infection (Figure 6.16; Figure 6.17).

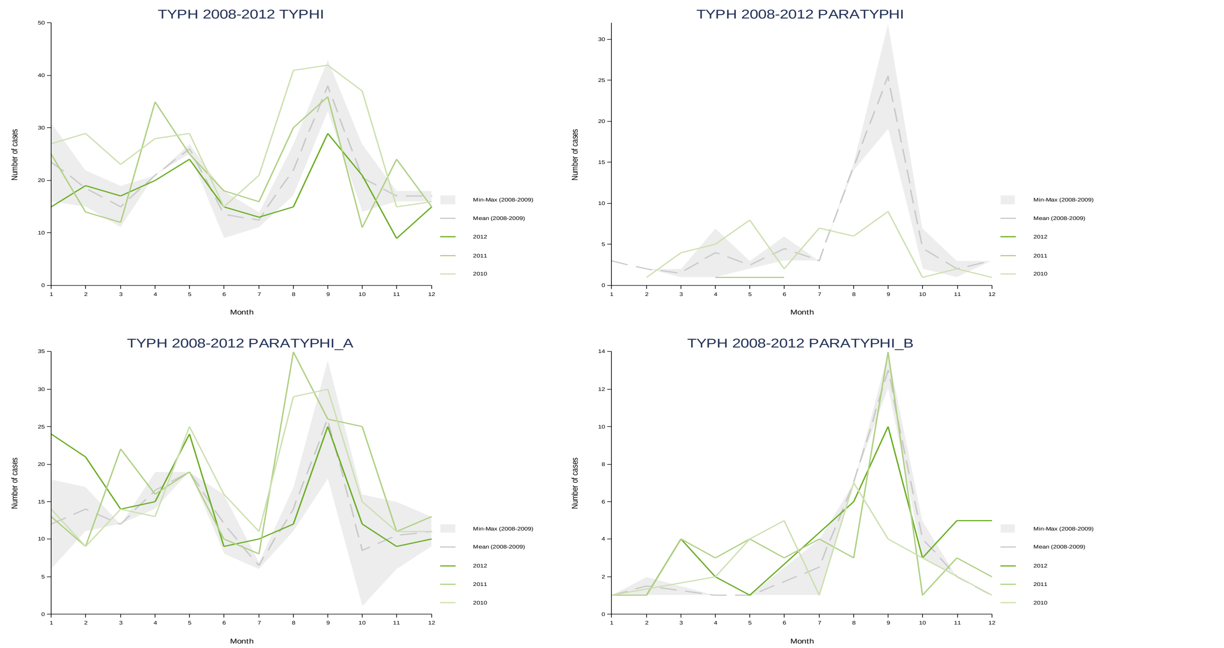
Serovars showed no seasonality in confirmed domestic cases of typhoid and paratyphoid fever, since the reported number of cases was low in 2010–2012 (Figure 6.16). Among travel-related cases, *S.* Typhi presented a clear seasonality, characterized by two peaks, a smaller one in April/May and the second in September. In 2010-2011, a smaller increase of cases in January was also reported (Figure 6.17). *S.* Paratyphi B also showed a clear seasonal pattern, the reporting of cases started increasing in April and peaked in September/October (Figure 6.17). Isolation of *S.* Paratyphi A increased between August and October and a high variability was observed during spring (Figure 6.17). Low case numbers due to serovar *S.* Paratyphi C were reported to evaluate the presence of any seasonal pattern.

Figure 6.16. Seasonal distribution of confirmed domestic cases of *Salmonella* Typhi (N=136), *S.* Paratyphi (N=37), *S.* Paratyphi A (N=60) and *S.* Paratyphi B (N=88), EU/EEA countries, 2008–2012 (N=462)



Source: Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Ireland, Malta, the Netherlands, Slovakia, United Kingdom; EEA country: Norway

Figure 6.17. Seasonal distribution of confirmed travel-related cases of *Salmonella* Typhi (N=1 285), *S.* Paratyphi (N=187), *S.* Paratyphi A (N=914), *S.* Paratyphi B (N=166), EU/EEA countries, 2008–2012



Source: Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Ireland, Malta, the Netherlands, Slovakia, United Kingdom; EEA country: Norway

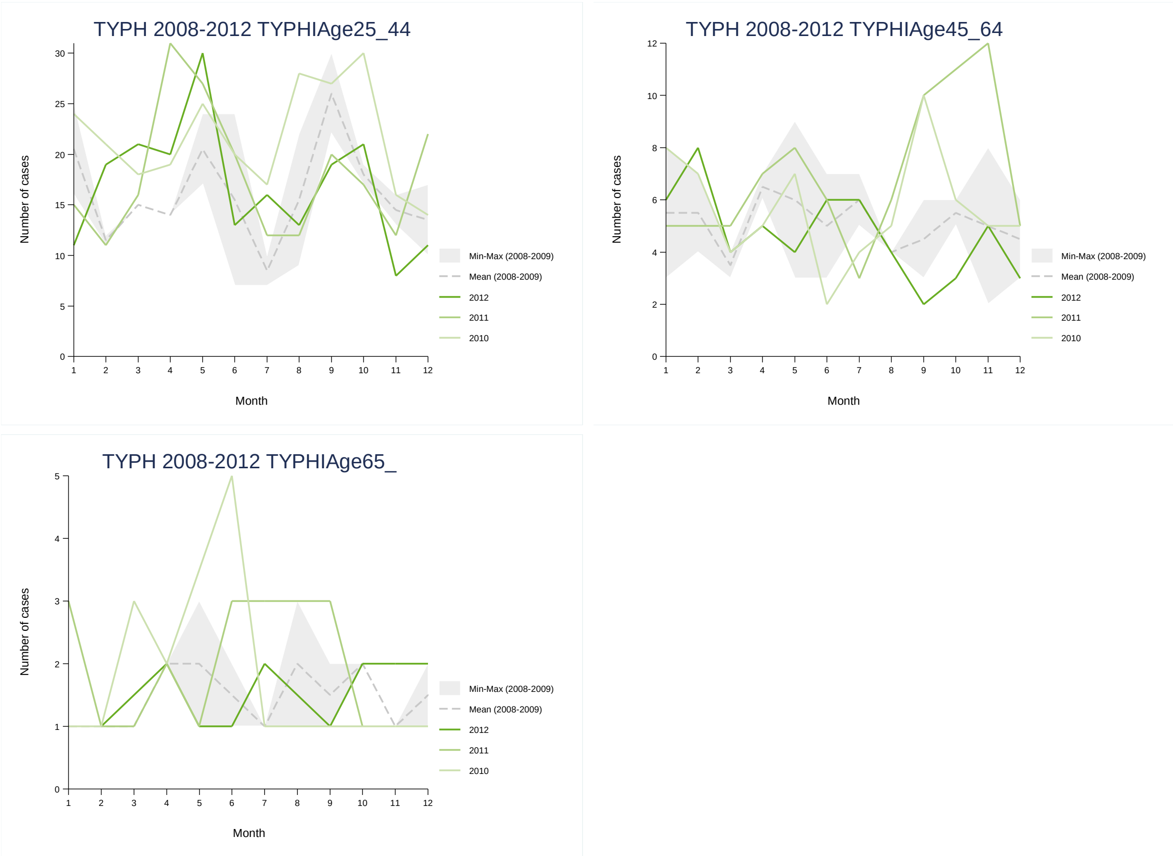
Seasonality by serovars and age group

Seasonality by age group was analysed for serovars *S.* Typhi and *S.* Paratyphi (including Paratyphi, Paratyphi A or Paratyphi B), for all and travel-related infections. Very few confirmed domestic cases of *S.* Typhi and *S.* Paratyphi were reported by month and age group to properly evaluate their seasonal distribution.

Most of *S.* Typhi cases between the age of 5 and 24 years were reported between August and October (Figure 6.18). Two peaks were observed in aged 25-44 years, one between April and May and the second between September and October (Figure 6.18). A clear seasonal pattern was observed in *S.* Paratyphi cases aged between 5 and 24 years. The number of cases started increasing in June/July and peaked in September (Figure 6.19). *S.* Paratyphi cases aged between 25 and 44 years also showed some seasonal pattern characterized by two peaks, one during spring and the second during autumn (Figure 6.19). In other age groups *S.* Typhi and *S.* Paratyphi cases were reported throughout the year, although the number of reported cases was low and interpretations should be made with caution (Figure 6.18 and Figure 6.19).

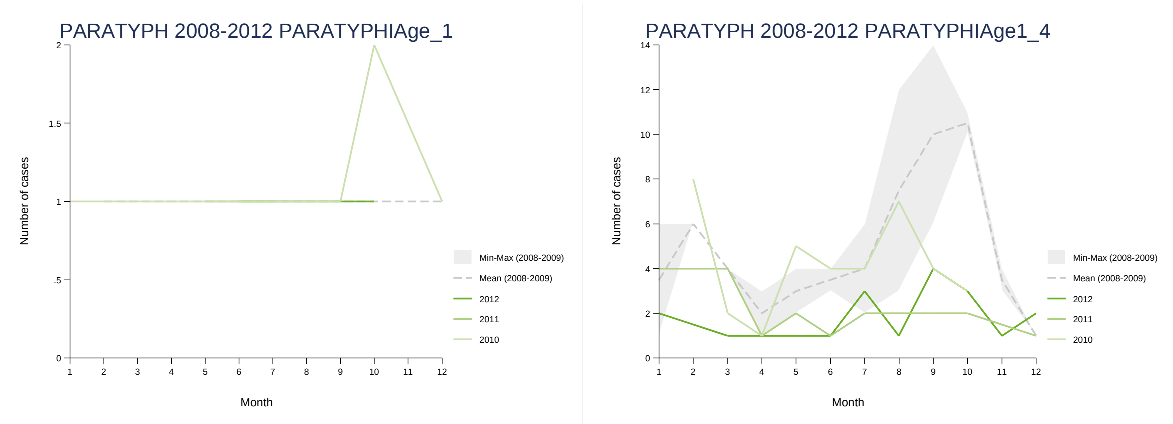
Among confirmed travel-related *S.* Typhi cases aged between 5 and 14 years a rise in reporting was observed in September, two smaller increases were reported during winter and spring (Figure 6.20). Some seasonality was observed in cases of 15-44 year of age characterized by two increases one in late winter/early springs another in late autumn (Figure 6.20). Among confirmed travel-related *S.* Paratyphi infections, only cases aged between 5 and 24 years showed a clear seasonal pattern, peaking in September; a smaller increase was recorded during winter and a high variability was observed during spring (Figure 6.21).

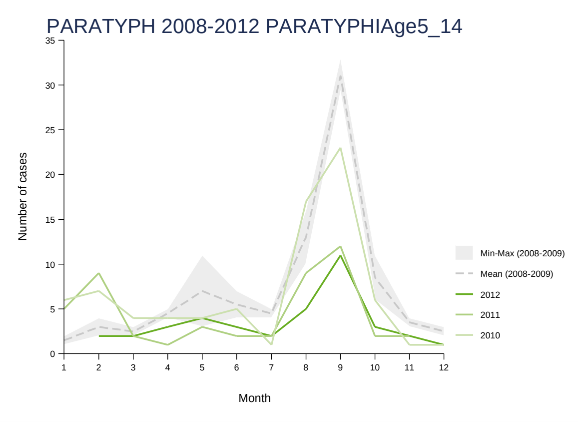
Figure 6.18. Seasonal distribution of confirmed cases of *Salmonella* Typhi (N=2 802) by age groups, EU/EEA countries, 2008–2012

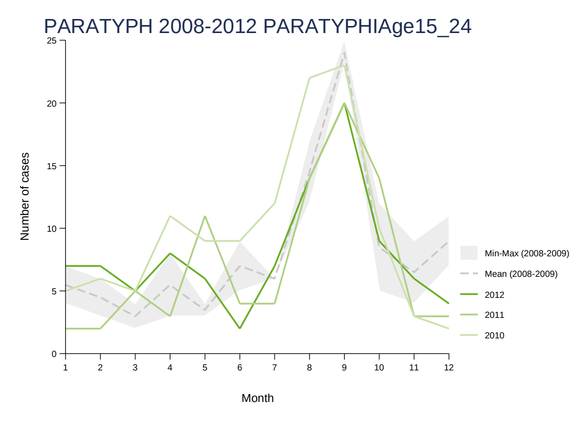


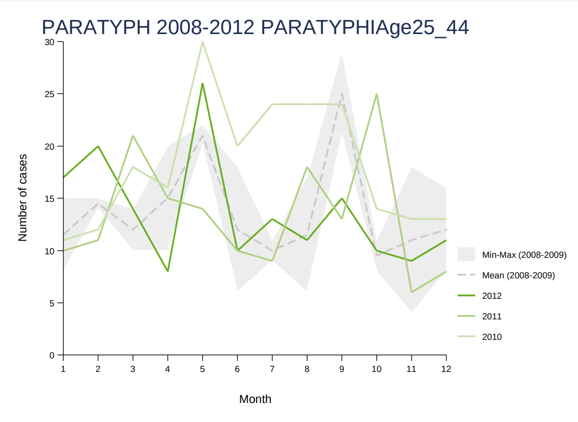
Source: Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Lithuania, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

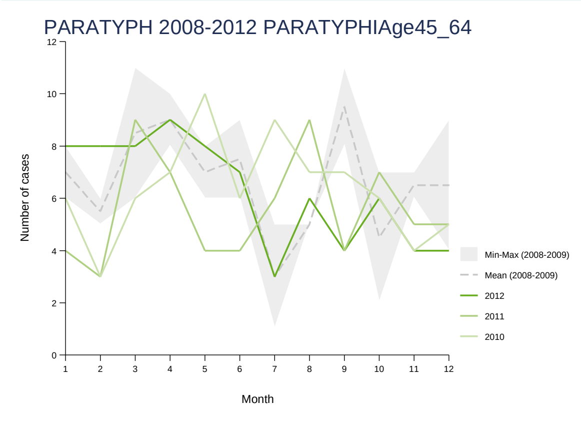
Figure 6.19. Seasonal distribution of confirmed cases of *Salmonella* Paratyphi* (N=2 408) serovars by age groups, EU/EEA countries, 2008–2012

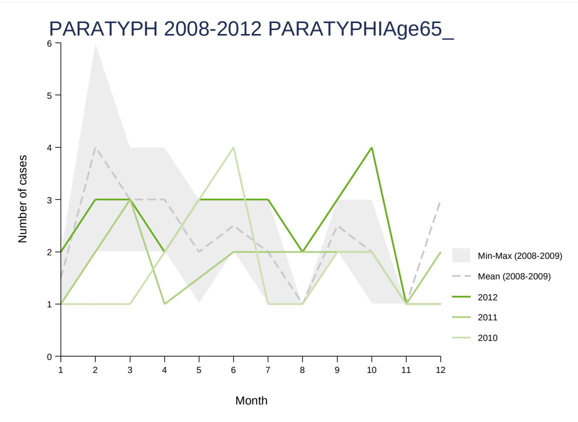








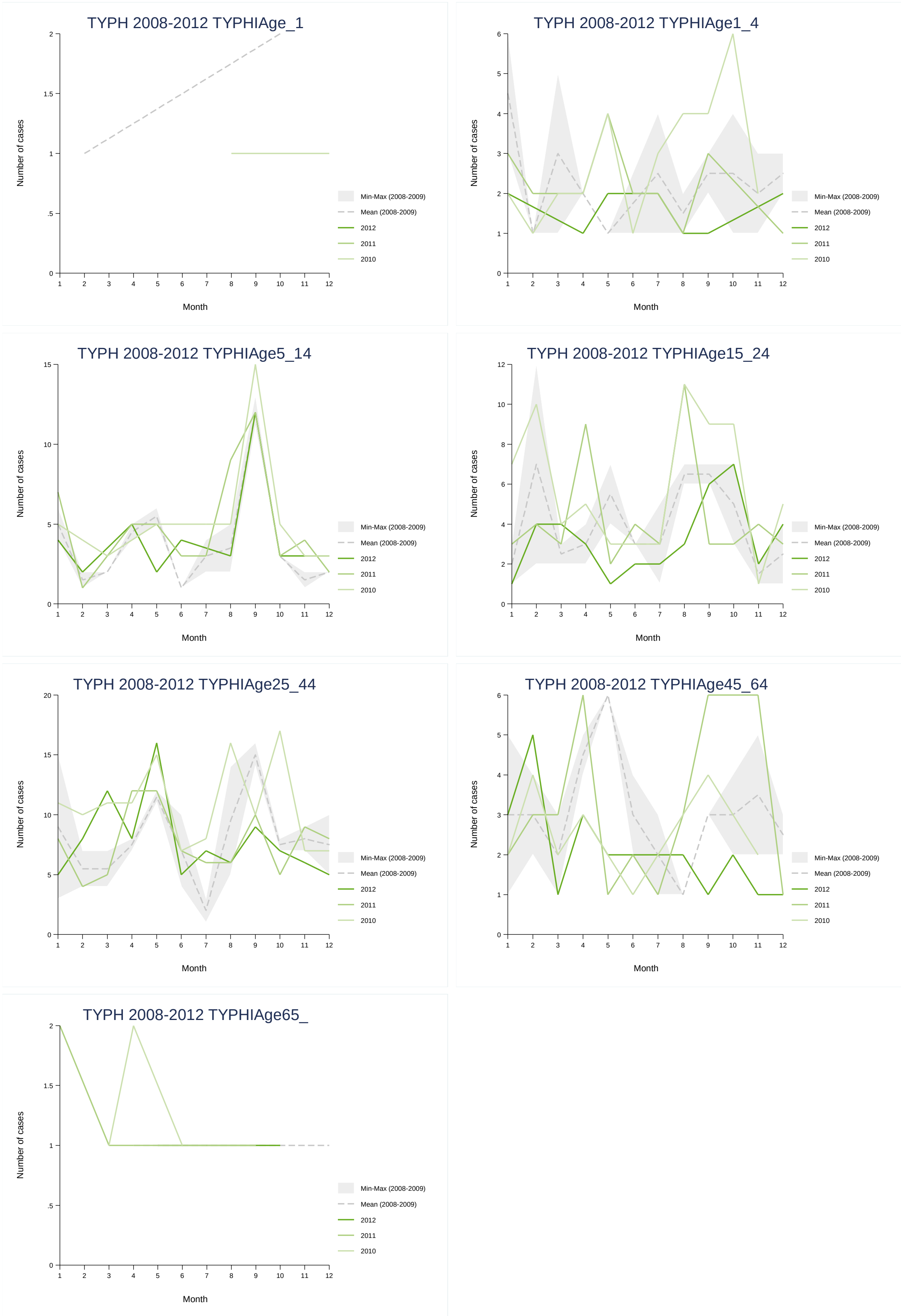




** Includes serovars* S. *Paratyphi (n=261),* S. *Paratyphi A (n=1596),* S. *Paratyphi B (n=531), and* S. *Paratyphi C (n=20)*

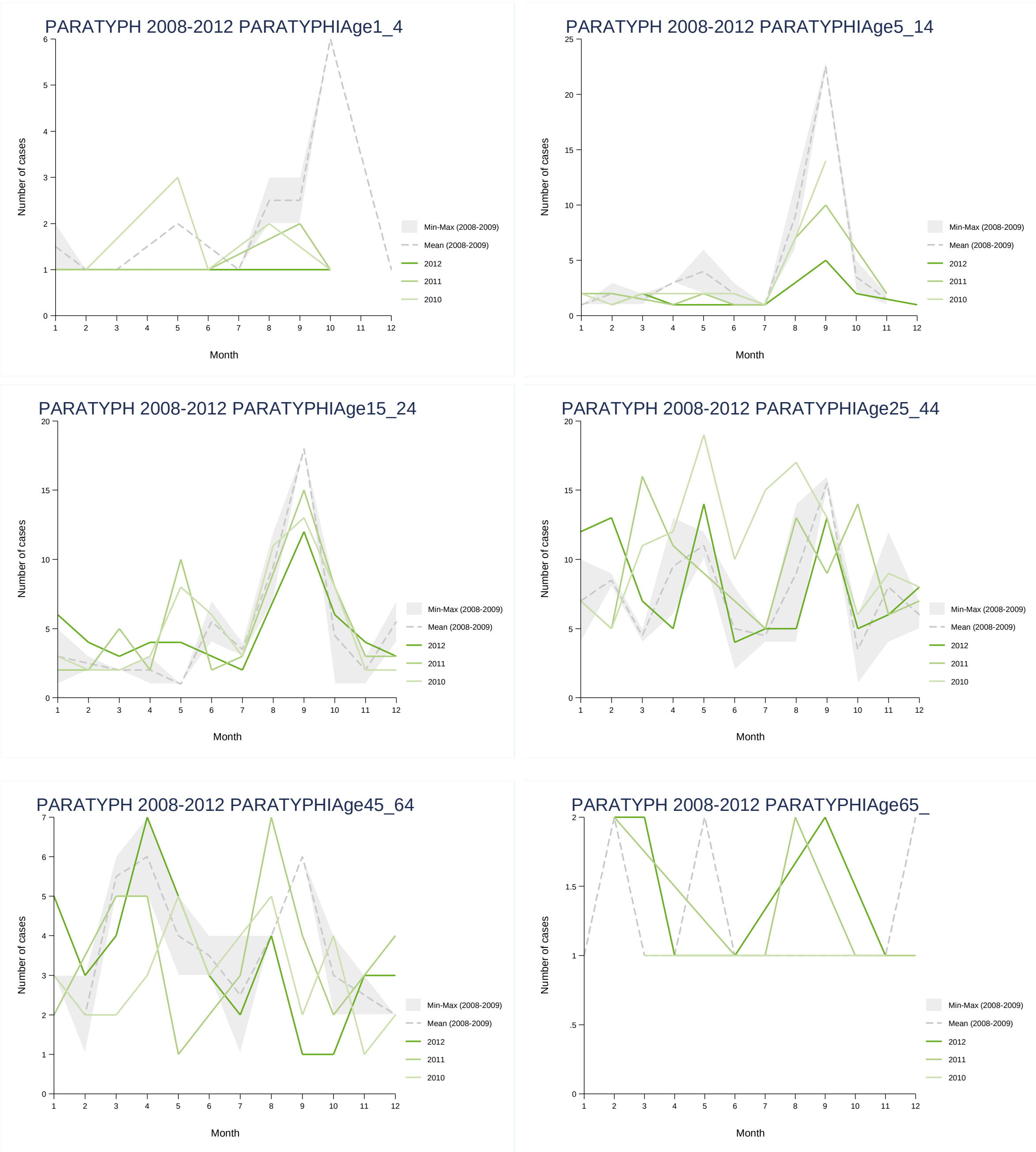
Source: Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Lithuania, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Figure 6.20. Seasonal distribution of confirmed travel-related cases of *Salmonella* Typhi (N=1 281) by age groups, EU/EEA countries, 2008–2012



Source: Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Ireland, Malta, the Netherlands, Slovakia, United Kingdom; EEA country: Norway

Figure 6.21. Seasonal distribution of confirmed travel-related cases of *Salmonella* Paratyphi* (N=1 274) serovars by age groups, EU/EEA countries, 2008–2012



* *Includes serovars* S. *Paratyphi (n=187),* S. *Paratyphi A (n=913),* S. *Paratyphi B (n=166), and* S. *Paratyphi C (n=8)*

Source: Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Ireland, Malta, the Netherlands, Slovakia, United Kingdom; EEA country: Norway

Severity

The severity of typhoid and paratyphoid fever cases was evaluated by analysing the hospitalisation ratio, the proportion of deaths due to *S.* Typhi and *S.* Paratyphi infections (outcome) among all confirmed cases and age groups, by calculating the case–fatality ratio. The specimen type used for diagnosis of the infection was also evaluated. Relative confidence intervals (95%CI) were calculated when analysing the hospitalisation ratio and the case–fatality ratio (CFR) and results were described on a country basis (Annex F: Tables F6.9, F6.10, F6.11, F6.12).

Hospitalisation

Hospitalisation data were included in the EU-level salmonellosis surveillance for the first time in 2009. During 2010–2012, the information on hospitalisation was reported for 12% of confirmed typhoid and paratyphoid fever cases. The number of reporting countries increased from 8 in 2010 to 11 in 2012 (Annex F: Table F6.9). At the EU/EEA level, the proportion of hospitalised typhoid/paratyphoid fever cases remained quite stable over the three-year period, at about 68% (CI 95% ranging from 58.8% to 76.2% in 201–2012) (Table 6.7). The highest hospitalisation ratio (75–100% of cases hospitalised) were observed in countries that reported a low number of confirmed typhoid and paratyphoid fever cases (Cyprus, Estonia, Greece and Hungary), suggesting that the surveillance systems in these countries focus on more severe cases (Annex F: Table F6.9). Since the proportion of unknown data was high (>85%), results on hospitalisation should be interpreted with caution.

Table 6.7. Hospitalisation ratio of confirmed typhoid and paratyphoid fever cases, EU/EEA, 2010–2012

Hospitalisation	Year		
	2010	2011	2012
Number of confirmed cases	1 463	1 160	966
Confirmed cases covered (%)[1]	10.5	10.8	14.3
Hospitalised cases	104	85	88
Hospitalisation ratio (%)[2] (confidence interval 95%)	67.5 (59.8–75.2)	67.7 (58.8–75.9)	68.1 (59.5–76.2)

[1] The proportion (%) of confirmed cases for which information on hospitalisation was available.

[2] Calculated as number of hospitalised cases of the confirmed cases for which this information was available.

Source: Austria (from 2011), Czech Republic (beginning from 2012), Cyprus (from 2012), Estonia, Greece, Hungary, Ireland, the Netherlands, Portugal, United Kingdom; EEA country: Norway

Outcome

Case–fatality ratio was calculated as the number of deaths/number of cases with known outcome (alive/dead). However, due to uncertainty related to unknown or missing data for the outcome, reporting needs to be improved before it can be considered as a parameter for severity.

During 2010–2012, 14 EU/EEA countries provided data on outcome for *S.* Typhi cases, with two Austria and the United Kingdom reporting the information from 2011 onwards (Annex F: Table F6.10). Overall, the information on outcome was reported for 18% of confirmed typhoid fever cases (Table 6.8; Annex F: Table F6.10). Three deaths of typhoid fever were reported during the three-year surveillance period; one fatal case was reported from Portugal and two from the United Kingdom, resulting in low CFRs: 1.68 in 2011 and 0.89 in 2012 (Table 6.8; Annex F: Table F6.10). Two deaths occurred among persons between 1 and 24 years. The third death was reported in a case older than 64 year of age.

Table 6.8. Number of deaths and case–fatality ratio due to *Salmonella* Typhi infections, EU/EEA countries, 2010–2012

Outcome	Year		
	2010	2011	2012
Number of confirmed cases	891	724	533
Confirmed cases covered (%)[1]	16.8	16.7	21.1
Number of deaths	0	2	1
Case fatality ratio (%)[2] (confidence interval 95%)	0.00 (0.0–2.49*)	1.68 (0.20–5.94)	0.89 (0.02–5.01)

[1] The proportion (%) of confirmed cases for which information on death was available.

[2] Calculated as number of fatal cases of the confirmed cases for which this information was available.

** One-sided, 97.5% confidence interval*

Source: Austria (from 2011), Czech Republic, Estonia, Germany, Greece, Hungary, Ireland, Malta, the Netherlands, Portugal, Romania, Slovakia, United Kingdom (from 2011); EEA country: Norway

During 2010–2012, 15 EU/EEA countries provided data on outcome for *S.* Paratyphi cases, with Austria and the United Kingdom reporting the information only for one or two years in 2010–2012 (Annex F: Table F6.11). Overall, the information on outcome was reported for 26% of confirmed paratyphoid fever cases (Table 6.9; Annex F: Table F6.11). Two deaths were reported by the United Kingdom during the three-year surveillance period (Annex F: Table F6.11). The case–fatality ratio for *S.* Paratyphi cases was 0.75 in 2010 and 0.83 in 2012 (Table 6.9). One death occurred among those aged 1 to 24 years and the second in those aged 25-44 years.

Table 6.9. Number of deaths and case–fatality ratio due to *Salmonella* Paratyphi infections, EU/EEA countries, 2010–2012

Outcome	Year		
	2010	2011	2012
Number of confirmed cases	572	435	433
Confirmed cases covered (%)[1]	23.4	27.1	28.2
Number of deaths	1	0	1
Case fatality ratio (%)[2] (confidence interval 95%)	0.75 (0.02-4.1)	0.00 (0-3.1*)	0.83 (0.02-4.52)

[1] The proportion (%) of confirmed cases for which information on death was available.

[2] Calculated as number of fatal cases of the confirmed cases for which this information was available.

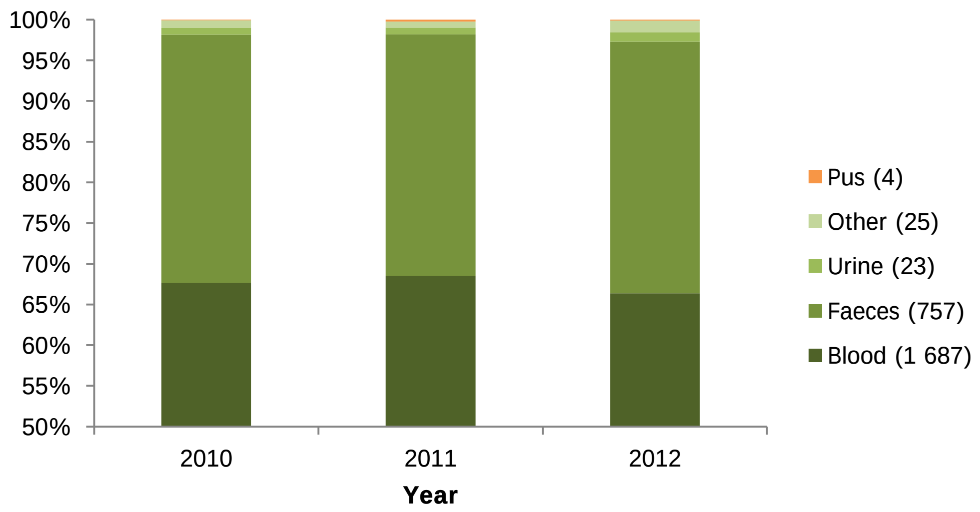
** One-sided, 97.5% confidence interval*

Source: Austria (from 2011), Cyprus, Czech Republic, Estonia, Germany, Greece, Hungary, Ireland, Malta, the Netherlands, Portugal, Romania, Slovakia, United Kingdom (only 2010 and 2012); EEA country: Norway

Isolation by specimen type

Nineteen EU/EEA countries were able to provide data on isolation of serovars in different specimens for 76% of all cases during the years 2010 and 2012. The distribution of specimens types used for laboratory confirmation did not differ significantly during 2010 -2012 (Annex F: Table F6.11). Of all typhoid and paratyphoid fever cases with known data, 65% were systemic, bloodstream infections (Annex F: Table F6.11; Figure 6.22). The second most frequently reported specimen was faeces, representing overall the 33% of all specimen types reported (Annex F: Table F6.11; Figure 6.22).

Figure 6.22. Distribution of confirmed typhoid and paratyphoid fever cases diagnosed from different specimen type as reported by EU/EEA countries in 2010–2012 (N=2 496)



Source: Austria, Cyprus, Denmark, Estonia, France, Germany, Greece, Hungary, Ireland, Lithuania, Malta, Portugal, Romania, Slovakia, Slovenia, Spain, United Kingdom; EEA country: Norway

Antimicrobial resistance

During 2010–2012, antimicrobial susceptibility testing (AST) data for *S.* Typhi were submitted by 12 EU/EEA countries for 1 155 isolates (63% of total reported in 2010–2012). France and the United Kingdom accounted for 90% of all isolates with AST results reported (Table 6.10). The highest proportion of resistance among *S.* Typhi was detected for nalidixic acid, about 70% of the isolates showed resistance to this antimicrobial in 2010–2012, followed by ciprofloxacin with 52% of isolates being resistant (Table 6.10). The level of resistance to ampicillin, chloramphenicol, sulfonamides, streptomycin and trimethoprim (co-trimoxazole) was moderate (around 20% of isolates resistant) (Table 6.10). During 2010–2012, the proportion of resistant strains was low for cefotaxime, gentamicin, kanamycin and tetracyclines, ranging between 0% and 6% (Table 6.10).

In 2010–2012, information on antimicrobial resistance for *S.* Paratyphi isolates was reported by 12 EU/EEA countries for 1018 isolates (71% of total reported in 2010–2012). Data submitted by three countries (France, Germany and the United Kingdom) represented about 90% of the total number of isolates with AST data provided (Table 6.14). In 2010–2012, the highest proportion of resistance in *S.* Paratyphi isolates was detected for nalidixic acid (71% of isolates resistant), followed by ciprofloxacin (56% of isolates resistant) (Table 6.14). The proportion of resistance for all the other antimicrobials was low, ranging from 0% for kanamycin to 3% for sulfonamides (Table 6.14).

Generally, in 2010–2012, isolates of *S.* Typhi were more commonly resistant to several antibiotics than *S.* Paratyphi serovars (Table 6.11, Table 6.15). Random fluctuation characterised the multidrug-resistance level observed during 2010–2012 among domestic and travel-related cases of both serovars (Table 6.12; Table 6.13; Table 6.16; Table 6.17).

Among *S.* Typhi strains, the highest proportion of multi-drug resistant strains (MDR) (13%) was reported for a specific antibiogram combination: ACNSuSTm (ampicillin, chloramphenicol, ciprofloxacin/nalidixic acid, sulfonamides streptomycin and trimethoprim) (Annex F: Table F6.12). All travel-related MDR *S.* Typhi and *S.* Paratyphi isolates were imported outside Europe.

More detailed information on specific profiles of combined resistance to three or more antimicrobial classes (multi-drug resistance) are presented in Annex F: Table F6.12 and 6.13, for isolates of *S.* Paratyphi for *S.* Typhi, respectively.

Table 6.10. Resistance of *Salmonella* Typhi isolates to different antimicrobial agents by EU/EEA countries, 2010–2012

Antimicrobial agent	Ampicillin		Chloramphenicol		Ciprofloxacin		Cefotaxime		Gentamicin		Kanamycin		Nalidixic acid		Sulphonamides		Streptomycin		Trimethoprim (co-trimoxazole)		Tetracyclines	
Country	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)
Estonia	0.0	1	-	0	0.0	1	0.0	1	100.0	1	-	0	-	0	-	0	-	0	0.0	1	0.0	1
France	11.3	265	12.1	265	2.6	265	0.0	265	0.0	265	0.0	265	29.1	265	14.3	265	12.8	265	13.6	265	7.5	265
Greece	50.0	2	50.0	2	0.0	2	-	0	-	0	0.0	2	50.0	2	-	0	50.0	2	100.0	1	0.0	2
Ireland	20.0	30	23.3	30	0.0	30	0.0	30	0.0	30	0.0	30	66.7	30	20.0	30	16.7	30	20.0	30	6.7	30
Italy	35.5	31	40.0	10	19.2	26	0.0	23	47.4	19	0.0	5	40.0	10	40.0	5	40.0	5	24.0	25	22.2	9
Lithuania	0.0	1	0.0	1	100.0	1	0.0	1	0.0	1	0.0	1	100.0	1	0.0	1	0.0	1	0.0	1	0.0	1
Malta	100.0	1	-	0	0.0	1	-	0	0.0	1	-	0	-	0	-	0	-	0	0.0	1	-	0
Netherlands	22.7	22	27.3	22	59.1	22	0.0	22	0.0	22	-	0	59.1	22	0.0	12	54.5	22	-	0	0.0	22
Romania	0.0	1	0.0	1	0.0	1	0.0	1	0.0	1	0.0	1	100.0	1	0.0	1	0.0	1	0.0	1	0.0	1
Slovenia	0.0	4	0.0	4	75.0	4	0.0	4	0.0	4	0.0	4	100.0	4	50.0	4	50.0	4	50.0	4	50.0	4
Spain	11.5	26	11.5	26	0.0	26	0.0	26	0.0	26	0.0	26	38.5	26	15.4	26	23.1	26	3.8	26	7.7	26
United Kingdom	24.8	771	23.8	770	73.7	771	0.0	770	0.0	771	0.0	770	84.2	770	24.5	770	23.8	770	24.0	771	4.8	770
Total	21.6	1148	20.9	1131	51.9	1150	0.0	1143	0.9	1141	0.0	1104	68.9	1131	21.6	1114	21.8	1126	21.0	1126	4.4	1491

** Total indicates the total number of isolates with SIR information available*

^ Res (%) = Proportion of resistant strains (total number of resistant strains out of all the tested strains)

– Not reported/not calculated

Table 6.11. Multidrug resistance of *Salmonella* Typhi isolates in confirmed cases, EU/EEA countries, 2010–2012

Resistant profile	2010		2011		2012		2010–2012	
	Res^ (N)	Res^ (%)	Res^ (N)	Res^ (%)	Res^ (N)	Res^ (%)	Res^ (N)	Res^ (%)
Susceptible to all	127	24.3	48	14.5	106	31.4	281	23.6
Multidrug resistant*	105	20.1	95	28.7	66	19.5	266	22.3
Others**	291	55.6	188	56.8	166	49.1	645	54.1
Total~	**523**	**100.0**	**331**	**100.0**	**338**	**100.0**	**1192**	**100.0**

** 'Multidrug resistant' includes isolates classified as 'intermediate' and 'resistant' to three or more antimicrobial classes*

*** 'Others' includes isolates classified as 'intermediate' and 'resistant' to one or two antimicrobial classes*

^ Res= Number and proportion of resistant strains (total number of resistant strains out of all the tested strains)

~Total indicates the total number of isolates with Multidrug information available

Source: Estonia, France, Greece, Ireland, Italy, Lithuania, Malta, the Netherlands, Romania, Slovenia, Spain, United Kingdom

Table 6.12. Multidrug resistance of *S.* Typhi isolates in confirmed domestic cases, EU/EEA countries, 2010–2012

Resistant profile	2010		2011		2012		2010–2012	
	Res^ (N)	Res^ (%)	Res^ (N)	Res^ (%)	Res^ (N)	Res^ (%)	Res^ (N)	Res^ (%)
Susceptible to all	0	0.0	7	29.2	4	22.2	11	14.5
Multidrug resistant*	8	23.5	6	25.0	1	5.6	15	19.7
Others**	26	76.5	11	45.8	13	72.2	50	65.8
Total~	**34**	**100.0**	**24**	**100.0**	**18**	**100.0**	**76**	**100.0**

** 'Multidrug resistant' includes isolates classified as 'intermediate' and 'resistant' to three or more antimicrobial classes*

*** Others includes isolates classified as 'intermediate' and 'resistant' to one or two antimicrobial classes*

^ Res= Number and proportion of resistant strains (total number of resistant strains out of all the tested strains)

~Total indicates the total number of isolates with Multidrug information available

Source: Estonia, France, Greece, Ireland, Italy, Lithuania, Malta, the Netherlands, Romania, Slovenia, Spain, United Kingdom

Table 6.13. Multidrug-resistance of *S.* Typhi isolates in confirmed travel-related cases, EU/EEA countries, 2010–2012

Resistant profile	2010		2011		2012		2010–2012	
	Res^ (N)	Res^ (%)	Res^ (N)	Res^ (%)	Res^ (N)	Res^ (%)	Res^ (N)	Res^ (%)
Susceptible to all	19	9.9	14	8.7	15	12.3	48	10.1
Multidrug resistant*	39	20.3	55	34.2	31	25.4	125	26.3
EU/EEA countries	0		0		0		0	
Non-EU/EEA countries	39		55		31		125	
Others**	134	69.8	92	57.1	76	62.3	302	63.6
Total~	**192**	**100.0**	**161**	**100.0**	**122**	**100.0**	**475**	**100.0**

** Multidrug-resistant includes isolates classified as 'intermediate' and 'resistant' to three or more antimicrobial classes*

*** 'Others' includes isolates classified as 'intermediate' and 'resistant' to one or two antimicrobial classes*

^ Res= Number and proportion of resistant strains (total number of resistant strains out of all the tested strains)

~Total indicates the total number of isolates with Multidrug information available

Source: Estonia, France, Greece, Ireland, Italy, Lithuania, Malta, the Netherlands, Romania, Slovenia, Spain, United Kingdom

Table 6.14. Resistance of *Salmonella* Paratyphi isolates to different antimicrobial agents by EU/EEA countries, 2010–2012

Antimicrobial agent	Ampicillin		Chloramphenicol		Ciprofloxacin		Cefotaxime		Gentamicin		Kanamycin		Nalidixic Acid		Sulphonamides		Streptomycin		Trimethoprim (co-trimoxazole)		Tetracyclines	
Country	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)
Denmark	0.0	34	2.9	34	73.5	34	0.0	34	0.0	34	0.0	34	73.5	34	2.9	34	8.8	34	2.9	34	5.9	34
Estonia	0.0	1	0.0	1	100.0	1	0.0	1	0.0	1	0.0	1	100.0	1	0.0	1	0.0	1	0.0	1	0.0	1
France	2.9	103	2.9	103	1.0	103	0.0	103	0.0	103	0.0	103	51.5	103	2.9	103	4.9	103	0.0	103	3.9	103
Germany	2.0	101	-	0	0.0	101	0.0	101	0.0	101	0.0	101	2.0	101	-	0	7.9	101	1.0	101	-	0
Greece	0.0	2	0.0	1	0.0	2	0.0	1	100.0	1	0.0	1	0.0	1	-	0	0.0	1	-	0	50.0	2
Ireland	0.0	12	0.0	12	0.0	12	0.0	12	0.0	12	0.0	12	58.3	12	8.3	12	16.7	12	8.3	12	0.0	12
Italy	12.9	31	0.0	9	6.7	30	0.0	25	47.6	21	0.0	4	11.1	9	25.0	4	0.0	4	3.3	30	6.3	16
Lithuania	0.0	3	0.0	3	0.0	3	0.0	3	0.0	3	0.0	3	33.3	3	33.3	3	33.3	3	0.0	2	0.0	3
Malta	0.0	1	-	0	100.0	1	-	0	0.0	1	-	0	-	0	-	0	-	0	0.0	1	-	0
Netherlands	0.0	25	-	25	52.0	25	-	25	0.0	25	-	0	-	25	-	16	-	25	-	0	-	25
Romania	0.0	2	0.0	2	0.0	2	0.0	2	0.0	2	0.0	2	0.0	2	50.0	2	0.0	2	0.0	2	0.0	2
Slovakia	0.0	1	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	v	0	0.0	1
Slovenia	0.0	2	0.0	2	0.0	2	0.0	2	0.0	2	0.0	2	100.0	2	0.0	2	0.0	2	0.0	2	0.0	2

Antimicrobial agent	Ampicillin		Chloramphenicol		Ciprofloxacin		Cefotaxime		Gentamicin		Kanamycin		Nalidixic Acid		Sulphonamides		Streptomycin		Trimethoprim (co-trimoxazole)		Tetracyclines	
Country	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)	Res^ (%)	Total* (N)
Spain	0.0	13	0.0	13	0.0	13	0.0	13	0.0	13	0.0	13	53.8	13	0.0	13	0.0	13	0.0	13	0.0	13
United Kingdom	1.5	687	0.7	685	76.6	687	0.3	684	0.0	687	0.0	685	86.1	685	2.6	685	0.1	685	2.0	687	1.2	685
Total	1.9	1018	1.0	890	56.0	1016	0.2	1006	1.1	1006	0.0	961	70.8	991	3.0	875	2.2	986	1.8	988	1.8	899

** Total indicates the total number of isolates with SIR information available*

^ Res (%) = Proportion of resistant strains (total number of resistant strains out of all the tested strains)

– Not reported/not calculated

Table 6.15. Multidrug-resistance of *Salmonella* Paratyphi isolates in confirmed cases, EU/EEA countries, 2010–2012

Resistant profile	2010		2011		2012		2010–2012	
	Res^ (N)	Res^ (%)	Res^ (N)	Res^ (%)	Res^ (N)	Res^ (%)	Res^ (N)	Res^ (%)
Susceptible to all	78	18.6	32	10.0	45	15.4	155	15.0
Multidrug resistant*	11	2.6	3	0.9	12	4.1	26	2.5
Others**	330	78.8	286	89.1	236	80.5	852	82.5
Total~	**419**	**100.0**	**321**	**100.0**	**293**	**100.0**	**1033**	**100.0**

** 'Multidrug resistant' includes isolates classified as 'intermediate' and 'resistant' to three or more antimicrobial classes*

*** Others includes isolates classified as 'intermediate' and 'resistant' to one or two antimicrobial classes*

^ Res= Number and proportion of resistant strains (total number of resistant strains out of all the tested strains)

~ Total indicates the total number of isolates with Multidrug information available

Source: Denmark, Estonia, France, Germany, Greece, Ireland, Italy, Lithuania, Malta, the Netherlands, Romania, Slovakia, Slovenia, Spain, United Kingdom

Table 6.16. Multidrug resistance of *Salmonella* Paratyphi isolates in confirmed domestic cases, EU/EEA countries, 2010–2012

Resistant profile	2010		2011		2012		2010–2012	
	Res^ (N)	Res^ (%)	Res^ (N)	Res^ (%)	Res^ (N)	Res^ (%)	Res^ (N)	Res^ (%)
Susceptible to all	2	3.3	4	7.1	2	5.7	8	5.3
Multidrug resistant*	4	6.7	1	1.8	4	11.4	9	6.0
Others**	54	90.0	51	91.1	29	82.9	134	88.7
Total~	**60**	**100.0**	**56**	**100.0**	**35**	**100.0**	**151**	**100.0**

** 'Multidrug resistant' includes isolates classified as 'intermediate' and 'resistant' to three or more antimicrobial classes*

*** Others includes isolates classified as 'intermediate' and 'resistant' to one or two antimicrobial classes*

^ Res= Number and proportion of resistant strains (total number of resistant strains out of all the tested strains)

~ Total indicates the total number of isolates with Multidrug information available

Source: Denmark, Estonia, France, Germany, Greece, Ireland, Italy, Lithuania, Malta, the Netherlands, Romania, Slovakia, Slovenia, Spain, United Kingdom

Table 6.17. Multidrug resistance of *Salmonella* Paratyphi isolates in confirmed travel-related cases, EU/EEA countries, 2010–2012

Resistant profile	2010		2011		2012		2010–2012	
	Res^ (N)	Res^ (%)	Res^ (N)	Res^ (%)	Res^ (N)	Res^ (%)	Res^ (N)	Res^ (%)
Susceptible to all	19	13.1	12	7.8	19	14.7	50	11.7
Multidrug resistant*	3	2.1	2	1.3	3	2.3	8	1.9
EU/EEA countries	0		0		0		0	

Resistant profile	2010		2011		2012		2010–2012	
	Res^ (N)	Res^ (%)	Res^ (N)	Res^ (%)	Res^ (N)	Res^ (%)	Res^ (N)	Res^ (%)
Non-EU/EEA countries	3		1		3		7	
Others**	123	84.8	140	90.9	107	82.9	370	86.4
Total~	**145**	**100.0**	**154**	**100.0**	**129**	**100.0**	**428**	**100.0**

** 'Multidrug resistant' includes isolates classified as 'intermediate' and 'resistant' to three or more antimicrobial classes*

*** Others includes isolates classified as 'intermediate' and 'resistant' to one or two antimicrobial classes*

^ Res= Number and proportion of resistant strains (total number of resistant strains out of all the tested strains)

~ Total indicates the total number of isolates with Multidrug information available

Source: Denmark, Estonia, France, Germany, Greece, Ireland, Italy, Lithuania, Malta, the Netherlands, Romania, Slovakia, Slovenia, Spain, United Kingdom

Discussion

Typhoid and paratyphoid fever are rare in Europe [2-3] and a significant decreasing five-year trend in the number of all confirmed cases was recorded at the EU/EEA level from 2008 to 2012, reflecting a constant reduction in the reporting of both *Salmonella* serovars.

During the three-year period from 2010 to 2012, 3 536 cases of typhoid and paratyphoid fever were reported in Europe. The overall notification rates in 2010–2012 were relatively low and nearly identical for both *S*. Typhi and *S*. Paratyphi serovars (1.6 and 1.2 per 100 000 population, respectively). About 40% of Member States reported ≤1 cases per year of *S*. Typhi and 80% of all typhoid fever cases at European level were reported by four countries (France, Germany, Italy and the United Kingdom). Similar findings were observed for *S*. Paratyphi; about 30% of EU/EEA countries reported ≤1 cases per year during the three-year surveillance period and about 70% of all paratyphoid fever cases were reported by four countries (France, Germany, the Netherlands and the United Kingdom). The high number of confirmed cases reported by the United Kingdom could be attributed to residents of Asian origin, with recent travel history to these areas, particularly to the Indian subcontinent [4-5].

Although most of the burden of the disease occurs in developing countries with poor hygiene and sanitation, in industrialised countries, most typhoid and paratyphoid cases are associated with travel to endemic areas outside Europe [2-3, 5-78], and special groups at risk are returning travellers, immigrants or migrant workers [4-5, 9]. In 2010–2012, at the EU/EEA level, 86% of *S*. Typhi and *S*. Paratyphi infections were acquired abroad, the vast majority travelling to a non-EU country, mainly Asia (India, Pakistan and Bangladesh). Several studies reported a high incidence of typhoid and paratyphoid fever in the Asian continent and described a much higher risk of typhoid fever for people travelling to the Indian subcontinent than for people travelling to any other geographic area [4, 7-8, 10]. For example, there is evidence that typhoid fever incidence has declined in Latin America [7].

The seasonal pattern, with a clear main increase in cases during September/October and a smaller one in April/May, is also most likely related to travelling abroad during the holiday period, especially to high-risk countries, with disease onset and reporting after the return home.

In the three-year surveillance period from 2010 to 2012, *S*. Typhi showed the highest notification rate, followed by *S*. Paratyphi A and *S*. Paratyphi B, whereas, isolation of *S*. Paratyphi C was rare. These findings are in agreement with other studies describing *S.* Typhi as the most common cause of enteric fever and the growing importance of *S*. Paratyphi, especially *S*. Paratyphi A, among travellers [4, 6-7].

In 2010–-2012, highest notification rates of *S*. Typhi and *S*. Paratyphi infections were recorded in children 1–4 years, which is similar to the reporting of non-typhoid salmonellosis, and in young adults 15–24 year of age, this is likely due to inadequate hand hygiene and the consumption of infected food items. The lowest notification rate was observed in the age group ≥65 years. The relative proportion of *S*. Typhi was highest in those younger than 15 years, decreasing with increasing age; on the contrary, *S*. Paratyphi A was most frequently reported among cases older than 15 years. In children below one year of age, *S*. Paratyphi B had the highest relative proportion, whereas *S*. Paratyphi C was only reported in the age group ≥65 years.

Hospitalisation data were included in the EU/EEA-level salmonellosis surveillance for the first time in 2009. During 2010–2012, the proportion of hospitalised typhoid and paratyphoid fever cases at the EU/EEA level remained quite stable over the three-year surveillance period, ranging between 69% and 65%. As typhoid and paratyphoid fever are systemic infections, the proportion of hospitalised cases is considerably higher (>65%) than in non-typhoidal salmonellosis cases (about 40% of the of the known hospitalisation data). However, the information on hospitalisation was reported for only 12% of confirmed typhoid and paratyphoid fever cases. During the three-year surveillance period, only three deaths of typhoid fever and two deaths of paratyphoid fever were recorded at the EU/EEA level.

During 2010–2012, data on resistance to antimicrobials were provided for 1 155 *S*. Typhi isolates and 1 018 *S*. Paratyphi isolates (including types A, B and C). It is worth mentioning that two countries (France and the United Kingdom) reported the vast majority of isolates with information on resistance. Among reported *Salmonella* Typhi and *S*. Paratyphi isolates, the proportion of resistant strains against nalidixic acid was the most frequently reported form of antimicrobial resistance (>70% strains resistant), followed by ciprofloxacin, with more than half of isolates being resistant. Ciprofloxacin is the drug of choice for treatment of severe or invasive *Salmonella* infections in humans. However, the emergence of less susceptible or resistant isolates among enteric fever infections limits treatment options [4, 6-7, 9].

A decreased susceptibility to ciprofloxacin was observed for *S*. Typhi and *S*. Paratyphi strains resistant to nalidixic acid [6], thus nalidixic acid is normally used as an indicator of ciprofloxacin resistance, not for the treatment of salmonellosis. *S*. Typhi showed a moderate (around 20% of resistant isolates) level of resistance to ampicillin, chloramphenicol, sulphonamides, streptomycin and trimethoprim (co-trimoxazole), and a low level of resistance to cefotaxime, gentamicin, kanamycin and tetracyclines, ranging between 0% and 6%. *S*. Paratyphi presented a low level of resistance to all other tested antimicrobials, ranging from 0% for kanamycin to 3% for sulphonamides. In 2010–2012, isolates of *S*. Typhi were more commonly resistant to several antibiotics (MDR) than *S*. Paratyphi serovars; the same finding has also been described in other studies [7, 9].

The majority of enteric fever cases occurred as sporadic cases [4]; no outbreaks of typhoid or paratyphoid fever were reported in the EU/EEA in 2010–2012 and only few outbreaks of enteric fever were reported in Europe during the last 20 years [11-13].

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7 Yersiniosis in the EU/EEA, 2010–2012

Yersiniosis

Yersinia pseudotuberculosis and pathogenic biotypes of *Y. enterocolitica* cause enteric infections in humans. Most (>95%) enteric *Yersinia* infections in the EU are caused by *Y. enterocolitica.*

Infection with *Y. enterocolitica* is most often reported in young children, whereas *Y. pseudotuberculosis* is diagnosed more often in the middle aged and elderly population. In young children, yersiniosis commonly causes fever, abdominal pain, and diarrhoea, which may be bloody. Fever and diarrhoea may last for 1–3 weeks. In older children and adults, acute mesenteric lymphadenitis is manifested by right-sided lower abdominal pain and may sometimes be confused with appendicitis as one third of cases may not develop diarrhoea. This can lead to unnecessary appendectomies, which may occasionally in turn result in a detection of an outbreak of yersiniosis. In a small proportion of cases, complications such as a skin rash (erythema nodosum) or joint pains (reactive arthritis) may occur. Invasive infection (bacteraemia) may develop in immunocompromised persons.

Oral transmission is the most common route, requiring a relatively high infective dose, sometimes up to 10^9 organisms. Infections are mainly contracted by the consumption of undercooked pork products, raw vegetables and fruits or unpasteurised milk and may also be contracted through contaminated natural or tap water. The incubation period is usually 3–7 days.

More information can be found at the ECDC website [56].

Surveillance of yersiniosis in the EU/EEA in 2010–2012

Since 2008, ECDC has been coordinating the European surveillance of yersiniosis, in close collaboration with a network of nominated experts, epidemiologists and microbiologists from EU/EEA countries as part of the Food- and Waterborne Diseases and Zoonoses (FWD) Network.

The scope of yersiniosis surveillance is defined by the general surveillance objectives for food- and waterborne diseases (see Introduction) and the EU case definition for yersiniosis (see Annex H). This report only covers enteric yersiniosis and not plague, which is caused by *Y. pestis.*

A discussion with the European Food- and Waterborne Diseases and Zoonoses Network on the aims and specific activities needed to strengthen yersiniosis surveillance highlighted two important areas:

- Determination of true incidence and prevalence of *Yersinia* infections in humans across the EU/EEA
- Harmonisation of laboratory methods and techniques by
  - identifying the most appropriate medium for *Yersinia* spp. isolation;
  - defining standardised biotyping to monitor the level of pathogenicity.

The European Surveillance System (TESSy) allows the standard reporting of cases of *Yersinia* infections with an agreed set of variables. In 2010–2012, the reporting of yersiniosis covered 29 variables, 27 of which were common variables for all diseases, two being specific for *Yersinia*. The common variables are presented in Table 1 in the chapter on 'Data collection and analyses'. Additional *Yersinia* specific variables are presented below in Table 7.1. In 2012, 20 EU/EEA countries had a compulsory reporting system with full population coverage for yersiniosis, five countries had a voluntary system and five countries did not report *Yersinia* infections to TESSy (Table 7.2).

Table 7.1. Enhanced dataset collected for yersiniosis cases, EU/EEA, 2010–2012

Variable	Description in TESSy
AntigenO	Only somatic (O) antigen of the antigenic formula of the pathogen which is the cause of the reported disease
Biovar[a]	Biogrouping of *Yersinia* species
Biotype[b]	Biotyping of *Yersinia* species.

[a] *Before 2012*

[b] *2012 and onwards*

National surveillance systems for yersiniosis

Table 7.2. Notification systems for yersiniosis cases in EU/EEA countries, 2012

Country	Reported since	Legal character	Case-based/aggregated	National coverage	Changes in surveillance system in 2010–2012
Austria	1947	Cp	C	Y	
Belgium	<1999	V	C	N	
Bulgaria	2004	Cp	A	Y	No changes
Cyprus	2005	Cp	C	Y	
Czech Republic	2008	Cp	C	Y	
Denmark	1979	Cp	C	Y	No changes
Estonia	1982	Cp	C	Y	
Finland	1995	Cp	C	Y	
France	1962	V	A	N	No changes
Germany	2001	Cp	C	Y	No changes (only *Y. enterocolitica* infections notifiable since 2001)
Greece	-	-	-	-	-[d]
Hungary	1998	Cp	C	Y	
Ireland	2004	Cp	C	Y	
Italy	1990	V	C	N	
Latvia	1986	Cp	C	Y	No changes
Lithuania	1985	Cp	C	Y	
Luxembourg	2004	V	C	Y	
Malta	Yes	Cp	C	Y	
Netherlands	-	-	-	-	-
Poland	2004	Cp	C	Y	
Portugal	-	-	-	-	-
Romania	Yes	Cp	C	Y	
Slovakia	1990	Cp	C	Y	
Slovenia	1977	Cp	C	Y	No changes
Spain	1989	V	C	N (population coverage 25%)	
Sweden	1996	Cp	C	Y	
United Kingdom	No	O	C	Y	
Iceland	-	-	-	-	-
Liechtenstein	Yes	-	-	-	-
Norway	1992	Cp	C	Y	

[a] *Legal character, Cp=compulsory, V=voluntary, O=other*

[b] *C=case based, A=aggregated*

[c] *National coverage Y=yes, N=no*

[d] *Not reported/no data provided*

Epidemiological situation in 2010–2012

Major findings

- Between 2008 and 2012, the number of confirmed yersiniosis cases in Europe decreased, mainly due to a reduction in *Y. enterocolitica* infections; the most commonly reported species (97% of cases with known data).
- The average notification rate in 2010–2012 was 2.1 cases per 100 000 population.
- In 2010–2012, 98% of all reported yersiniosis infections were acquired in Europe.
- The highest rates of yersiniosis were in children aged between one and four years (≥9.4cases per 100 000)
- *Y. enterocolitica* and *Y. pseudotuberculosis* had a different age distribution; *Y. enterocolitica* was predominant in those under 15 years, whereas *Y. pseudotuberculosis* was more common in those over 25 years.

- The most commonly reported *Y. enterocolitica* serotype in the EU/EEA was O:3 (89%), followed by serotypes O:9 (7%), O:8 (2%) and O:5,27 (2%)
- Serotype O:3 has shown a significant decreasing trend since 2008, while a slight increase has been observed for serotype O:5,27. Reporting of serotype O:8 has remained stable and that of serotype O:9 has increased slightly in travel-related cases.
- During the three-year surveillance period 2010–2012, yersiniosis had a low mortality rate, with only one death reported.

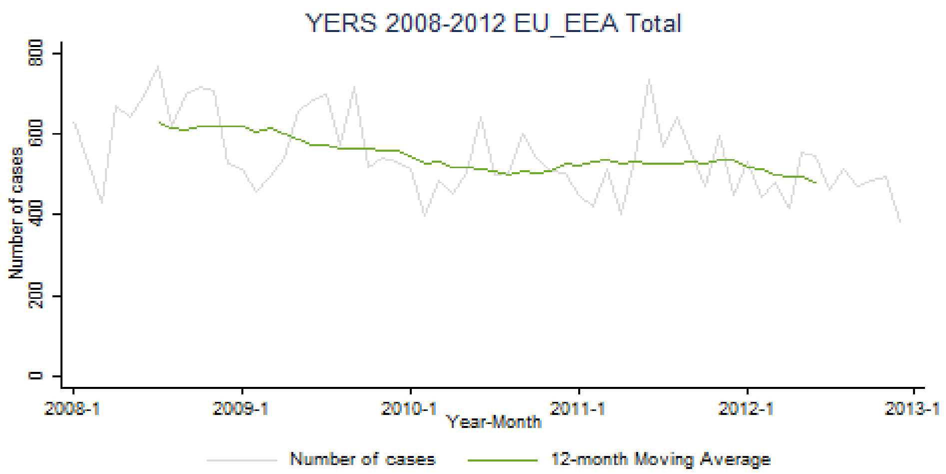
Overview of trends

From 2010 to 2012, a total of 20 156 confirmed yersiniosis cases were reported to TESSy by 23 EU Member States and one EEA country (Table 7.3).

There was a statistically significant decreasing five-year trend in the European Union over the period 2008–2012 (p-value<0.001) (Figure 7.1). The numbers of confirmed yersiniosis cases recorded at EU/EEA level in 2012 (N=6 482), declined by 7.7% compared with 2011 (N=7 029) and by 4.6% compared with 2010 (N=6 793) (Figure 7.1; Table 7.3).

Between 2010 and 2012, the highest country-specific notification rates were reported from Finland and Lithuania (≥9.2cases per 100 000). During the three-year period, these two countries constantly reported notification rates that were about five times higher than the EU/EEA rate during the same period (Table 7.3). The lowest notification rates were observed in seven countries (Bulgaria, Hungary, Ireland, Malta, Poland, Romania and the United Kingdom) that reported less than 0.96 cases per 100 000 population during the whole period (Table 7.3). Overall, Germany accounted for the highest proportion of cases in the EU/EEA (46%), followed by Finland with 8% (cumulative N=1 641) and the Czech Republic with 7% (cumulative N=1 518) of all reported cases. Cyprus did not report any confirmed yersiniosis cases (Table 7.3).

Figure 7.1. Trend in number of confirmed yersiniosis cases in EU/EEA countries, 2008–2012 (N=32 746)



Source: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Latvia, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA country: Norway

Table 7.3. Confirmed yersiniosis cases and notification rates (per 100 000 population) by country in the EU/EEA, 2010–2012

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	84	1.0	119	1.4	130	1.5
Belgium*	216	-	214	-	256	-
Bulgaria^	5	0.1	4	0.1	11	0.2
Cyprus	0	0.0	0	0.0	0	0.0
Czech Republic	447	4.3	460	4.4	611	5.8
Denmark	193	3.5	225	4.0	291	5.2
Estonia	58	4.3	69	5.1	47	3.5
Finland	522	9.8	554	10.3	565	10.5
France*	238	-	294	-	314	-
Germany	3346	4.1	3381	4.1	2686	3.3

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Greece	-	-	-	-	-	-
Hungary	87	0.9	93	0.9	53	0.5
Ireland	3	0.1	6	0.1	2	0.0
Italy*	15	-	15	-	14	-
Latvia	23	1.0	28	1.3	28	1.4
Lithuania	428	12.9	370	12.1	276	9.2
Luxembourg	-	-	-	-	-	-
Malta	1	0.2	0	0.0	0	0.0
Netherlands	-	-	-	-	-	-
Poland	205	0.5	235	0.6	201	0.5
Portugal	-	-	-	-	-	-
Romania	27	0.1	47	0.2	26	0.1
Slovakia	166	3.1	166	3.1	181	3.3
Slovenia	16	0.8	16	0.8	22	1.1
Spain[a]	325	2.8	264	2.3	220	1.9
Sweden	281	3.0	350	3.7	303	3.2
United Kingdom ~	55	0.1	59	0.1	54	0.1
EU total	**6 741**	**2.16**	**6 969**	**2.22**	**6 291**	**1.94**
Iceland	-	-	-	-	-	-
Liechtenstein	-	-	-	-	-	-
Norway	52	1.1	60	1.2	43	0.9
EU/EEA total	**6 793**	**2.14**	**7 029**	**2.20**	**6 334**	**1.92**

**Voluntary surveillance system. Population coverage unknown, notification rate not calculated*

^ Aggregated reporting

[a] Population coverage 25%

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

*** For each year shown, notification rates were calculated, with the exception of countries with unknown population coverage. Also excluded were populations of countries which did not report data. Populations of countries which reported 0 cases were included.*

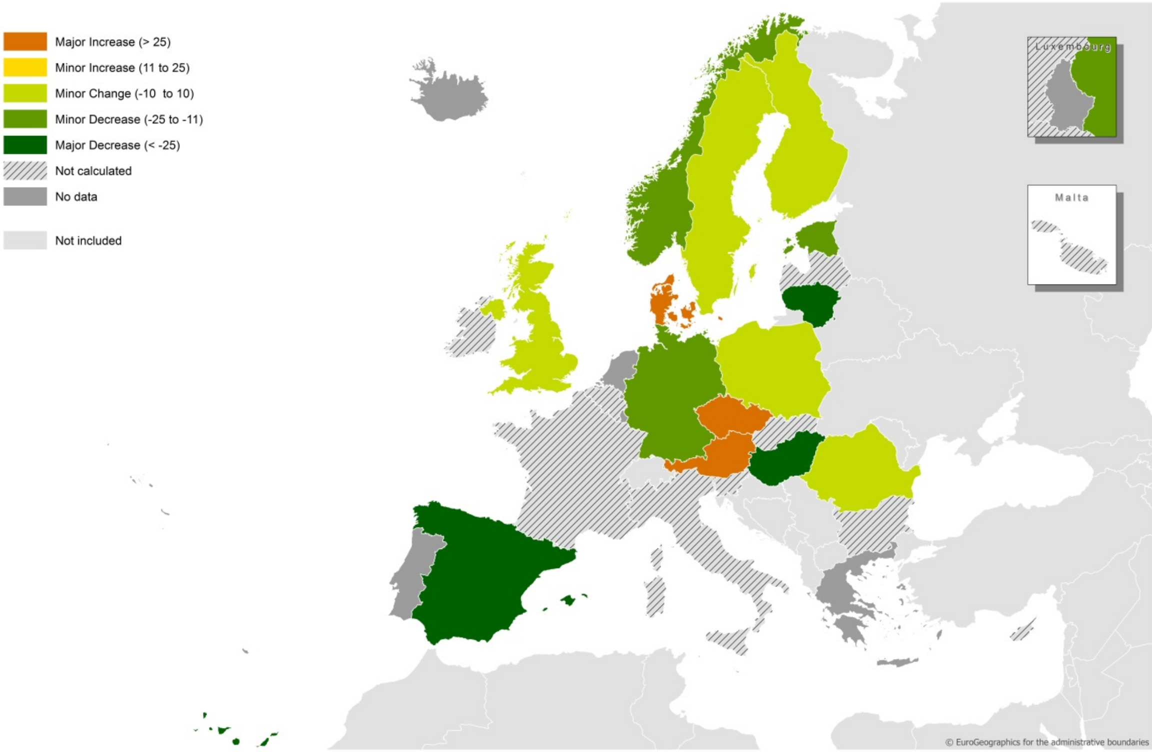
– Not reported/not calculated

When comparing 2012 to 2010, a remarkable decrease in rates was observed in Lithuania (from 12.9 to 9.2 cases per 100 000), followed by Germany (from 4.1 to 3.3 cases per 100 000) and Spain (from 2.8 to 1.9 cases per 100 000). Rates also significantly decreased in Hungary (from 0.9 to 0.5 cases per 100 000), however, the total number of cases reported was very low (Table 7.3, Figure 7.2). A major rise in rates was observed in Denmark (from 3.5 to 5.2 cases per 100 000), Czech Republic (from 4.3 to 5.8 cases per 100 000) and Austria (from 1 to 1.5 cases per 100 000), although the number of confirmed cases was low in Austria (Figure 7.2; Table 7.3). The increase in cases in Denmark from 2010 was mainly because of a pathogenic biotype 1A increasingly being reported by some clinical laboratories.

Country-specific trends based on the number of confirmed yersiniosis cases were calculated from 2008 to 2012 (Figure 7.3). Trends remained stable in the majority of the EU/EEA countries and in four countries (Germany, Lithuania, Spain and Sweden) a significant decreasing trend in yersiniosis cases was detected during the five-year period (p-value <0.01).

It is worth noting, however, that in a country with a small population, even low numbers of reported cases can lead to a relative overrepresentation.

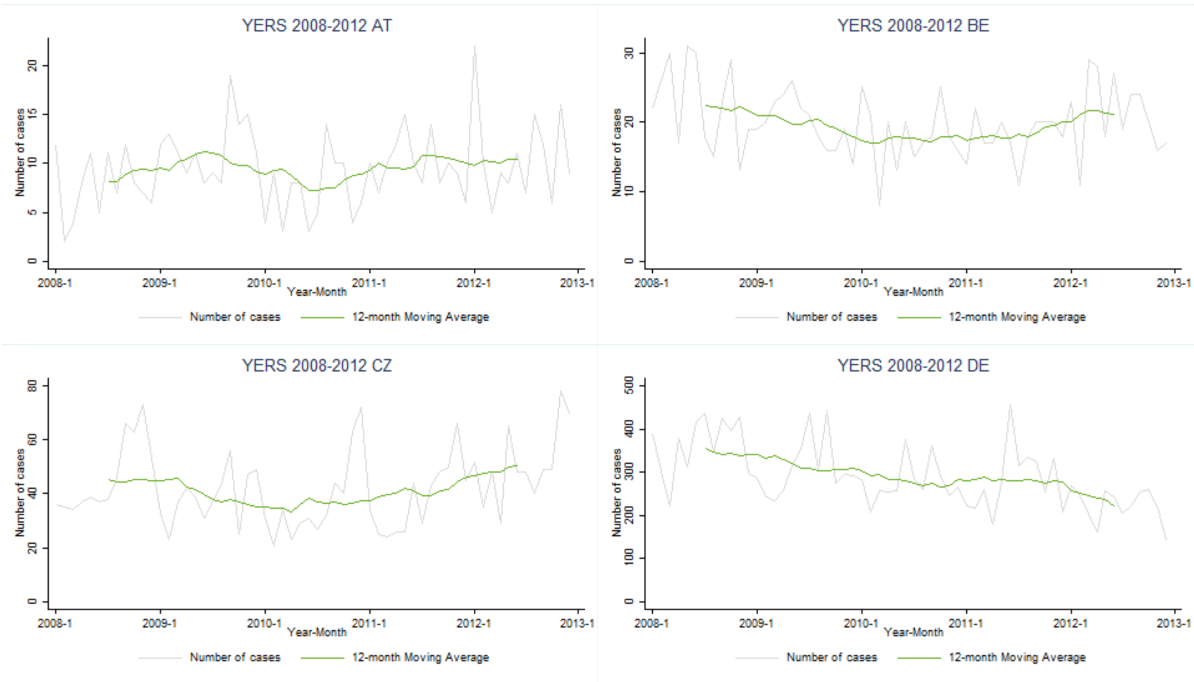
Figure 7.2. Percentage change in notification rates of yersiniosis cases, EU/EEA, 2010–2012

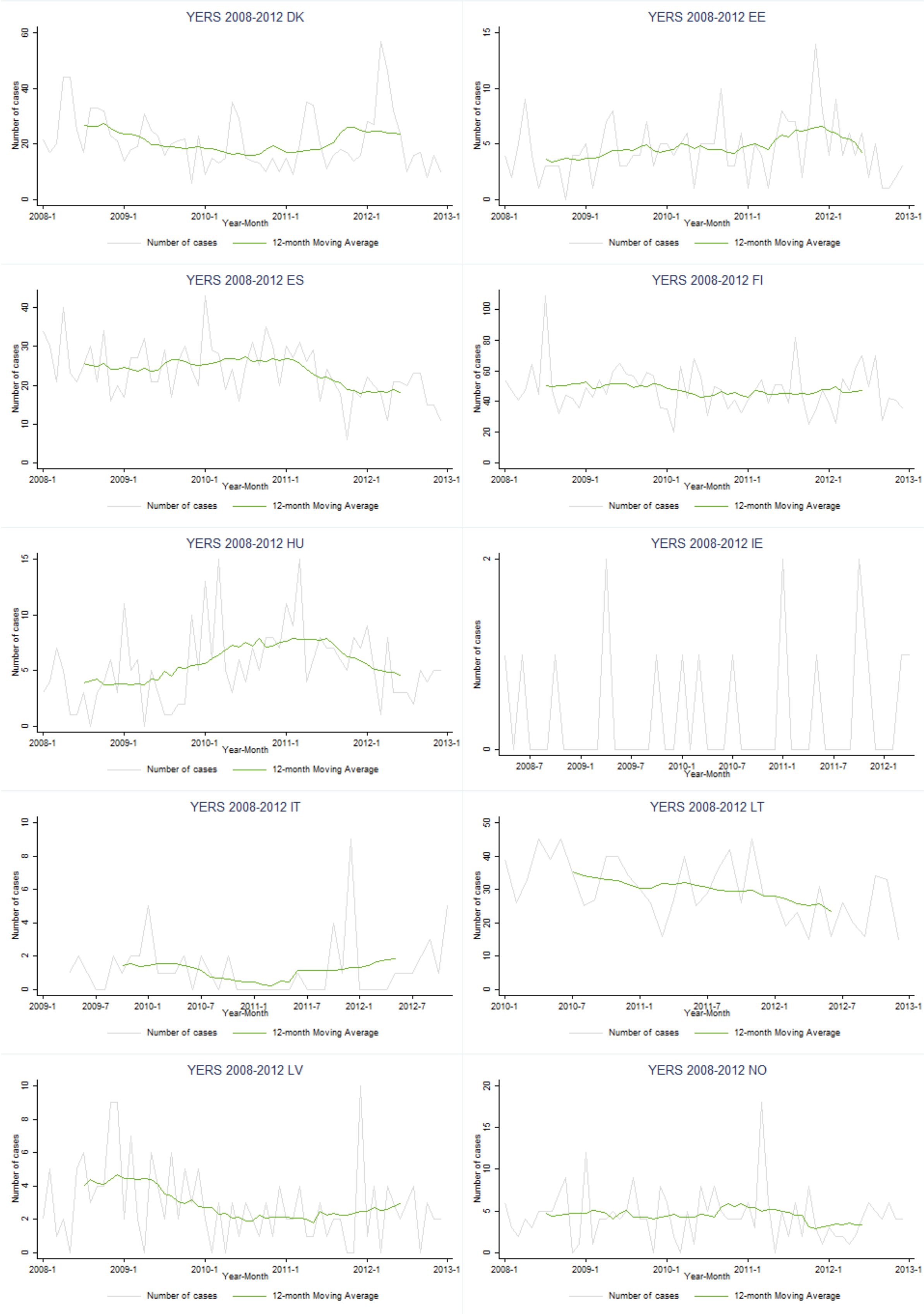


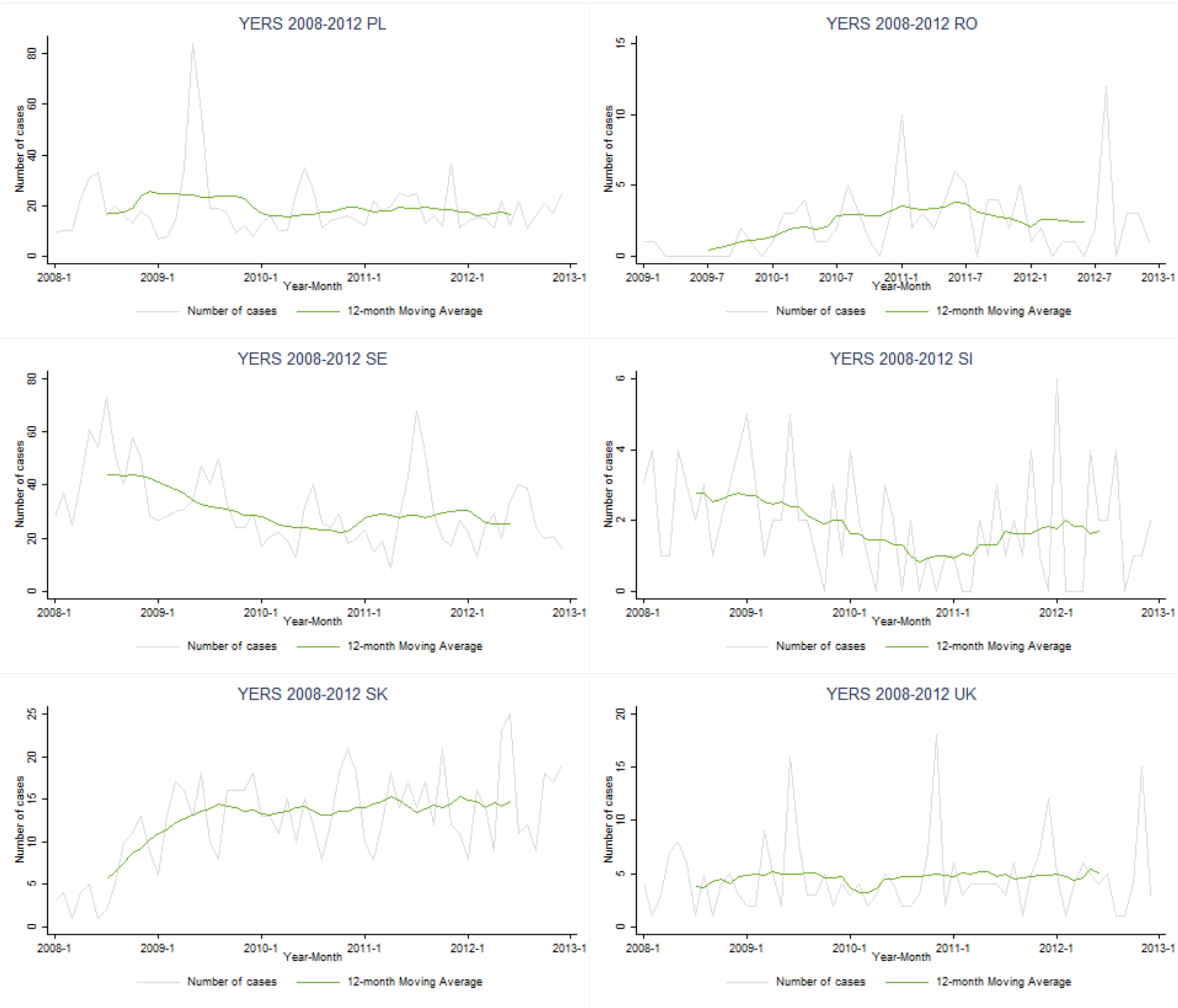
Not calculated: Country-specific percentage changes in notification rates were not calculated if the number of confirmed cases reported for one or more years during 2010–2012 was lower than 25, if sentinel surveillance systems had unknown population coverage, or if there was incomplete reporting for one of the reporting years.

Source: The European Surveillance System (TESSy) data, 2010–2012

Figure 7.3. Trend in number of confirmed yersiniosis cases by EU/EEA country, 2008–2012




YERS 2008-2012 DK
YERS 2008-2012 EE
YERS 2008-2012 ES
YERS 2008-2012 FI
YERS 2008-2012 HU
YERS 2008-2012 IE
YERS 2008-2012 IT
YERS 2008-2012 LT
YERS 2008-2012 LV
YERS 2008-2012 NO
Number of cases
Year-Month
Number of cases
12-month Moving Average



Country codes: see page xiv

Please note that graphs are on different scales.

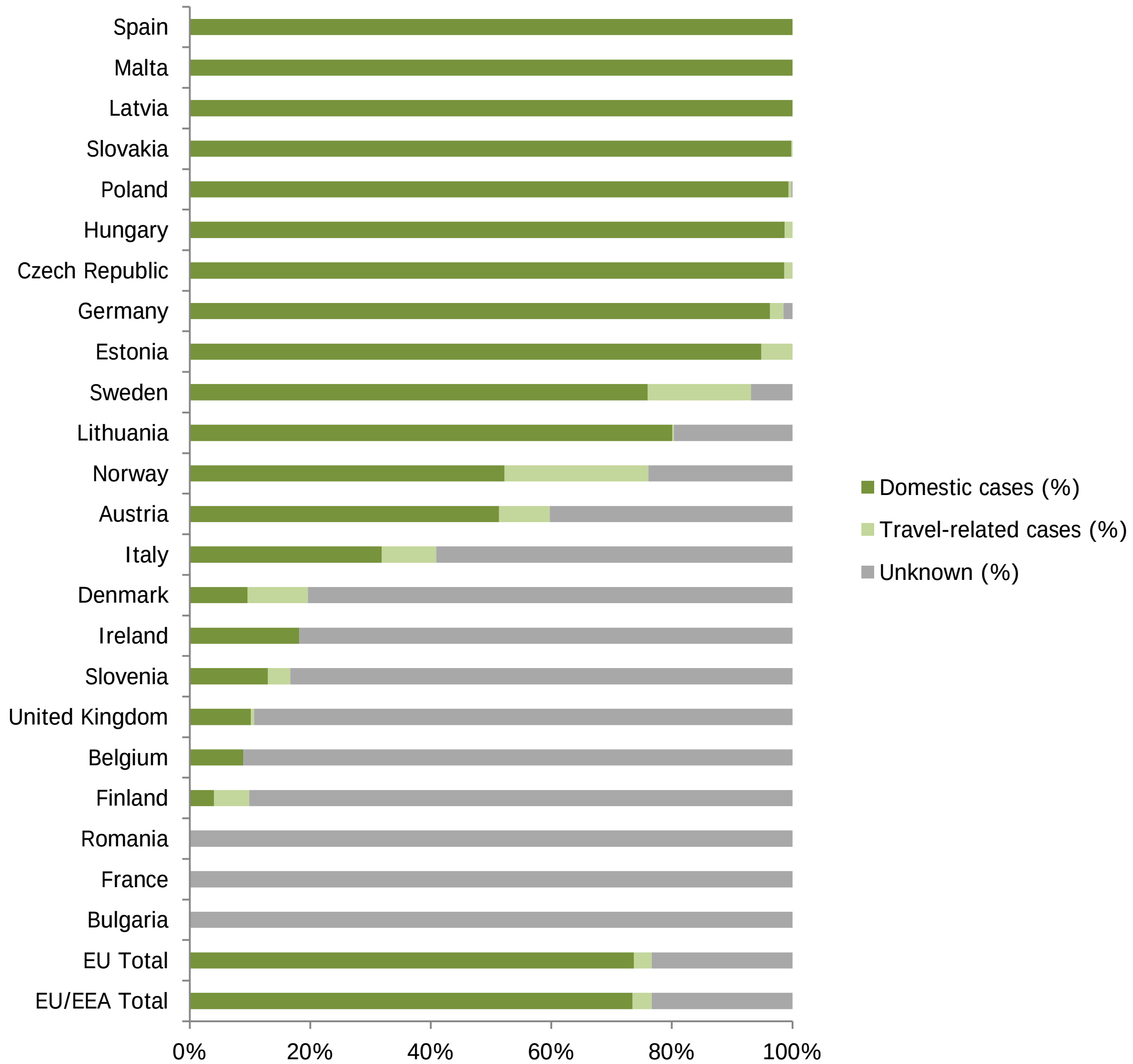
Country-specific trends were not calculated if less than five confirmed cases were reported per month during the period 2008–12.

Origin of the infection

Within the three-year period from 2010 to 2012, 21 out of 25 EU/EEA countries reported data on the origin of infection for 15 700 confirmed cases (76.7%, pooled data). Four countries reported information only for cases notified in one or two years of the period from 2010–2012 (Figure 7.4; Annex G: G7.1).

The proportion of domestic cases versus travel-associated cases varied markedly between countries, with the highest proportion of domestic cases (>95%) reported in the Czech Republic, Estonia, Germany, Hungary, Poland and Slovakia (Figure 7.4; Annex G: G7.1). Spain, Malta and Latvia reported only domestically acquired infections. The highest proportion of travel-related yersiniosis cases compared with other reporting countries was found in Norway (24%), followed by Sweden (17%) (Figure 7.4; Annex G: G7.1).

Figure 7.4. Proportion of confirmed yersiniosis cases by origin of infection (domestic/travel-related) as reported by EU/EEA countries, 2010–2012 (N=20 304)



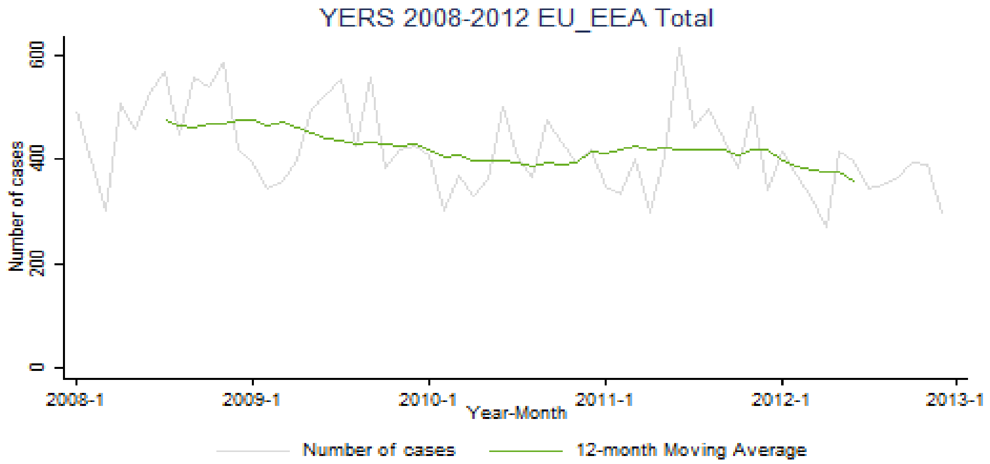
Domestic cases

Among cases for which information was available (n=15 700, cumulative data 2010–2012), 96% of all infections reported at EU/EEA level during 2010–2012 were domestically acquired (Annex G: G7.1). Moreover, a steady, significant decreasing trend in domestic yersiniosis cases has been observed since 2008 (p-value<0.01) (Figure 7.5; Annex G: G7.2).

Country-specific trends in the number of domestic cases reported were only calculated for seven EU/EEA countries (Latvia, Poland Slovakia, Slovenia, Sweden, United Kingdom and Norway).

During 2008–2012, significant reductions in domestic yersiniosis cases were observed in Sweden and Slovenia (p-value<0.01), though in the latter the total number of reported cases was low and the completeness of information on the origin of infection was about 17% (Annex G: G7.1 and G7.2). Over the five-year period, Slovakia was the only country in which the trend for domestically acquired *Yersinia* infections increased (p-value<0.001).

Figure 7.5. Trend and number of confirmed domestic yersiniosis cases in EU/EEA countries, 2008–2012 (N=25 207)



Source: Austria, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Latvia, Poland, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA country: Norway

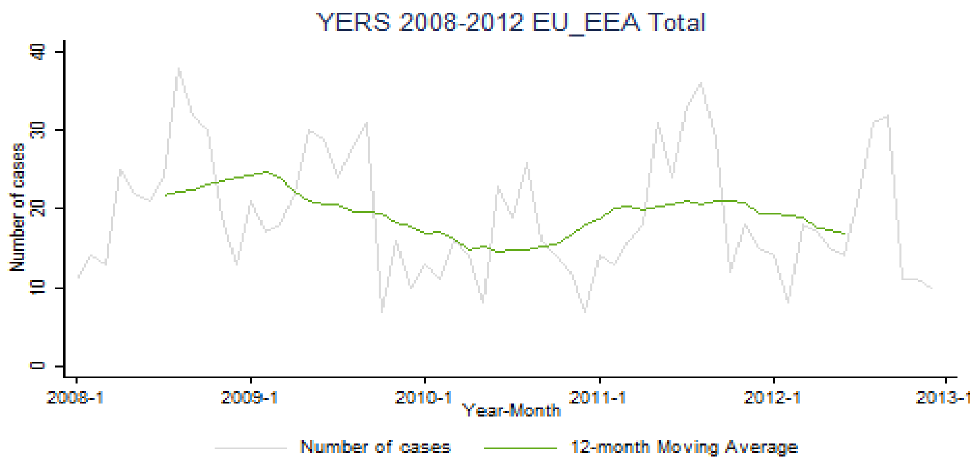
Travel-related cases

During 2010–2012, among confirmed yersiniosis cases for which information was available (n=15 700, cumulative data), only 648 infections (4%) were acquired abroad (Annex G: G7.1 and 7.3). The trend in the annual number of confirmed travel-related yersiniosis cases remained stable for the period 2008–2012 (Figure 7.6; Annex G: G7.3).

Between 2008 and 2012, country-specific trends in the number of travel-associated infections were only calculated for five EU/EEA countries (Poland, Slovenia, Sweden, United Kingdom and Norway). Over the five-year period, only Sweden saw a slight decrease in the country-specific trend in confirmed travel-related yersiniosis cases (p-value<0.01). However, there were no increases observed in the other countries.

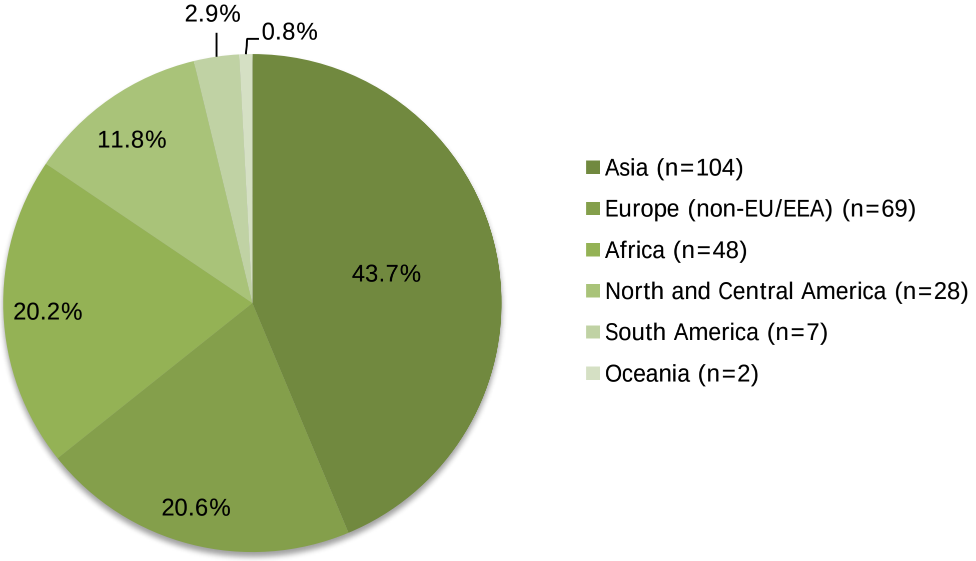
Information on the suspected country of infection was available for 527 (81%) confirmed travel-related yersiniosis infections reported between 2010 and 2012, of which 49% (n=258) were acquired in non-EU countries, mainly in Asia (n=104) (Figure 7.7).The other 269 (51%) travel-associated cases were imported from another EU country. Overall, the most frequently reported countries of destination in travel-related yersiniosis cases were Spain (n=82), Turkey (n=40) and Italy (n=35) (Figure 7.8).

Figure 7.6. Trend and number of confirmed travel-related yersiniosis cases in EU/EEA countries, 2008–2012 (N=1 156)



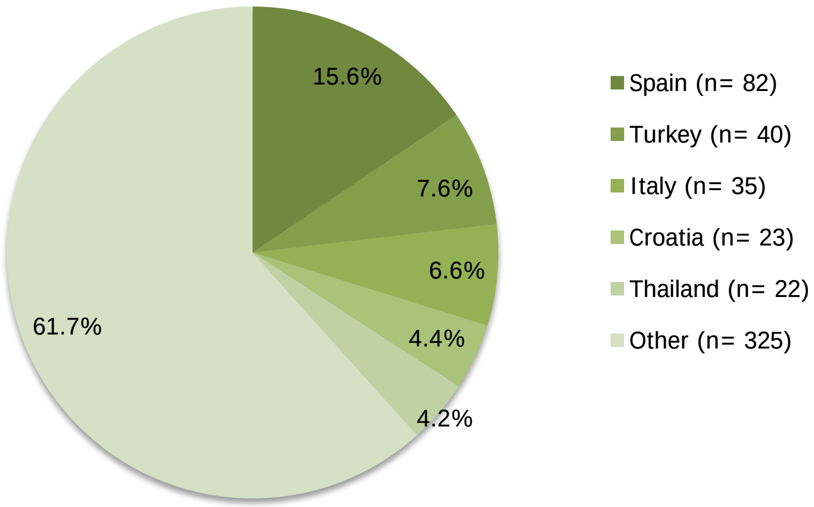
Source: Austria, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Poland, Slovakia, Slovenia, Sweden, United Kingdom; EEA country: Norway

Figure 7.7. Origin of travel-related yersiniosis infections acquired in non-EU/EEA countries by geographical region, as reported by EU/EEA countries, 2010–2012



Source: Austria, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Italy, Lithuania, Poland, Slovakia, Slovenia, Sweden, United Kingdom; EEA country: Norway

Figure 7.8. Five most frequently reported countries of infection in confirmed travel-related yersiniosis cases, as reported by EU/EEA countries, 2010–2012



Source: Austria, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Italy, Lithuania, Poland, Slovakia, Slovenia, Sweden, United Kingdom; EEA country: Norway

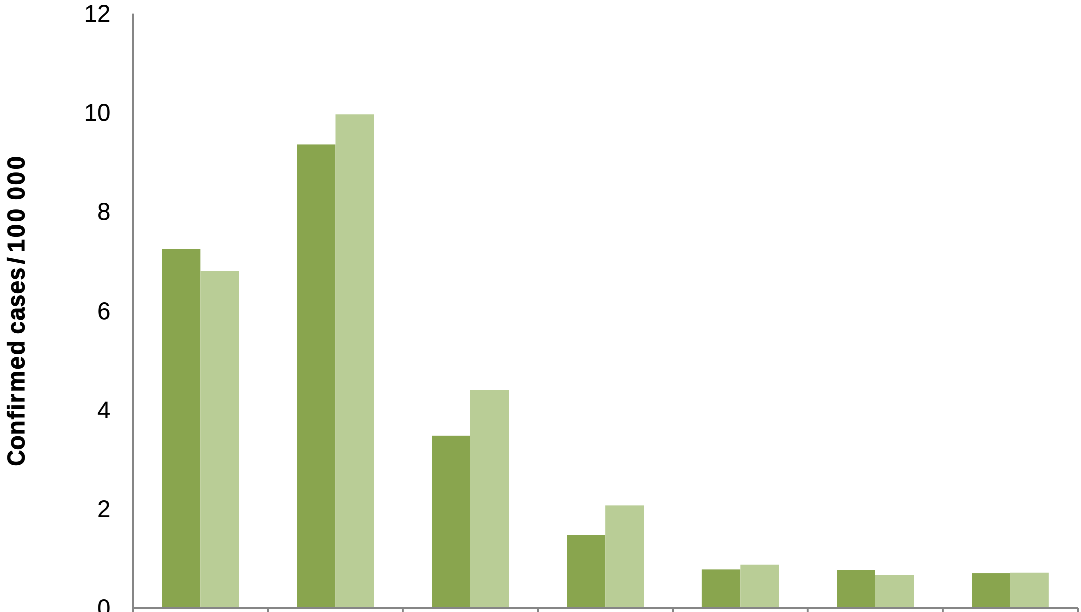
Age and sex

During 2010–2012, data on age and sex were reported for 94% of confirmed yersiniosis cases by 23 EU/EEA countries (n=19 339) (Annex G: G7.4). Among confirmed yersiniosis cases with known data for sex and age, children under 15 years accounted for 53% of the total reported in 2010–2012 (Annex G: G7.4).

Overall, children aged between one and four years had the highest notification rate for both sexs (≥9.4 cases per 100 000), followed by children under one year of age (>6.5 cases per 100 000). In the 15–24 year age group notification rates ranged from 1.5 to 4.5 cases per 100 000 population, whereas in those over 25 years rates dropped to less than one case per 100 000 population (Figure 7.9; Annex G: G7.4).

There was some difference in notification rates between sexs. A general male predominance was observed in cases aged 1–44 years, with the highest male-to-female ratio (1.5:1) noted for the age group 15–24 years (Figure 7.9; Annex G: G7.4).

Figure 7.9. Notification rates of confirmed yersiniosis cases by age group and sex in EU/EEA countries, 2010–2012 (N=19 339)



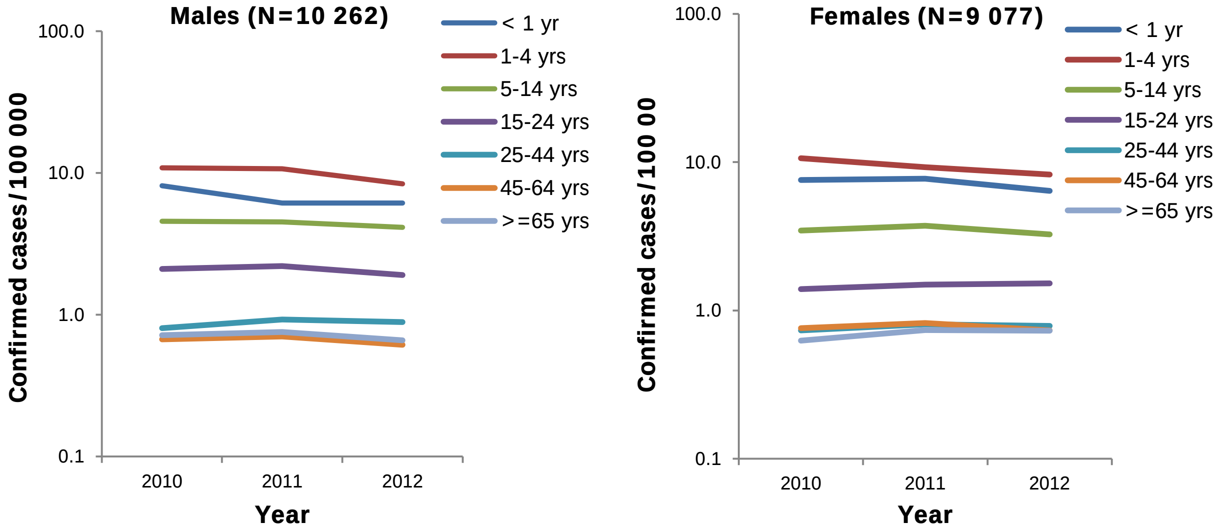
	< 1 yr	1–4 yrs	5–14 yrs	15–24 yrs	25–44 yrs	45–64 yrs	≥ 65 yrs
Females	7.2	9.4	3.5	1.5	0.8	0.8	0.7
Males	6.8	10.0	4.4	2.1	0.9	0.7	0.7

Source: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA country: Norway

Due to the differences in notification rates between age groups in males and females, three-year trends for the period 2010 to 2012 were described by sex (Figure 7.10; Annex G: G7.4).

Notification rates remained nearly stable or slightly decreased in the majority of age groups, with the exception of males aged 25–44 years and females aged 15–44 years and 65 years or above. However, the detected changes were not statistically significant (Figure 7.10; Annex G: G7.4).

Figure 7.10. Semi-logarithmic graph showing trends in notification rates of confirmed yersiniosis cases by age group and sex in EU/EEA countries, 2010–2012



Source: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA country: Norway

Yersinia species

In the three-year period from 2010 to 2012, information on *Yersinia* species was reported by 23 EU/EEA countries for 93% of confirmed cases. Among cases with known data on species (N=19 722), less than 2% of the total *Yersinia* isolates were reported without speciation, as '*Yersinia* species unspecified' (n=139) or 'Other *Yersinia* species' (n=156) (Table 7.4). The proportion of *Yersinia* cases without speciation remained stable during the whole period (Table 7.4).

Yersinia enterocolitica was the most commonly reported species in, accounting for about 97% of total confirmed cases with information on species (Table 7.4). *Y. pseudotuberculosis* was the second reported species, although, it represented a minor proportion (less than 2%) of total reported *Yersinia* cases with known data in2010–2012 (Table 7.4).

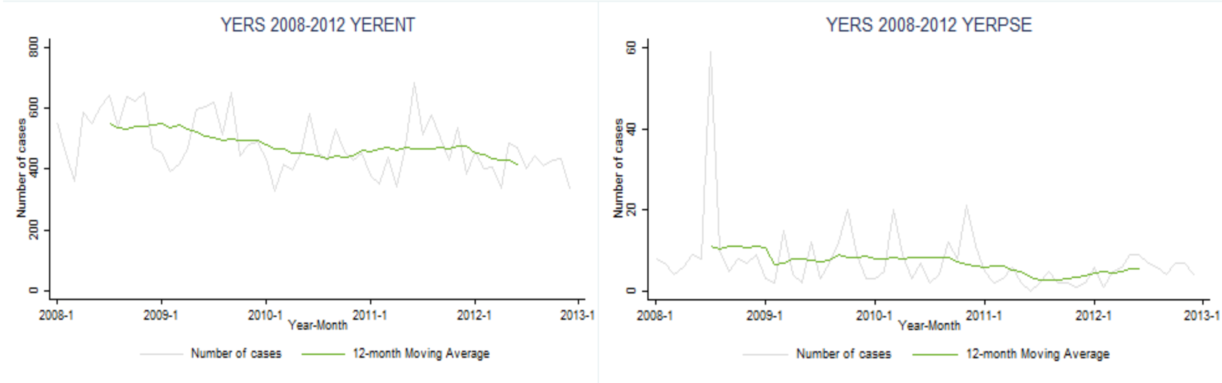
Table 7.4. Distribution of Yersinia species isolated from reported confirmed cases, EU/EEA countries, 2010–2012

Species	2010		2011		2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
Y. enterocolitica	6 250	96.8	6 768	97.3	6 111	96.8
Y. pseudotuberculosis	118	1.8	64	0.9	116	1.8
Yersinia spp	49	0.8	42	0.6	48	0.8
Yersinia Other	38	0.6	79	1.2	39	0.6
Total known	**6 455**	**100.0**	**6 953**	**100.0**	**6 314**	**100.0**
Unknown/missing	650	9.1	403	5.5	548	8.0
Total	**7 105**		**7 356**		**6 862**	

Source: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA country: Norway

Trends in number of confirmed cases by *Yersinia* species were calculated from 2008 to 2012 (Figure 7.11). Isolation *Y. enterocolitica* strongly decreased over five-year period (p-value<0.001), whereas reporting of *Y. pseudotuberculosis* remained stable.

Figure 7.11. Trend in number of confirmed cases of Yersinia enterocolitica (N=28 819) and *Y. pseudotuberculosis* (N=440), EU/EEA countries, 2008–2012



Source: Austria, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Latvia, Poland, Romania, Slovakia, Slovenia, Sweden, United Kingdom; EEA country: Norway

Species by age group

The age distribution of confirmed yersiniosis cases by reported species is shown in Table 7.5 and Figure 7.12. The two reported *Yersinia* species presented a significantly different distribution across all age groups: *Y. enterocolitica* was predominant in children under 15 years, accounting for 54% of all reported *Y. enterocolitica* cases in 2010–2012, whereas 85% of all reported *Y. pseudotuberculosis* cases were older than 25 years (Table 7.5; Figure 7.12). Only one *Y. pseudotuberculosis* case was reported in a child under one year of age during the three-year period (Table 7.5; Annex G: G7.5).

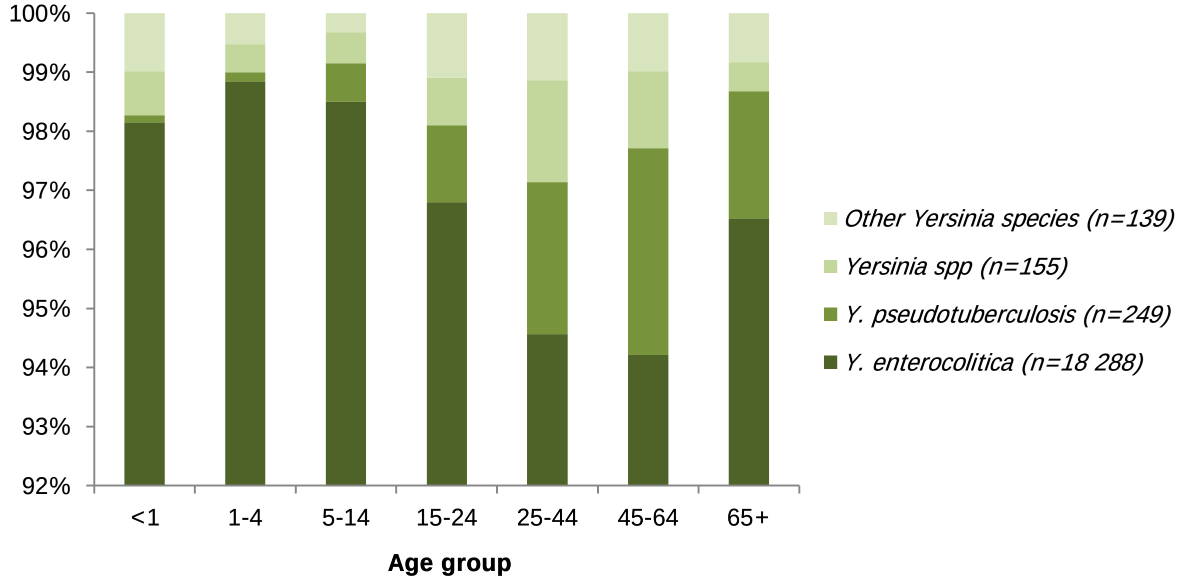
The relative proportion of '*Yersinia* spp.*'* and '*Yersinia* other' was higher in cases aged over 15 years (Figure 7.12; Annex G: G7.5).

Table 7.5. Age distribution of confirmed yersiniosis cases by species, EU/EEA countries, 2010–2012

Age groups	*Yersinia enterocolitica*		*Yersinia pseudotuberculosis*		*Yersinia* species unspecified		Other *Yersinia* species	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
<1	794	4.3	1	0.4	6	3.9	8	5.8
1-4	4522	24.7	7	2.8	22	14.2	24	17.3
5-14	4 521	24.7	30	12.0	24	15.5	15	10.8
15-24	2388	13.1	32	12.9	20	12.9	27	19.4
25-44	2576	14.1	70	28.1	47	30.3	31	22.3
45-64	2101	11.5	78	31.3	29	18.7	22	15.8
≥ 65	1 386	7.6	31	12.4	7	4.5	12	8.6
Total	**18 288**	**100.0**	**249**	**100.0**	**155**	**100.0**	**139**	**100.0**

Source: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA country: Norway

Figure 7.12. Relative distribution of confirmed *Yersinia* isolates by species and age group, as reported by EU/EEA countries, 2010–2012 (N=18 831)



Source: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA country: Norway

Yersinia spp.*: unspecified* Yersinia *species*

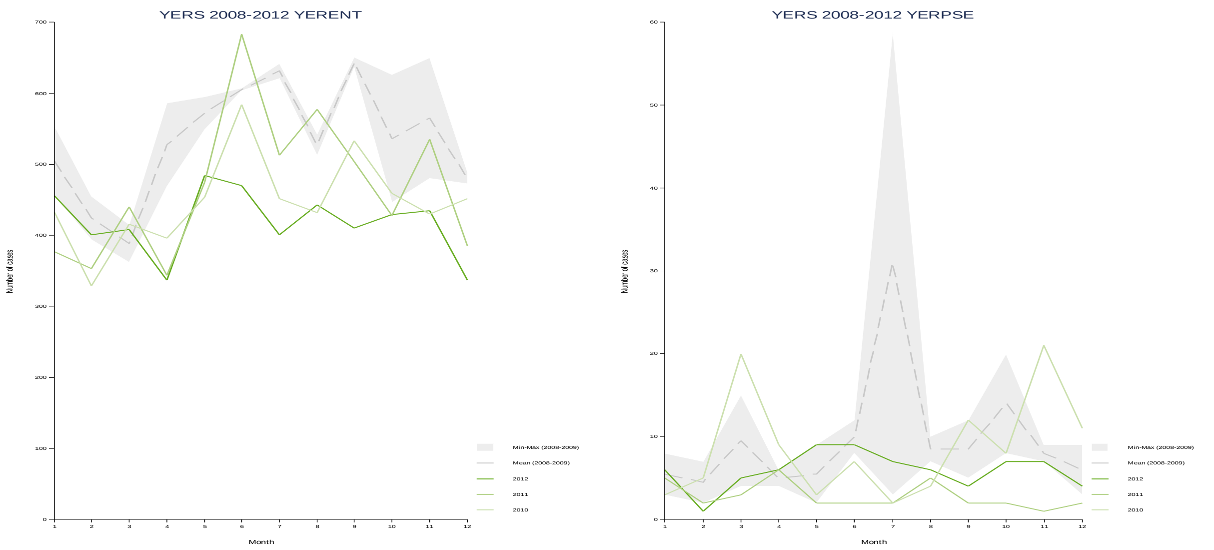
Seasonality by species

The seasonality was analysed for *Y. enterocolitica* and *Y. pseudotuberculosis* separately and results are presented in Figure 7.13. *Y. enterocolitica* showed some seasonality, with a rise in the number of cases during summer and autumn, although significant variability was observed, especially in the autumn months, when comparing data with the period 2008–2009 (Figure 7.13).

The distribution of *Y. pseudotuberculosis* was stable throughout the period, with no clear seasonality during 2010–2012. Its seasonal pattern was characterised by small fluctuation, probably associated with short-term trends, and sporadic outbreaks occurring randomly. However, the total number of confirmed *Y. pseudotuberculosis* cases was low and less than 25 cases per month were reported for the whole period (Figure 7.13).

The peak of *Y. pseudotuberculosis* observed during summer 2008–2009 in relation to case numbers for the same period in other years was due by the large Finnish outbreak caused by *Y. pseudotuberculosis* serotype O:1 in 2008.

Figure 7.13. Distribution of confirmed *Yersinia enterocolitica* (N=28 819) and *Yersinia pseudotuberculosis* (N=440) cases by month, EU/EEA countries, 2008–2012



Source: Austria, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Latvia, Poland, Romania, Slovakia, Slovenia, Sweden, United Kingdom; EEA country: Norway.

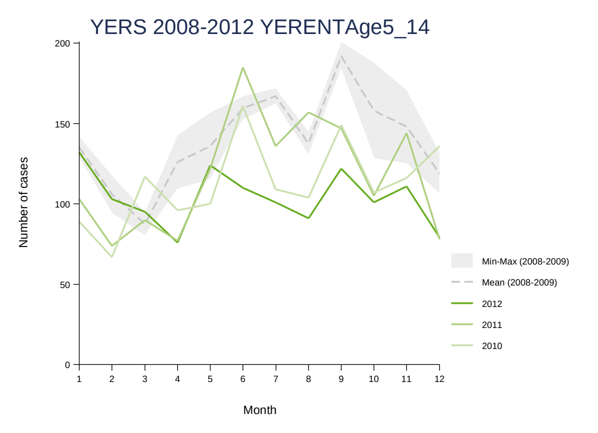
Seasonality by species and age group

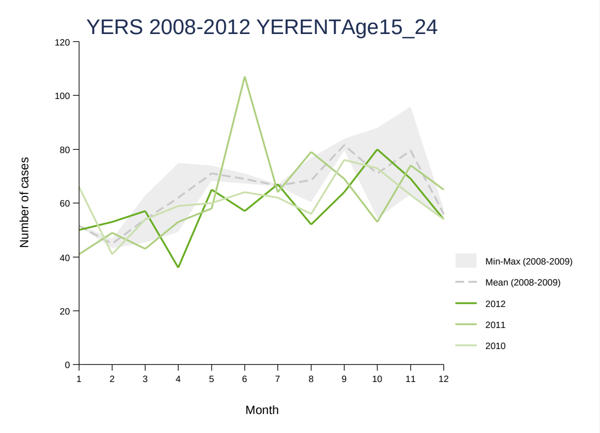
Seasonality by age group was analysed for the two most common species, *Y. enterocolitica* and *Y. pseudotuberculosis,* and results are shown in Figures 7.14 and 7.15, respectively.

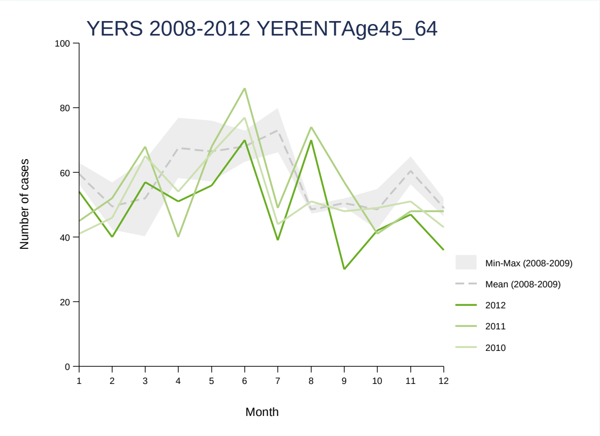
The seasonal distribution of *Y. enterocolitica* in all age groups was characterised by significant variability between years. In the age group 1–44 years, some increase in the number of cases was observed during the summer and autumn. In those aged over 65 years the seasonal pattern presented two peaks, one during winter and the second smaller peak during autumn/late summer. No clear seasonality was observed in infants and those aged 45–64 years (Figure 7.14).

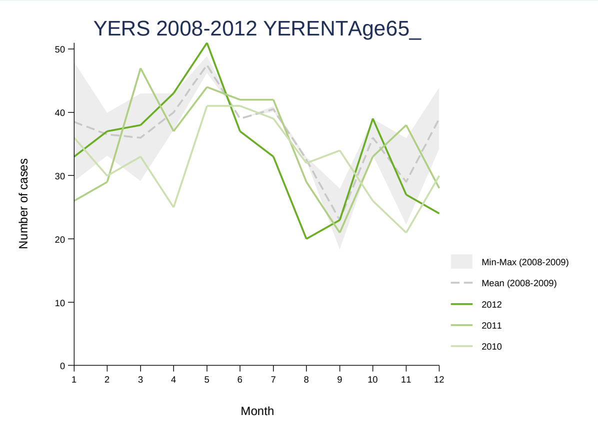
The distribution of *Y. pseudotuberculosis* did not show a clear seasonality in any age group during the period 2010–2012 (Figure 7.15).

Figure 7.14. Distribution of confirmed *Yersinia enterocolitica* (N=28 793) cases by month and age group, EU/EEA countries, 2008–2012



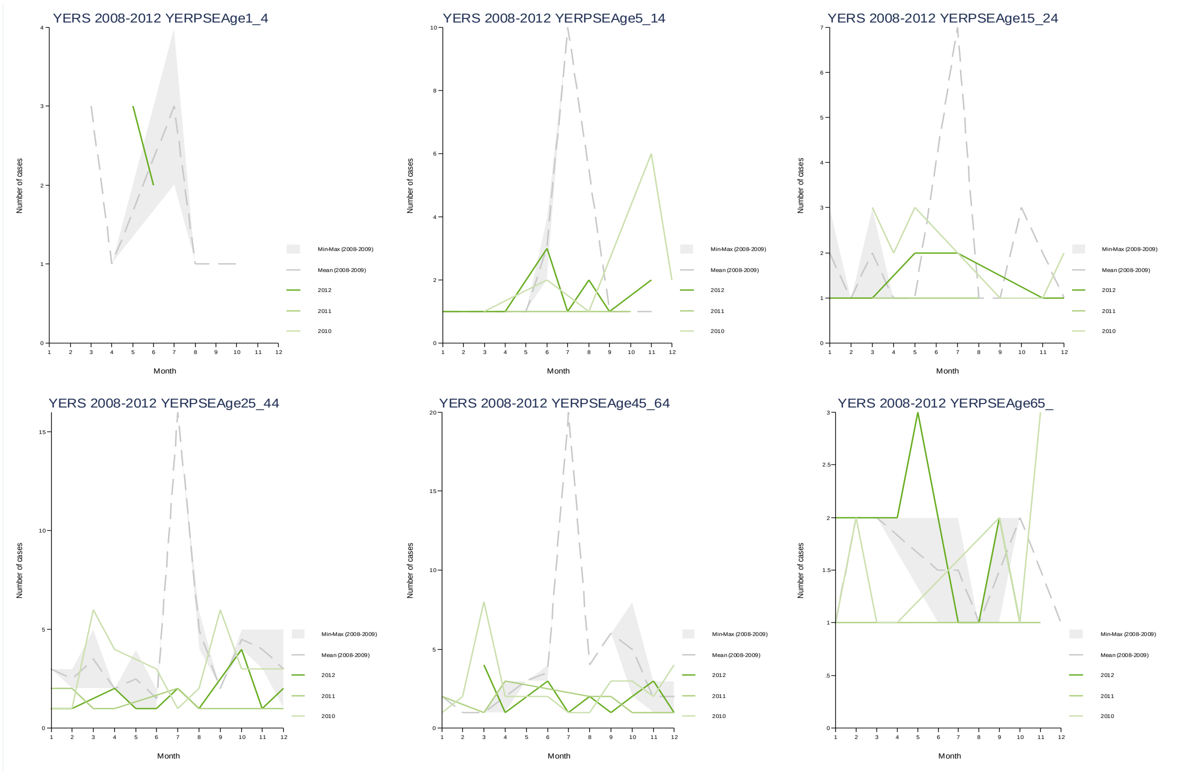






Source: Austria, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Latvia, Poland, Romania, Slovakia, Slovenia, Sweden, United Kingdom; EEA country: Norway.

Figure 7.15. Distribution of confirmed *Yersinia pseudotuberculosis* (N=431) cases by month and age group, EU/EEA countries, 2008–2012



Source: Austria, Denmark, Finland, Hungary, Ireland, Latvia, Poland, Slovakia, Sweden, United Kingdom; EEA country: Norway

Yersinia enterocolitica serotypes

The pathogenic potential of *Y. enterocolitica* isolates is determined by both serotype and biotype. Biotypes correlate with serotype designation, human pathogenicity and ecological and geographical distribution. Serotypes are defined according to the variability of the 'O' antigen present in the outer membrane of bacteria.

During 2010–2012, 21 EU/EEA countries (20 EU countries plus Norway) provided data on serotype characterisation for 9 678 *Y. enterocolitica* isolates (53% of the total reported). Five countries (Italy, Lithuania, Luxemburg, Slovenia and Spain) provided data on *Y. enterocolitica* serotypes for only one or two years in 2010–2012.

The most commonly reported *Y. enterocolitica* serotype in the EU/EEA was O:3, accounting for 89% of all reported serotypes throughout the three-year period from 2010 to 2012 (Table 7.6; Figure 7.16). The second most common serotype was O:9, representing around 7% of the known serotypes (Table 7.6).

Table 7.6. Distribution of confirmed *Yersinia enterocolitica* cases by serotype, EU/EEA countries, 2010–2012

Yersinia enterocolitica serotype	2010		2011		2012		2010–2012	
	Cases	Per-centage (%)	Cases	Per-centage (%)	Cases	Per-centage (%)	Cases	Per-centage (%)
O:3	3 016	91.3	3 085	87.4	2 469	86.8	8 570	88.6
O:9	193	5.8	266	7.5	241	8.5	700	7.2
O:8	51	1.5	95	2.7	44	1.5	190	2.0
O:5,27	32	1.0	66	1.9	78	2.7	176	1.8
O:5	0	0.0	0	0.0	10	0.4	10	0.1
O:1	0	0.0	0	0.0	1	0.0	1	0.0
Other	10	0.3	18	0.5	3	0.1	31	0.3

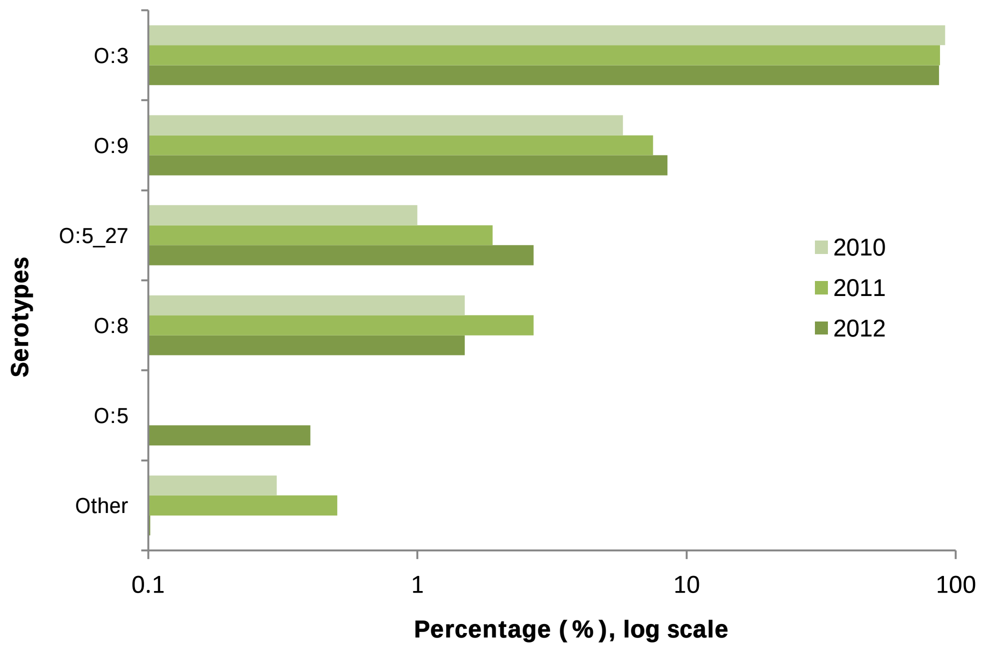
Yersinia enterocolitica serotype	2010		2011		2012		2010–2012	
	Cases	Per-centage (%)	Cases	Per-centage (%)	Cases	Per-centage (%)	Cases	Per-centage (%)
Total known	**3 302**	**100.0**	**3 530**	**100.0**	**2 846**	**100.0**	**96 78**	**100.0**
Unknown/missing	2 723	45.2	2 956	45.6	2 966	51.0	8 645	47.2
Total	**6 025**		**6 486**		**5 812**		**18 323**	

Source: Austria, Belgium, Czech Republic, Estonia, Finland, Germany, Hungary, Ireland, Italy (only 2010), Latvia, Lithuania (from 2011), Malta, Poland, Romania, Slovakia, Slovenia (only 2010-2011), Spain (from 2011), Sweden, United Kingdom; EEA country: Norway

Some changes were observed in the distribution of reported serotypes between 2010 and 2012 (Figure 7.16; Table 7.6). The proportion of serotype O:9 of the total serotypes reported increased slightly, from 5.8% in 2010 to 8.5% in 2012. An increase was also observed for serotype O:5,27, mainly reported by Luxemburg and Germany (Figure 7.16; Annex G: G7.6).

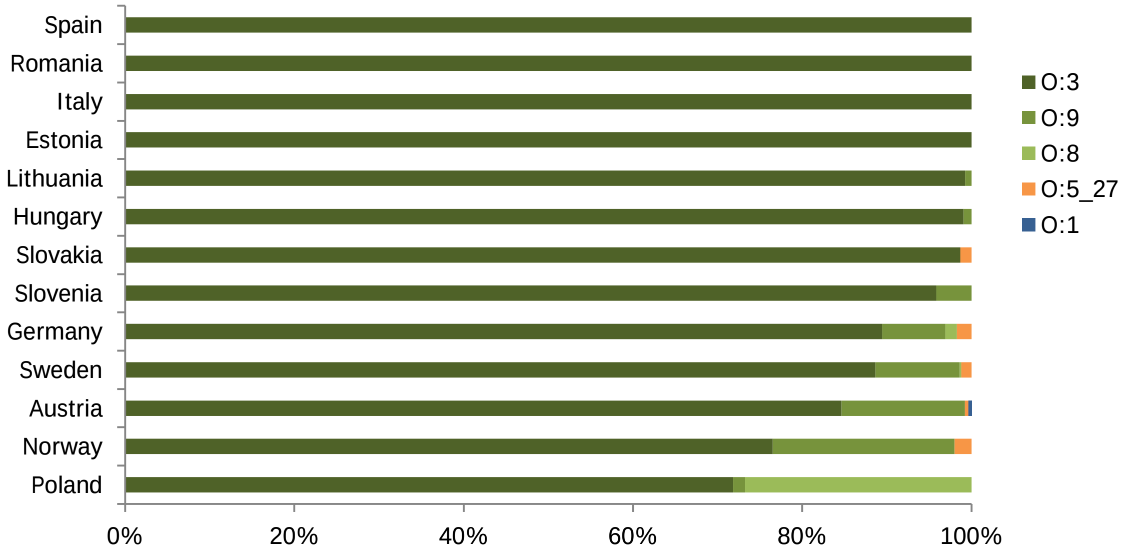
The distribution of selected *Y. enterocolitica* serotypes by reporting country in 2010–2012 is presented in Figure 7.17. Serotype O:3 was isolated in all EU/EEA countries that provided the information. In Estonia, Italy, Romania and Spain the totality of isolates reported belonged to serotype O:3, though the total number of cases reported was low. High proportion serotype O:3 cases were also found in Slovenia, Slovakia, Hungary and Lithuania (>95%) (Figure 7.16; Annex G: G7.6). The highest proportion of serotype O:9 was recorded in Norway (21%), followed by Austria (15%). Serotype O:8 was mainly reported in Poland and serotype O:5,27 in Germany and Norway (Figure 7.16; Annex G: G7.6).

Figure 7.16. Distribution of *Yersinia enterocolitica* serotypes in confirmed cases, as reported in 2010 (N=3 302), 2011 (N=3 530) and 2012 (N=2 846) by EU/EEA countries



Source: Austria, Belgium, Czech Republic, Estonia, Finland, Germany, Hungary, Ireland, Italy (only 2010), Latvia, Lithuania (from 2011), Malta, Poland, Romania, Slovakia, Slovenia (only 2010-2011), Spain (from 2011), Sweden, United Kingdom; EEA country: Norway

Figure 7.17. **Proportion of confirmed *Yersinia enterocolitica* cases by serotypes (N=9 579) as reported by EU/EEA countries, 2010–2012**



Three EU countries provided data on *Y. enterocolitica* biotypes for the period 2010–2012 (Austria, Lithuania and Slovenia) for 260 *Y. enterocolitica* isolates, representing a minor proportion of reported cases. The most commonly reported biovar was biotype 4, accounting for over 82% of all reported biotypes throughout the three-year period from 2010 to 2012 (Table 7.7). All reported biotypes 4 were associated with serotype O:3 (Table 7.8). The second most commonly reported was biotype 2, representing about 14% of the known biotypes (Table 7.7). Biotype 2 isolates were mainly associated with serotype O:9 (Table 7.8).

Due to the very low number of cases with information available on biotype, interpretation of results should be made with caution.

Table 7.7. **Distribution of confirmed *Yersinia enterocolitica* cases by biotype, EU/EEA countries, 2010–2012**

Yersinia enterocolitica biotype	2010		2011		2012		2010–2012	
	Cases	Per-centage (%)	Cases	Per-centage (%)	Cases	Per-centage (%)	Cases	Percentage (%)
4	71	82.6	78	82.1	64	81.0	213	81.9
2	13	15.1	11	11.6	12	15.2	36	13.8
3	0	0.0	3	3.2	2	2.5	5	1.9
1A	1	1.2	2	2.1	1	1.3	4	1.5
5	1	1.2	1	1.1	0	0.0	2	0.8
Total	**86**	**100.0**	**95**	**100.0**	**79**	**100.0**	**260**	**100.0**

Source: Austria, Lithuania and Slovenia

Table 7.8. Distribution of confirmed *Yersinia enterocolitica* cases by bio/serotype combination, EU/EEA countries, 2010–2012

Yersinia enterocolitica bio-/serotype	2010		2011		2012		2010–2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
4/O:3	71	82.6	72	84.7	61	82.4	204	83.3
2/O:9	12	14.0	10	11.8	11	14.9	33	13.5
2/O:5_27	0	0.0	0	0.0	1	1.4	1	0.4
3/O:3	0	0.0	1	1.2	1	1.4	2	0.8
5/O:3	1	1.2	1	1.2	0	0.0	2	0.8
1A/O:3	1	1.2	0	0.0	0	0.0	1	0.4
3/O:9	0	0.0	1	1.2	0	0.0	1	0.4
2/O:OTHER	1	1.2	0	0.0	0	0.0	1	0.4
Total	**86**	**100.0**	**85**	**100.0**	**74**	**100.0**	**245**	**100.0**

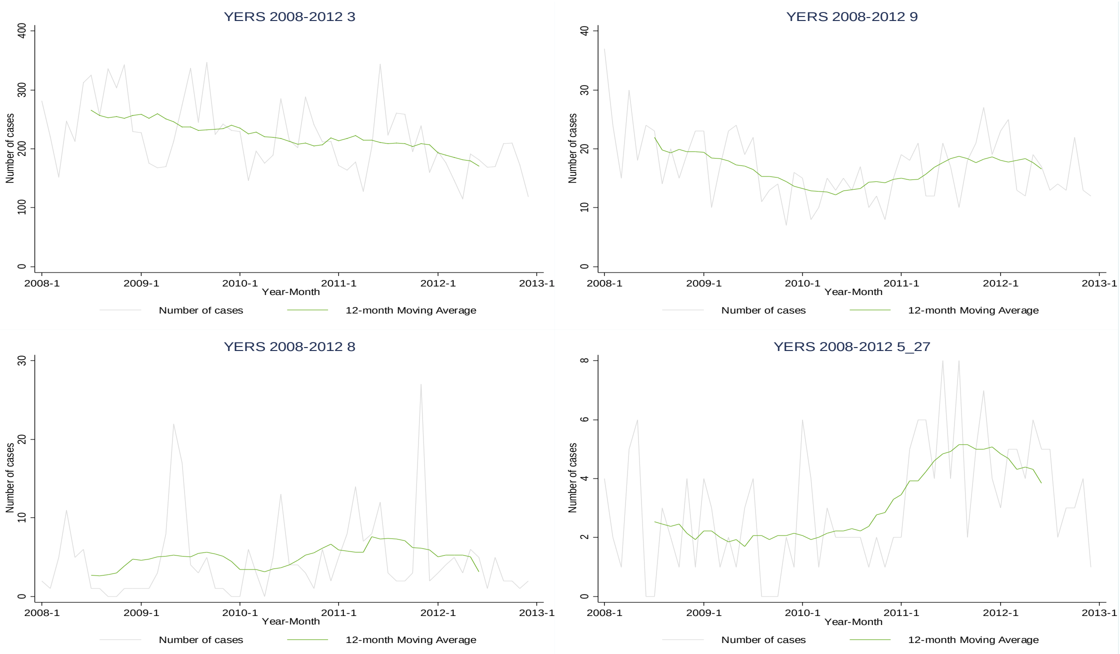
Source: Austria, Lithuania and Slovenia

Trends by serotype

Trends in the number of reported cases for the period 2008–2012 were calculated from the four most commonly reported *Y. enterocolitica* serotypes (O:3, O:9, O:8 and O:5,27), overall and by origin of infection.

As expected, the same trend pattern was observed for domestic cases of *Y. enterocolitica* as for all reported cases. Serotype O:3 showed a significant five-year decreasing trend, while a significant increase was observed for serotype O:5,27 (p-value≤0.01). Isolation of serotypes O:9 and O:8 remained stable over the five-year period (Figure 7.18). No changes in serotype-specific trends were observed among confirmed travel-related cases.

Figure 7.18. Trend in number of confirmed domestic cases for the four most common *Y. enterocolitica* serotypes (N=14 703), EU/EEA countries, 2008–2012



Source: Germany, Hungary, Poland, Slovakia; EEA country: Norway

Y. enterocolitica serotypes by age groups

The age distribution of confirmed *Y. enterocolitica* cases was described for the four most commonly reported serotypes in 2010–2012. Data on serotype and age were provided by 14 EU/EEA countries for 9 607 confirmed cases (48% of all *Y. enterocolitica* cases, cumulative data 2010–2012).

The four most common serotypes (O:3, O:9, O:8 and O:5,27) were spread across all age groups (Table 7.9; Annex G: G7.7), however there were significant differences in the age distribution. Serotype O:3 was predominant among cases under 24 years (78% of total serotype O:3 reported), peaking in the age group 5–14 (Table 7.9). Serotype O:9 was mainly isolated from cases over 15 years, accounting for 62% of all cases with this serotype during the three-year period (Table 7.9). With regard to the relative distribution, serotype O:3 decreased with age, while serotype O:9 increased with age (Figure 7.19; Annex G: G7.7). Serotype O:8 was common among children, with 37% of cases aged 1–4 years (Table 7.9). During 2010–2012, serotypes O:5,27 had higher relative proportions in the older age groups >25 years (Figure 7.19; Annex G: G7.7) and only two cases reported among infants under one year (Table 7.9).

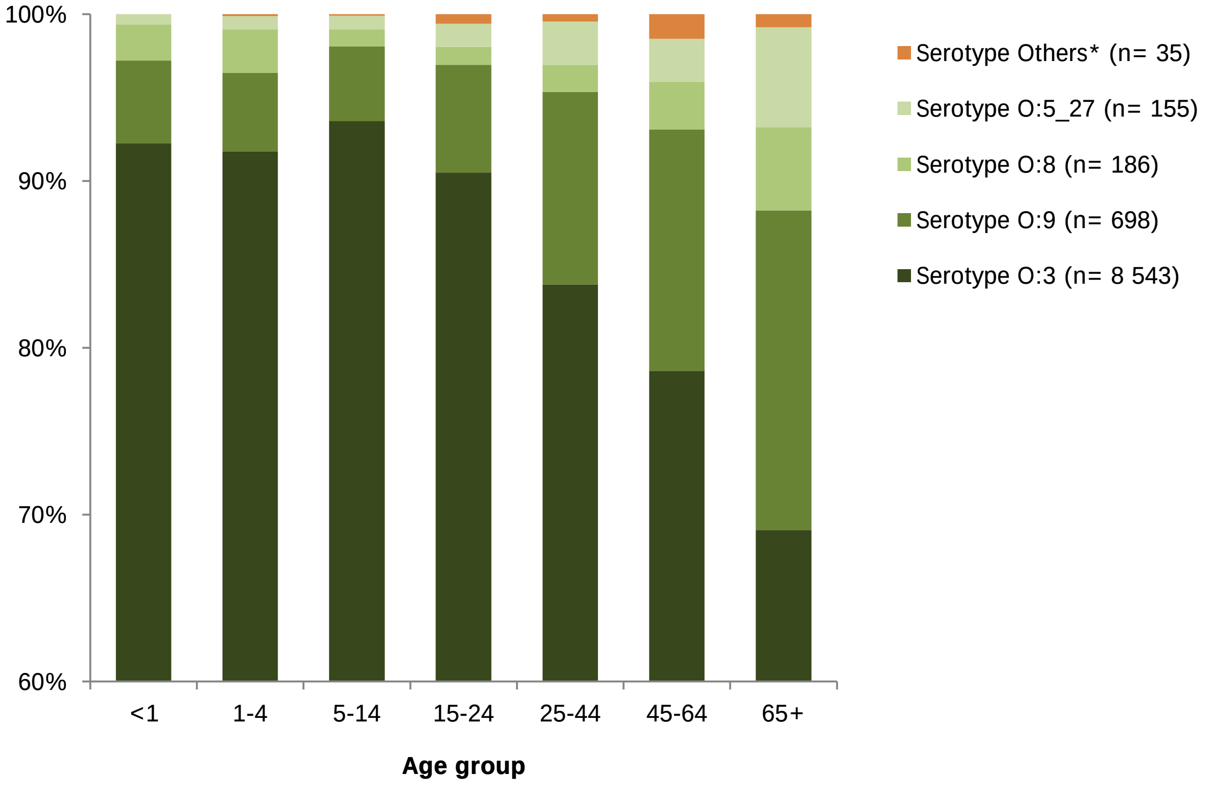
Table 7.9. Age distribution of confirmed *Yersinia enterocolitica* cases by serotype (N=9 607), EU/EEA countries, 2010–2012

Age groups	Serotype O:3		Serotype O:9		Serotype O:8		Serotype O:5_27		Serotype Other*	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
< 1 yrs	298	3	16	2	7	4	2	1	0	0
1–4 yrs	2 403	28	124	18	68	37	21	14	3	9
5–14 yrs	2 682	31	128	18	30	16	23	16	3	9
15–24 yrs	1 247	15	89	13	15	8	19	13	8	23
25–44 yrs	931	11	128	18	18	10	29	20	5	14
45–64 yrs	636	7	117	17	23	12	21	14	12	34
≥ 65 yrs	346	4	96	14	25	13	30	21	4	11
Total	**8 543**	**100**	**698**	**100**	**186**	**100**	**145**	**100**	**35**	**100**

Source: Austria, Estonia, Germany, Hungary, Italy, Lithuania, Poland, Romania, Slovakia, Slovenia, Spain and Sweden; EEA country: Norway.

** Others includes: isolates reported as Antigen O:5 (25–44 years n=2; 45-64 years n=2) and isolates reported as 'other'*

Figure 7.19. Relative distribution of the four most common *Yersinia enterocolitica* serotypes by age groups (N=9 607), as reported by EU/EEA countries, 2010–2012



Source: Austria, Estonia, Germany, Hungary, Italy, Lithuania, Poland, Romania, Slovakia, Slovenia, Spain and Sweden; EEA country: Norway.

** Others includes: isolates reported as Antigen O:5 (25-44 years n=2; 45-64 years n=2) and isolates reported as 'other'.*

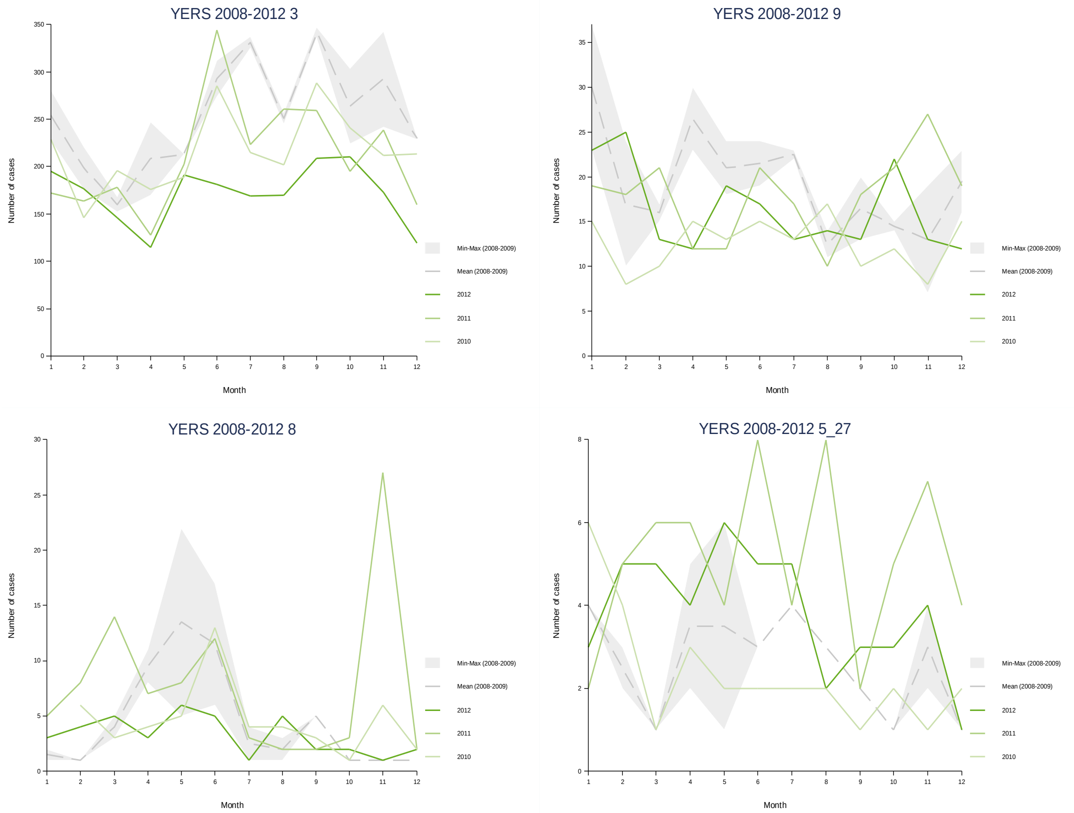
Y. enterocolitica serotypes seasonality

Seasonality was analysed for the four most common *Y. enterocolitica* serotypes (O:3, O:9, O:8 and O:5,27). Due to the low number of *Y. enterocolitica* infections acquired abroad, in this report the seasonal pattern is described only for domestic cases.

In 2010–2012, serotype O:3 presented some seasonality, characterised by an increase in cases during summer (June) and autumn (September), with a second smaller peak reported in January. The lowest number of cases was reported between March and April, while a high variability was observed during the autumn months (Figure 7.20).The distribution of serotype O:9 was almost stable throughout the year (Figure 7.20); the observed fluctuation may be associated with a three-monthly seasonal pattern.

Cases of serotype O:8 were more frequently reported during winter and spring (Figure 7.20). During 2011, a dramatic rise in serotype O:8 cases was recorded in November. Serotype O:5,27 did not show any clear seasonal pattern for the period 2010–2012 (Figure 7.20); however, the number of reported cases by month was very limited.

Figure 7.20. Seasonal distribution of confirmed domestic cases for the four most common *Yersinia enterocolitica* serotypes (N=14 703), EU/EEA countries, 2008–2012



Source: Germany, Hungary, Poland, Slovakia; EEA country: Norway

Severity

The severity of yersiniosis was evaluated by analysing the hospitalisation and the proportion of deaths due to yersiniosis (outcome) among all confirmed cases by calculating the case–fatality ratio. Relative confidence intervals (95% CI) were calculated analysing the hospitalisation ratio and the case–fatality ratio (CFR) and results were described on a country basis (Annex G: G7.8, G7.9).

Hospitalisation

During 2010–2012, information on hospitalisation was only reported for a very low proportion of confirmed yersiniosis cases (14%). The number of reporting countries increased from nine in 2010 to ten in 2012, with four countries (Austria, Italy, Latvia, and the United Kingdom) reporting the information for only one or two years (Annex G: G7.8). Since there is an extremely high proportion of unknown data (>80%), results on hospitalisation of confirmed yersiniosis cases should be interpreted with caution.

At EU/EEA level, the proportion of hospitalised cases slightly decreased in 2012 compared to 2010, from 66.6% (CI 95%: 63.4%–69.7%) to 52.0% (CI 95%: 48.9%–55.8%) (Table 7.10).The observed decrease in hospitalisations was mainly driven by Lithuania (from 78% in 2010 to 63% in 2012) and Poland (from 76% in 2010 to 57% in 2012) (Annex G: G7.8).The highest hospitalisation ratios (60–100 % of cases hospitalised) were reported in Italy, Ireland, Romania and the United Kingdom. These countries also reported some of the lowest notification rates for yersiniosis, which indicates that their surveillance systems primarily capture the more severe cases (Annex G: G7.8). The proportion of hospitalised cases was less than 30% for the whole period (2010–2012) in Hungary, and Norway (Annex G: G7.8).

Table 7.10. Hospitalisation ratio of confirmed yersiniosis cases reported by EU/EEA countries, 2010–12

Hospitalisation	Year		
	2010	2011	2012
Number of confirmed cases	6 793	7 029	6 334
Confirmed cases covered (%)[1]	13.1	14.7	12.7
Hospitalised cases	593	619	427
Hospitalisation ratio (%)[2] (confidence interval 95%)	66.6 (63.4–69.7)	60.0 (57.0–63.0)	53.2 (50.3–56.4)

[1] The proportion (%) of confirmed cases for which information on hospitalisation was available.

[2] Calculated as number of hospitalised cases of the confirmed cases for which this information was available.

Source: Austria (from 2011), Estonia, Hungary, Ireland, Italy (from 2010), Latvia (from 2011), Lithuania, Malta, Poland, Romania, Slovenia and United Kingdom (only 2010 and 2012); EEA country: Norway

Outcome

Between 2010 and 2012, 15 countries (14 Member States plus Norway) reported data on outcome (alive/dead) for 13 998 confirmed yersiniosis cases (Annex G: G7.9); overall, during 2010–2012, the proportion of unknown data (including missing data) was about 30% (Table 7.11; Annex G: G7.9). Based on known data only, the proportion of deaths in yersiniosis cases was extremely low, with only one death reported during the three-year surveillance period (Table 7.11; Annex G: G7.9).

Table 7.11. Number of deaths and case-fatality ratio of confirmed yersiniosis cases, EU/EEA countries, 2010–2012

Outcome	Year		
	2010	2011	2012
Number of confirmed cases	6 793	7 029	6 334
Confirmed cases covered (%)[1]	70.4	70.4	65.8
Number of deaths	0	1	0
Case fatality ratio (%)[2] (confidence interval 95%)	0.00 (0–0.08*)	0.02 (<0.001–0.1)	0.00 (0–0.09*)

[1] The proportion (%) of confirmed cases for which information on death was available.

[2] Calculated as number of fatal cases of the confirmed cases for which this information was available.

** One-sided, 97.5% confidence interval*

Source: Austria, Czech Republic, Estonia, Germany, Hungary, Ireland, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia, United Kingdom (only 2010 and 2012); EEA country: Norway

Discussion

Notification of yersiniosis cases at EU/EEA level fell significantly between 2008 and 2012, confirming the decreasing trend observed since 2006 [1-4]. However, yersiniosis is still the third most commonly reported bacterial zoonosis in humans, and a common gastrointestinal disease in Europe [1-5]. The observed trend was mainly driven by a reduction in *Y. enterocolitica* infections, the most commonly reported species. The trend for *Y. pseudotuberculosis* remained stable over the five-year period, even though, when looking more closely at the trend, data still reflect the large national outbreak reported in Finland in 2008 [15]. During the period 2010–2012, 98% of yersiniosis infections were acquired in Europe, when domestic cases and infections in travellers to other European countries were taken into consideration.

The overall notification rate in 2010–2012 was 2.1 cases per 100 000 population, with the highest number of cases reported in 2011; an increase of around 3% on 2010. The 2011 peak was mainly an increase in *Y. enterocolitica* infections, serotypes O:3 and O:8. Notification rates peaked in seven EU/EEA countries (Estonia, Germany, Hungary, Poland, Romania, Sweden and Norway). In Sweden it was mainly an increase in the most common serotype O:3. In Poland, there was increased reporting of *Y. enterocolitica* serotype O:8 (biotype 1B), a bioserotype which in the past was rarely reported in the EU. The occurrence of serotype O:8 infections has been observed in some areas of the country since 2006, most cases were sporadic and no large outbreaks were identified [13, 16]. *Y. enterocolitica* serotype O:8 cases also peaked in Germany during 2011. This was the first time that the number of yersiniosis cases had shown an increase at EU/EEA level since 2006 [2]. In 2012, the number of confirmed yersiniosis cases declined by 7.3% compared with 2011, and by 4.6% compared with 2010.

The observed differences in notification rates across EU/EEA countries may reflect variations in the sensitivity of diagnostic practices, diagnostic procedures, reporting methods and surveillance systems. Declaration of human cases is not compulsory in all countries and it is likely that the true number of yersiniosis cases in Europe is underestimated. Some country-to-country variation may also reflect true frequency differences. Being psychrophilic, *Yersinia* is able to grow and thrive at refrigeration temperatures (~4°C). Due to this ability, cold chain food products may provide an opportunity for growth of pathogenic *Yersinia* spp. and could represent a potential food safety hazard and a challenge to the food industry.

In 2010–2012, yersiniosis placed a considerable burden on children, especially those under five years, whereas in those over 25 years rates dropped to less than one case per 100 000 population. The vast majority of infections reported in children under 15 years were due to *Y. enterocolitica*. Conversely, *Y. pseudotuberculosis* was more commonly reported among adults over 25 years. The highest occurrence of yersiniosis in children under five years has been already reported in literature [5-7], as has the significant variation in age distribution observed in the two most common *Yersinia* species [8-9]. Notification rates were generally higher in men, and this was particularly relevant for those aged 15–24 years, as already observed in 2009. Due to the complex and partially unknown epidemiology of *Yersinia* species [1,5-6], it is still unclear why there are more cases in men than in women. This could be partially due to different dietary habits, as men possibly consume more meat, including pork which is considered to be the main food vehicle for *Y. enterocolitica*.

Only one death was reported during the three-year surveillance period (2010–2012) and 59% of yersiniosis cases required hospital care. However, the information was highly incomplete and therefore results are only indicative and should be interpreted with caution. The highest hospitalisation ratios were observed in countries that also reported low notification rates for yersiniosis, suggesting that surveillance systems primarily capture the more severe cases.

Based on biochemical profiles, strains of *Y. enterocolitica* are classified into six different biotypes [5-7,10]. Biotype correlates with serotype designation, human pathogenicity and ecological and geographical distribution [5,7]. Five biotypes (1B, 2, 3, 4, 5) contain human pathogenic strains and only one is considered non-pathogenic (1A), although recently a possible pathogenic potential has been described for some strains of this biotype [11]. Biotype 1B is known to be highly pathogenic and biotype 2-5 has a low pathogenicity for humans. Generally, biotypes with low pathogenicity are widespread in the world and biotype 3 is predominant in Europe, Asia and Australia. In contrast, highly pathogenic strain 1B is most commonly isolated in North America [5-7, 9-10].

Serologically, *Y. enterocolitica* is subdivided into about 60 serotypes, according to the variability of the O-antigen present in the outer membrane of bacteria, with only 11 serotypes having been most frequently associated with human infection [5, 7,10]. The most common bio/serotype combinations in human infections are biotype 1B/serotype O:8, 2/O:5,27, 2/O:9, 3/O:3, and 4/O:3; in particular bioserotype 4/O:3 is the most common combination isolated in European countries [6-7,10]. Serotyping of *Y. enterocolitica* provides valuable additional information, but it should always be accompanied with biotyping or other confirmation of pathogenicity of the isolates in clinical cases.

During the three-year surveillance period 2010–2012, only three EU/EEA countries (Austria, Lithuania and Slovenia) reported data on *Y. enterocolitica* biotypes. On the basis of the data submitted, the vast majority of strains belonged to biotype 4 and it was always associated with serotype O:3. The second most commonly reported biotype was 2 and this was mainly associated with serotype O:9. Biotype 1A strain was isolated from four cases. However, since a very low number of countries provided data on biotype and the information reported was incomplete, results should be interpreted with caution and no general conclusions can be drawn on the circulation of *Y. enterocolitica* biotypes in Europe, since the available information is not representative.

Information on serotype was provided by 22 EU/EEA countries for about half of the total reported *Y. enterocolitica* cases during 2010–2012. Some differences were observed in the geographical distribution of *Y. enterocolitica* serotypes among EU/EEA countries. Serotype O:3 remains the most dominant serotype at European level, although the number of isolates reported decreased significantly in 2008–2012. During the period 2010–2012, serotype O:3 was isolated in all EU/EEA reporting countries, mainly in persons under 15 years. A high proportion of serotype O:9, mainly isolated from cases over the age of 15 years, was reported by Norway in outbreaks [12] and by Austria, whereas serotype O:8 was mainly reported in Poland [13,16]. An increasing five-year trend (2008–2012) was observed for serotype O:5,27, mainly driven by Germany and Norway. Geographical variation among the most common causative serotypes of yersiniosis in humans has already been described in literature [5-7,9].

In 2010–2012, the seasonal distribution of *Y. enterocolitica*, in particular serotype O:3, was characterised by a more marked rise in the number of cases during summer and autumn and a second smaller peak observed in winter. The summer increase may be explained by a change in eating habits and lifestyle during the warmer months and the smaller peak observed in January may be due to an increased consumption of pork products during Christmas.

In fact, pigs are considered to be the primary reservoir for the human pathogenic types of *Y. enterocolitica* and prevalence of *Y. enterocolitica* in pork products is relevant to humans, since they represent an important vehicle of infection. In Europe the same bioserotypes found in humans (4/O3 and 2/O:9) are regularly detected in slaughter pigs, pork meat and pork products [6,17]. Other possible sources of *Y. enterocolitica* infection are contaminated raw vegetables, fruit or other miscellaneous prepared food products [5-6]. Improved food safety control measures, changes in the routine inspection procedures at slaughterhouses (e.g. incision of the tonsils) and better hygiene measures during food preparation at consumer level are possible explanations for the continuing decrease in *Yersinia* infections at European level.

In 2010–2012, *Y. pseudotuberculosis* infections were less frequent than those caused by *Y. enterocolitica*, however, strong and sudden peaks have been observed throughout the year, indicating the random occurrence of outbreaks. When outbreaks occur, *Y. pseudotuberculosis* is most often detected in contaminated raw vegetables [19-21]. Wild animals such as rodents, deer and birds have been found to carry *Y. pseudotuberculosis*, providing a possible contamination route to vegetables directly or through contaminated irrigation water [18,22].

However, most of the yersiniosis cases are reported as sporadic and outbreaks with strong evidence of the infection source are relatively rare [5-7]. In 2010, eleven possible *Yersinia* outbreaks, affecting 84 people, were reported by six Member States [1,3]. Vegetables were suspected as a source of one *Y. enterocolitica* bioserotype 2/O:9 outbreak with 42 cases reported in Finland [3]. In 2011, seven Member States reported a total of 17 possible *Yersinia* outbreaks [2,4]. One of them, caused by *Y. enterocolitica* O:9, was linked to mixed food consumed at a restaurant and accounted for seven human cases in Denmark. In Norway, packed salad mix containing radicchio rosso was suspected as a source of an *Y. enterocolitica* O:9 outbreak involving 21 cases [4, 12]. In 2012, twelve possible *Yersinia* outbreaks were reported at EU/EEA level but all were reported as weak-evidence outbreaks without specified source of infection [14].

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Annex A. Campylobacteriosis

Table A1.1. Number and proportion of confirmed campylobacteriosis cases by origin of infection (domestic/travel-related) as reported by EU/EEA countries, 2010–2012

Country	Confirmed cases reported	Domestic cases		Travel-related cases		Unknown	
		N	%	N	%	N	%
Austria	14 243	10 700	75.1	1 385	9.7	2 158	15.2
Belgium	20 370	2 883	14.2	30	0.1	17 457	85.7
Bulgaria^	176	0	0.0	0	0.0	176	100.0
Cyprus	185	0	0.0	0	0.0	185	100.0
Czech Republic	58 105	57 389	98.8	716	1.2	0	0.0
Denmark	11 817	2 467	20.9	1 862	15.8	7 488	63.4
Estonia	679	626	92.2	53	7.8	0	0.0
Finland	12 462	1 828	14.7	6 784	54.4	3 850	30.9
France[a]	14 941	2 038	13.6	272	1.8	12 631	84.5
Germany	198 426	181 578	91.5	13 394	6.8	3 454	1.7
Greece	-	-	-	-	-	-	-
Hungary	19 668	19 638	99.8	30	0.2	0	0.0
Ireland	6 484	282	4.3	61	0.9	6 141	94.7
Italy	1 699	327	19.2	115	6.8	1 257	74.0
Latvia	16	16	100.0	0	0.0	0	0.0
Lithuania	3 136	687	21.9	5	0.2	2 444	77.9
Luxembourg	1 885	0	0.0	0	0.0	1 885	100.0
Malta	638	633	99.2	5	0.8	0	0.0
Netherlands[b]	12 978	11 604	89.4	782	6.0	592	4.6
Poland	1 152	1 142	99.1	6	0.5	4	0.3
Portugal	-	-	-	-	-	-	-
Romania	416	0	0.0	0	0.0	416	100.0
Slovakia	14 745	14676	99.5	69	0.5	0	0.0
Slovenia	3 003	21	0.7	6	0.2	2 976	99.1
Spain[c]	17 297	17 297	100.0	0	0.0	0	0.0
Sweden	24 116	9 603	39.8	13 435	55.7	1 078	4.5
United Kingdom	215 026	33973	15.8	1 863	0.9	179190	83.3
EU total	**653 663**	**369 408**	**56.5**	**40 873**	**6.3**	**243 382**	**37.2**
Iceland	238	105	44.1	97	40.8	36	15.1
Liechtenstein	-	-	-	-	-	-	-
Norway	8620	3272	38.0	4269	49.5	1079	12.5
EU/EEA total	**662 521**	**372 785**	**56.3**	**45 239**	**6.8**	**244 497**	**36.9**

^ Aggregated reporting

[a] Population coverage 20%

[b] Population coverage 52%

[c] Population coverage 25%

– Not reported/not calculated

Table A1.2. Number and notification rates of confirmed domestic campylobacteriosis cases by EU/EEA countries, 2010–2012

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	3104	37.1	3 716	44.2	3 880	46.0
Belgium*	0	-	2 883	-	0	-
Bulgaria^	-	-	-	-	-	-
Cyprus	-	-	-	-	-	-
Czech Republic	20 865	198.6	18 492	176.3	18 032	171.7
Denmark	1 074	19.4	1 006	18.1	387	6.9
Estonia	178	13.3	195	14.6	253	18.9
Finland	536	10.0	556	10.3	736	13.6
France[a]	877	6.8	1 161	8.9	0	0.0
Germany	57 652	70.6	66 215	81.2	57 711	70.7
Greece	-	-	-	-	-	-
Hungary	7 170	72.8	6 115	62.3	6 353	65.0
Ireland	154	3.4	84	1.8	44	1.0
Italy*	83	-	97	-	147	-
Latvia	1	0.0	7	0.3	8	0.4
Lithuania	0	0.0	0	0.0	687	22.8
Luxembourg	-	-	-	-	-	-
Malta	203	49.0	216	51.9	214	51.3
Netherlands[b]	3 732	43.3	3 887	44.9	3 985	45.8
Poland	364	1.0	350	0.9	428	1.1
Portugal	-	-	-	-	-	-
Romania	-	-	-	-	-	-
Slovakia	4 456	82.2	4 542	84.2	5 678	105.1
Slovenia	0	0.0	0	0.0	21	1.0
Spain[c]	6 340	55.2	5 469	47.4	5 488	47.5
Sweden	3 152	33.7	3 281	34.8	3 170	33.4
United Kingdom~	11 423	18.6	11552	18.6	10 998	17.5
EU total	**121 364**	**42.9**	**129 824**	**44.8**	**118 220**	**41.5**
Iceland	24	7.6	60	18.8	21	6.6
Liechtenstein	-	-	-	-	-	-
Norway	1007	20.7	1168	23.7	1097	22.0
EU/EEA total	**122 395**	**42.5**	**131 052**	**44.4**	**119 338**	**41.1**

** Sentinel surveillance. Population coverage unknown so notification rate not calculated*

^ Aggregated reporting

[a] Population coverage 20%

[b] Population coverage 52%

[c] Population coverage 25%

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

– Not reported/not calculated

Table A1.3. Number and notification rates of confirmed travel-related campylobacteriosis cases by EU/EEA countries, 2010–2012

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	424	5.1	483	5.7	478	5.7
Belgium*	0	-	30	-	0	-
Bulgaria^	-	-	-	-	-	-
Cyprus	-	-	-	-	-	-
Czech Republic	210	2.0	251	2.4	255	2.4
Denmark	653	11.8	667	12.0	542	9.7
Estonia	19	1.4	19	1.4	15	1.1
Finland	2 406	45.0	2 402	44.7	1 976	36.6
France[a]	125	1.0	147	1.1	0	0.0

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Germany	4 004	4.9	4 597	5.6	4 793	5.9
Greece	-	-	-	-	-	-
Hungary	10	0.1	6	0.1	14	0.1
Ireland	46	1.0	7	0.2	8	0.2
Italy*	34	-	28	-	53	-
Latvia	0	0.0	0	0.0	0	0.0
Lithuania	0	0.0	0	0.0	5	0.2
Luxembourg	-	-	-	-	-	-
Malta	1	0.2	4	1.0	0	0.0
Netherlands[b]	251	2.9	268	3.1	263	3.0
Poland	2	0.0	2	0.0	2	0.0
Portugal	-	-	-	-	-	-
Romania	-	-	-	-	-	-
Slovakia	20	0.4	23	0.4	26	0.5
Slovenia	2	0.1	3	0.1	1	0.0
Spain[c]	0	0.0	0	0.0	0	0.0
Sweden	4 466	47.8	4555	48.4	4 414	46.5
United Kingdom~	673	1.1	561	0.9	629	1.0
EU total* **	**13346**	**4.7**	**14 053**	**4.9**	**13 474**	**4.7**
Iceland	22	6.9	45	14.1	30	9.4
Liechtenstein	-	-	-	-	-	-
Norway	1376	28.3	1482	30.1	1411	28.3
EU/EEA total* **	**14 744**	**5.1**	**15 580**	**5.4**	**14 915**	**5.1**

**Sentinel surveillance. Population coverage unknown so notification rate not calculated*

^ Aggregated reporting

[a] Population coverage 20%

[b] Population coverage 52%

[c] Population coverage 25%

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

*** For each year shown, notification rates were calculated, with the exception of countries with unknown population coverage. Also excluded were populations of countries which did not report data. Populations of countries which reported 0 cases were included.*

– Not reported/not calculated

Table A1.4. Notification rates of confirmed campylobacteriosis cases by age groups and sex in EU/EEA countries, 2010–2012

Sex	Age group	2010		2011		2012		2010–2012	
		Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Male	< 1 yr	3 167	120.7	3 015	115.0	3 110	121.1	9 292	118.9
	1–4 yrs	13 041	126.2	12 475	119.1	12 453	118.0	37 969	121.1
	5–14 yrs	11 241	44.1	11 447	44.9	10 926	42.8	33 614	43.9
	15–24 yrs	15 827	53.4	16 756	57.3	15 722	54.5	48 305	55.1
	25–44 yrs	28 976	42.4	29 811	43.9	27 233	40.4	86 020	42.2
	45–64 yrs	27 367	44.2	29 434	46.7	28 243	44.4	85 044	45.1
	≥65 yrs	14 789	42.9	16 570	47.4	16 804	46.9	48 163	45.7
	Total	**114 408**	**49.1**	**119 508**	**51.1**	**114 491**	**48.8**	**348 407**	**49.7**
Female	< 1 yr	2 549	102.3	2 270	91.1	2 288	93.8	7107	95.8
	1–4 yrs	10 042	102.3	9 648	96.9	9 671	96.4	29 361	98.5
	5–14 yrs	7 781	32.1	8 047	33.2	7 642	31.5	23 470	32.3
	15–24 yrs	15 187	53.5	16 366	58.5	15 200	55.0	46 753	55.7
	25–44 yrs	27 384	40.9	28 244	42.4	26 047	39.3	81 675	40.9
	45–64 yrs	23 942	37.4	25 417	39.0	24 531	37.3	73 890	37.9
	≥ 65 yrs	15 119	31.5	16 143	33.4	16 285	33.2	47 547	32.7
	Total	**102 004**	**41.8**	**106 135**	**43.4**	**101 664**	**41.4**	**309 803**	**42.2**

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Table A1.5. Number of isolates and relative distribution of reported *Campylobacter* species by age groups, EU/EEA countries, 2010–2012

Age groups	*Campylobacter jejuni*		*Campylobacter coli*		*Campylobacter lari*		*Campylobacter* species unspecified		Other *Campylobacter* species		Total 2010–2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
< 1 yr	7028	50.1	285	2.0	25	0.2	6 077	43.4	602	4.3	**14 017**	**100.0**
1–4 yrs	32 484	55.4	1 199	2.0	70	0.1	21 717	37.0	3 191	5.4	**58 661**	**100.0**
5–14 yrs	27 574	53.1	1 401	2.7	74	0.1	19 059	36.7	3 825	7.4	**51 933**	**100.0**
15–24 yrs	40 273	44.7	2 581	2.9	162	0.2	38 893	43.2	8 093	9.0	**90 002**	**100.0**
25–44 yrs	61 635	38.4	4 627	2.9	254	0.2	79 042	49.2	15 086	9.4	**160 644**	**100.0**
45–64 yrs	48 356	31.6	4 152	2.7	212	0.1	85 435	55.8	14 980	9.8	**153 135**	**100.0**
≥ 65 yrs	26 541	29.0	2 697	2.9	141	0.2	53 309	58.2	8 961	9.8	**91 649**	**100.0**

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Table A1.6. Number of hospitalisation of confirmed campylobacteriosis cases by EU/EEA countries, 2010–2012

Country	2010					2011					2012				
	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)
Austria	4 404	84.7	1 441	38.6	37.1-40.2	5 129	87.1	1 720	38.5	37.1-40	4 710	87.2	1 584	38.5	37.1-40.1
Belgium	6 047	0.0	-	-	-	7 716	0.0	-	-	-	6 607	0.0	-	-	-
Bulgaria	6	0.0	-	-	-	73	0.0	-	-	-	97	0.0	-	-	-
Cyprus	55	0.0	-	-	-	62	0.0	-	-	-	68	55.9	29	76.3	59.8-88.6
Czech Republic	21 075	0.0	-	-	-	18 743	0.0	-	-	-	18 287	0.0	-	-	-
Denmark	4 037	0.0	-	-	-	4 060	0.0	-	-	-	3 720	0.0	-	-	-
Estonia	197	100.0	113	57.4	50.1-64.4	214	100.0	125	58.4	51.5-65.1	268	100.0	144	53.7	47.6-59.8
Finland	3 944	0.0	-	-	-	4 267	0.0	-	-	-	4 251	0.0	-	-	-
France	4 324	0.0	-	-	-	5 538	0.0	-	-	-	5 079	0.0	-	-	-
Germany	65 110	0.0	-	-	-	70 812	0.0	-	-	-	62 504	0.0	-	-	-
Greece	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hungary	7 180	100.0	1 658	23.1	22.1-24.1	6 121	100.0	1 352	22.1	21.1-23.2	6 367	100.0	1 429	22.4	21.4-23.5
Ireland	1 660	78.5	332	25.5	23.1-27.9	2 433	85.7	528	25.3	23.5-27.3	2 391	83.2	580	29.2	27.2-31.2
Italy	457	0.0	-	-	-	468	0.0	-	-	-	774	0.0	-	-	-
Latvia	1	0.0	-	-	-	7	0.0	-	-	-	8	100.0	7	87.5	47.4-99.7
Lithuania	1 095	0.0	-	-	-	1 124	0.0	-	-	-	917	100.0	714	77.9	75-80.5
Luxembourg	600	0.0	-	-	-	704	0.0	-	-	-	581	0.0	-	-	-
Malta	204	0.0	-	-	-	220	100.0	83	37.7	31.3-44.5	214	100.0	43	20.1	14.9-26.1
Netherlands	4 322	0.0	-	-	-	4 408	0.0	-	-	-	4 248	0.0	-	-	-
Poland	367	100.0	203	55.3	50.1-60.5	354	100.0	204	57.6	52.3-62.8	431	100.0	247	57.3	52.5-62
Portugal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Romania	175	94.3	122	73.9	66.5-80.5	149	98.0	87	59.6	51.2-67.6	92	79.3	54	74.0	62.4-83.6
Slovakia	4 476	0.0	-	-	-	4 565	0.0	-	-	-	5 704	0.0	-	-	-
Slovenia	1 022	0.0	-	-	-	998	99.6	561	56.4	53.3-59.6	983	98.3	564	58.4	55.2-61.5
Spain	6 340	0.0	-	-	-	5 469	0.0	-	-	-	5 488	0.0	-	-	-
Sweden	8 001	0.0	-	-	-	8 214	0.0	-	-	-	7 901	0.0	-	-	-
United Kingdom	70 298	1.5	216	20.8	18.3-23.4	72 150	7.9	4 742	83.7	82.7-84.7	72 578	7.5	4 551	83.3	82.3-84.3
EU total	215 397	6.5	4 085	29.2	28.5-30	223 998	9.0	9 402	46.4	45.7-47.1	214 268	9.7	9 946	47.7	47-48.4
Iceland	55	0.0	-	-	-	123	0.0	-	-	-	60	0.0	-	-	-
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Norway	2 682	99.4	490	18.4	16.9-19.9	3 005	99.5	638	21.3	19.9-22.9	2 933	99.7	636	21.8	20.3-23.3
EU/EEA total	218 134	7.6	4 575	27.5	26.8-28.2	227 126	10.2	10 040	43.2	42.5-43.8	217 261	10.9	10 582	44.5	43.9-45.2

– Not reported/not calculated

Table A1.7. Number of deaths and case–fatality rate (CFR) of confirmed campylobacteriosis cases by EU/EEA countries, 2010–2012

Country	2010					2011					2012				
	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)
Austria	4404	100.0	0	0.00	0.00-0.08	5129	100.0	3	0.06	0.01-0.17	4710	100.0	1	0.02	0.00-0.12
Belgium	6047	0.0	-	-	-	7716	0.0	-	-	-	6607	0.0	-	-	-
Bulgaria	6	0.0	-	-	-	73	0.0	-	-	-	97	0.0	-	-	-
Cyprus	55	96.4	0	0.00	0.00-6.72	62	100.0	0	0.00	0.00-5.78	68	100.0	0	0.00	0.00-5.28
Czech Republic	21075	100.0	5	0.02	0.01-0.06	18743	100.0	2	0.01	0.00-0.04	18287	100.0	4	0.02	0.01-0.06
Denmark	4037	0.0	-	-	-	4060	0.0	-	-	-	3720	0.0	-	-	-
Estonia	197	99.5	0	0.00	0.00-1.86	214	100.0	1	0.47	0.01-2.58	268	100.0	0	0.00	0.00-1.37
Finland	3944	0.0	-	-	-	4267	0.0	-	-	-	4251	0.0	-	-	-
France	4324	0.0	-	-	-	5538	0.0	-	-	-	5079	0.0	-	-	-
Germany	65110	99.5	2	0.00	0.00-0.01	70812	99.3	5	0.01	0.00-0.02	62504	99.7	6	0.01	0.00-0.02
Greece	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hungary	7180	99.7	0	0.00	0.00-0.05	6121	100.0	0	0.00	0.00-0.06	6367	100.0	0	0.00	0.00-0.06
Ireland	1660	10.0	0	0.00	0.00-2.2	2433	5.0	0	0.00	0-3	2391	4.1	0	0.00	0.00-3.69
Italy	457	0.0	-	-	-	468	0.0	-	-	-	774	0.0	-	-	-
Latvia	1	100.0	0	0.00	0.00-97.5	7	100.0	0	0.00	0.00-40.9	8	100.0	0	0.00	0.00-36.9
Lithuania	1095	0.0	-	-	-	1124	0.0	-	-	-	917	100.0	0	0.00	0.00-0.40
Luxembourg	600	0.0	-	-	-	704	0.0	-	-	-	581	0.0	-	-	-
Malta	204	100.0	0	0.00	0.00-1.79	220	100.0	0	0.00	0.00-1.66	214	100.0	0	0.00	0.00-1.71
Netherlands	4322	0.0	-	-	-	4408	0.0	-	-	-	4248	0.0	-	-	-
Poland	367	97.3	0	0.00	0.00-1.03	354	99.7	0	0.00	0.00-1.04	431	95.6	0	0.00	0.00-0.89
Portugal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Romania	175	98.3	0	0.00	0.00-2.12	149	97.3	0	0.00	0.00-2.51	92	84.8	0	0.00	0.00-4.62
Slovakia	4476	94.4	0	0.00	0.00-0.09	4565	95.1	0	0.00	0.00-0.08	5704	95.5	0	0.00	0.00-0.07
Slovenia	1022	0.0	-	-	-	998	0.0	-	-	-	983	0.0	-	-	-
Spain	6340	0.0	-	-	-	5469	0.0	-	-	-	5488	0.0	-	-	-
Sweden	8001	0.0	-	-	-	8214	0.0	-	-	-	7901	0.0	-	-	-
United Kingdom	70298	18.1	23	0.18	0.11-0.27	72150	17.8	34	0.27	0.18-0.37	72578	16.9	20	0.16	0.10-0.25
EU total	215397	53.6	30	0.03	0.02-0.03	223998	52.9	45	0.04	0.03-0.05	214268	52.0	31	0.03	0.02-0.04
Iceland	55	0.0	-	-	-	123	0.0	-	-	-	60	0.0	0	-	-
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Norway	2682	69.0	-	0.00	0.00-0.2	3005	67.8	0	0.00	0.00-0.18	2933	67.0	0	0.00	0.00-0.19
EU/EEA total	218134	53.8	30	0.03	0.02-0.0.4	227126	53.1	45	0.04	0.03-0.05	217261	52.2	31	0.03	0.02-0.04

– Not reported/not calculated

Annex B. Listeriosis

Table B2.1. Number and proportion of confirmed listeriosis cases by origin of infection (domestic/travel-related) as reported by EU/EEA countries, 2010–2012

Country	Confirmed cases reported	Domestic cases		Travel-related cases		Unknown	
		N	%	N	%	N	%
Austria	96	67	69.8	0	0.0	29	30.2
Belgium	193	-		-		193	100.0
Bulgaria	18	-		-		18	100.0
Cyprus	4	-		-		4	100.0
Czech Republic	93	93	100.0	0	0.0	0	0.0
Denmark	161	-		-		161	100.0
Estonia	11	11	100.0	0	0.0	0	0.0
Finland	175	110	62.9	3	1.7	62	35.4
France	942	939	99.7	3	0.3	0	0.0
Germany	1,119	1,092	97.6	14	1.3	13	1.2
Greece	31	28	90.3	1	3.2	2	6.5
Hungary	44	44	100.0	0	0.0	0	0.0
Ireland	28	13	46.4	2	7.1	13	46.4
Italy*	273	-		-		273	100.0
Latvia	20	20	100.0	0	0.0	0	0.0
Lithuania	19	14	73.7	0	0.0	5	26.3
Luxembourg	4	-		-		4	100.0
Malta	4	4	100.0	0	0.0	0	0.0
Netherlands	232	211	90.9	10	4.3	11	4.7
Poland	175	108	61.7	0	0.0	67	38.3
Portugal	-	-	-	-	-	-	-
Romania	18	6	33.3	0	0.0	12	66.7
Slovakia	47	47	100.0	0	0.0	0	0.0
Slovenia	23	15	65.2	0	0.0	8	34.8
Spain	327	327	100.0	0	0.0	0	0.0
Sweden	191	173	90.6	6	3.1	12	6.3
United Kingdom	523	425	81.3	13	2.5	85	16.3
EU total	**4 771**	**3 747**	**78.5**	**52**	**1.1**	**972**	**20.4**
Iceland	7	-		-		7	100.0
Liechtenstein	-	-	-	-	-	-	-
Norway	73	64	87.7	1	1.4	8	11.0
EU/EEA total	**4 851**	**3 811**	**78.6**	**53**	**1.1**	**987**	**20.3**

** Incomplete reporting for 2012*

– Not reported/not calculated

Table B2.2. Number and notification rates of confirmed domestically-acquired listeriosis cases by EU/EEA countries, 2010–2012

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	15	0.18	21	0.25	31	0.37
Belgium	-	-	-	-	-	-
Bulgaria^	-	-	-	-	-	-
Cyprus	-	-	-	-	-	-
Czech Republic	26	0.25	35	0.33	32	0.30
Denmark	-	-	-	-	-	-
Estonia	5	0.37	3	0.22	3	0.22
Finland	52	0.97	17	0.32	41	0.76
France	310	0.48	281	0.43	348	0.53
Germany	362	0.44	326	0.40	404	0.49
Greece	8	0.07	9	0.08	11	0.10
Hungary	20	0.20	11	0.11	13	0.13
Ireland	3	0.07	5	0.11	5	0.11
Italy	-	-	-	-	-	-

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Latvia	7	0.31	7	0.34	6	0.29
Lithuania	5	0.15	6	0.20	3	0.10
Luxembourg	-	-	-	-	-	-
Malta	1	0.24	2	0.48	1	0.24
Netherlands	60	0.36	82	0.49	69	0.41
Poland	6	0.02	48	0.12	54	0.14
Portugal	-	-	-	-	-	-
Romania	6	0.03	-	-	-	-
Slovakia	5	0.09	31	0.57	11	0.20
Slovenia	11	0.54	3	0.15	1	0.05
Spain*	129	1.12	91	0.79	107	0.93
Sweden	58	0.62	51	0.54	64	0.67
United Kingdom ~	123	0.20	139	0.22	163	0.26
EU total**	**1 212**	**0.33**	**1 168**	**0.32**	**1 367**	**0.37**
Iceland	-	-	-	-	-	-
Liechtenstein	-	-	-	-	-	-
Norway	19	0.39	19	0.39	26	0.52
EU/EEA total**	**1 231**	**0.33**	**1 187**	**0.32**	**1 393**	**0.37**

– Not reported/not calculated

^ Aggregated reporting

** Population coverage 25%*

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

*** For each year shown, notification rates were calculated, with the exception of countries with unknown population coverage. Also excluded were populations of countries which did not report data. Populations of countries which reported 0 cases were included.*

Table B2.3. Number and notification rates of confirmed travel-related listeriosis cases by EU/EEA countries, 2010–2012

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	0	0.00	0	0.00	0	0.00
Belgium	-	-	-	-	-	-
Bulgaria^	-	-	-	-	-	-
Cyprus	-	-	-	-	-	-
Czech Republic	0	0.00	0	0.00	0	0.00
Denmark	-	-	-	-	-	-
Estonia	0	0.00	0	0.00	0	0.00
Finland	0	0.00	1	0.02	2	0.04
France	2	< 0.01	1	0.00	0	0.00
Germany	2	< 0.01	4	0.00	8	0.01
Greece	1	0.01	0	0.00	0	0.00
Hungary	0	0.00	0	0.00	0	0.00
Ireland	1	0.02	1	0.02	0	0.00
Italy	-	-	-	-	-	-
Latvia	0	0.00	0	0.00	0	0.00
Lithuania	0	0.00	0	0.00	0	0.00
Luxembourg	-	-	-	-	-	-
Malta	0	0.00	0	0.00	0	0.00
Netherlands	5	0.03	2	0.01	3	0.02
Poland	0	0.00	0	0.00	0	0.00
Portugal	-	-	-	-	-	-
Romania	0	0.00	-	-	-	-
Slovakia	0	0.00	0	0.00	0	0.00
Slovenia	0	0.00	0	0.00	0	0.00
Spain*	0	0.00	0	0.00	0	0.00
Sweden	2	0.02	1	0.01	3	0.03
United Kingdom ~	8	0.01	2	0.00	3	0.00

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
EU total**	**21**	**0.01**	**12**	**0.005**	**19**	**0.01**
Iceland	-	-	-	-	-	-
Liechtenstein	-	-	-	-	-	-
Norway	1	0.02	0	0.00	0	0.00
EU/EEA total**	**22**	**0.01**	**12**	**0.004**	**19**	**0.01**

– Not reported/not calculated

^ Aggregated reporting

** Population coverage 25%*

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

*** For each year shown, notification rates were calculated, with the exception of countries with unknown population coverage. Also excluded were populations of countries which did not report data. Populations of countries which reported 0 cases were included.*

Table B2.4. Notification rates of confirmed listeriosis cases by age groups and sex in EU/EEA countries, 2010–2012

Sex	Age group	2010		2011		2012		2010–2012	
		Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Male	< 1 yrs	47	0.90	43	0.83	33	0.66	123	0.80
	1–24 yrs	16	0.01	15	0.01	12	0.01	43	0.01
	25–44 yrs	43	0.03	28	0.02	36	0.03	107	0.03
	45–64 yrs	207	0.19	208	0.19	230	0.21	645	0.19
	65–74 yrs	224	0.71	191	0.60	236	0.73	651	0.68
	75–84 yrs	250	1.40	189	1.03	227	1.22	666	1.21
	≥ 85 yrs	65	1.61	71	1.66	69	1.53	205	1.60
	Total	**852**	**0.20**	**745**	**0.17**	**843**	**0.20**	**2440**	**0.19**
Female	< 1 yrs	41	0.83	36	0.74	32	0.67	109	0.75
	1–24 yrs	24	0.02	33	0.03	30	0.02	87	0.02
	25–44 yrs	100	0.08	99	0.08	114	0.09	313	0.08
	45–74 yrs	117	0.10	120	0.10	154	0.13	391	0.11
	65–44 yrs	141	0.35	115	0.28	158	0.38	414	0.34
	75–84 yrs	163	0.55	170	0.57	187	0.62	520	0.58
	≥ 85 yrs	72	0.72	73	0.69	92	0.84	237	0.75
	Total	**658**	**0.15**	**646**	**0.14**	**767**	**0.17**	**2071**	**0.15**

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Luxembourg, the Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Table B2.5a. Distribution of *Listeria monocytogenes* serotypes (traditional serotyping) isolated in confirmed cases as reported by EU/EEA countries, 2010–2012

Country	1/2a			1/2b			1/2c			4b			3			Other*		
	2010 (n = 303)	2011 (n = 223)	2012 (n = 138)	2010 (n = 71)	2011 (n = 71)	2012 (n = 25)	2010 (n = 13)	2011 (n = 12)	2012 (n = 8)	2010 (n = 248)	2011 (n = 215)	2012 (n = 123)	2010 (n = 0)	2011 (n = 0)	2012 (n = 0)	2010 (n = 165)	2011 (n = 173)	2012 (n = 0)
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Austria	6.3	5.8	9.4	5.6	5.6	20.0	7.7	0.0	12.5	4.0	2.3	13.0	-	-	-	-	-	-
Belgium	4.6	9.0	13.8	5.6	1.4	8.0	7.7	8.3	25.0	7.7	6.0	23.6	-	-	100	0.6	-	-
Denmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35.2	28.3	-
France	33.7	38.6	-	56.3	57.7	0.0	46.2	50.0	-	62.5	69.3	-	-	-	-	-	-	-
Germany	12.5	13.5	34.1	7.0	12.7	36.0	-	-	-	13.3	14.4	43.9	-	-	-	-	12.7	-
Hungary	-	1.3	-	-	-	-	-	-	-	-	1.9	-	-	-	-	-	-	-
Ireland	-	-	1.4	0.0	0.0	8.0	-	-	-	0.8	1.4	4.1	-	-	-	1.2	1.7	-
Italy§	6.3	16.1	31.9	2.8	2.8	20.0	7.7	16.7	62.5	4.8	4.2	12.2	-	-	-	0.6	0.6	-
Netherlands	1.3	-	-	1.4	-	-	-	-	-	2.8	0.5	-	-	-	-	-	-	-
Norway	-	-	8.7	-	-	4.0	-	-	-	-	-	2.4	-	-	-	12.7	10.4	-
Romania	0.3	-	0.7	-	-	-	-	-	-	-	-	-	-	-	-	1.2	-	-
Slovenia	2.0	-	-	-	-	-	15.4	-	-	-	-	-	-	-	-	1.8	-	-

Country	1/2a			1/2b			1/2c			4b			3			Other*		
	2010 (n = 303)	2011 (n = 223)	2012 (n = 138)	2010 (n = 71)	2011 (n = 71)	2012 (n = 25)	2010 (n = 13)	2011 (n = 12)	2012 (n = 8)	2010 (n = 248)	2011 (n = 215)	2012 (n = 123)	2010 (n = 0)	2011 (n = 0)	2012 (n = 0)	2010 (n = 165)	2011 (n = 173)	2012 (n = 0)
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Sweden	15.8	-	-	5.6	-	-	-	-	-	4.0	-	-	-	-	-	-	-	-
UK	17.2	15.7	-	15.5	19.7	4.0	15.4	25.0	-	-	-	0.8	-	-	-	46.7	46.2	-
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	-	-	100.0	100.0	100.0	-

– Not reported/not calculated

§ Incomplete reporting for 2012

** Includes serotypes reported as 'other' and incomplete serotypes 1/2 or 4*

Table B2.5b. Distribution of Listeria monocytogenes PCR serogroups isolated in confirmed cases, as reported by EU/EEA countries, 2012

Country	IVb		IIa		IIb		IIc	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
France	188	67.9	103	64.4	43	68.3	12	54.5
Sweden	6	2.2	18	11.3	1	1.6	6	27.3
United Kingdom	83	30.0	39	24.4	19	30.2	4	18.2
Total	**277**	**100.0**	**160**	**100.0**	**63**	**100.0**	**22**	**100.0**

Table B2.6a. Age distribution of *Listeria monocytogenes* serotypes (traditional serotyping) isolated in confirmed cases, EU/EEA countries, 2010–2012

Age groups	1/2a			1/2b			1/2c			4b			3a			Other*		
	2010	2011	2012	2010	2011	2012	2010	2011	2012	2010	2011	2012	2010	2011	2012	2010	2011	2012
< 1 yr	7	1	3	-	1	2	-	-	-	7	5	11	-	-	-	-	-	-
1–24 yrs	3	2	3	1	-	1	-	-	-	1	1	4	-	-	-	1	1	-
25–44 yrs	4	4	4	1	1	-	-	-	-	6	7	17	-	-	-	1	1	-
45–64 yrs	15	18	29	2	4	1	3	1	1	15	11	26	-	-	-	-	6	-
65–74 yrs	26	14	28	5	4	3	1	-	-	12	12	23	-	-	-	-	4	-
75–84 yrs	19	20	17	4	4	8	-	-	2	24	17	20	-	-	1	-	8	-
≥ 85 yrs	8	7	10	1	-	4	-	-	3	6	4	4	-	-	-	-	1	-
Total	**82**	**66**	**94**	**14**	**14**	**19**	**4**	**1**	**3**	**71**	**57**	**105**	**-**	**-**	**1**	**2**	**21**	**-**

– Not reported/not calculated

** Include serotypes reported as 'other' and incomplete serotype 1/2 or 4.*

Source: Austria, Belgium, Denmark, Germany, Hungary, Ireland, the Netherlands, Romania, Slovenia; EEA country: Norway

Table B2.6b. Age distribution of *Listeria monocytogenes* PCR serogroups isolated in confirmed cases, EU/EEA countries, 2012

Age groups	IIa		IIb		IIc		IVb	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
< 1 yr	3	1.9	1	2	-	-	5	1.8
1-24 yrs	3	1.9	1	1.6	-	-	7	2.5
25-44 yrs	9	5.6	7	11.1	2	9	40	14.4
45-64 yrs	31	19.4	17	27.0	5	23	64	23.1
65-74 yrs	43	26.9	12	19.0	7	32	47	17.0
75-84 yrs	47	29.4	14	22.2	5	23	82	29.6
≥ 85 yrs	24	15.0	11	17.5	3	14	32	11.6
Total	**160**	**100.0**	**63**	**100.0**	**22**	**100.0**	**277**	**100.0**

– Not reported/not calculated

Source: France, Sweden, United Kingdom

Table B2.7. Hospitalisation ratio of confirmed listeriosis cases by EU/EEA countries, 2010–2012

Country	2010					2011					2012				
	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)
Austria	34	100.0	34	100.0	89.7-100	26	96.2	24	96.0	79.7-99.9	36	100.0	35	97.2	85.5-99.9
Belgium	40	0.0	-	-	-	70	0.0	-	-	-	83	0.0	-	-	-

Country	2010					2011					2012				
	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)
Bulgaria	4	0.0	-	-	-	4	0.0	-	-	-	10	0.0	-	-	-
Cyprus	1	0.0	-	-	-	2	100.0	2	100.0	15.8-100	1	100.0	1	100.0	2.5-100
Czech Republic	26	0.0	-	-	-	35	0.0	-	-	-	32	0.0	-	-	-
Denmark	62	0.0	-	-	-	49	0.0	-	-	-	50	0.0	-	-	-
Estonia	5	100.0	5	100.0	47.8-100	3	100.0	3	100.0	29.2-100	3	100.0	3	100.0	29.2-100
Finland	71	0.0	-	-	-	43	0.0	-	-	-	61	0.0	-	-	-
France	312	100.0	312	100.0	98.8-100	282	100.0	282	100.0	98.7-100	348	100.0	348	100.0	99-100
Germany	377	0.0	-	-	-	330	0.0	-	-	-	412	0.0	-	-	-
Greece	10	100.0	9	90.0	55.5-99.8	10	100.0	10	100.0	69.2-100	11	90.9	9	90.0	55.5-99.8
Hungary	20	100.0	20	100.0	83.2-100	11	100.0	11	100.0	71.5-100	13	100.0	12	92.3	64-99.8
Ireland	10	90.0	6	66.7	29.9-92.5	7	100.0	6	85.7	42.1-99.6	11	100.0	10	90.9	58.7-99.8
Italy*	137	0.0	-	-	-	100	0.0	-	-	-	36	0.0	-	-	-
Latvia	7	100.0	7	100.0	59-100	7	100.0	7	100.0	59-100	6	100.0	6	100.0	54.1-100
Lithuania	5	100.0	5	100.0	47.8-100	6	100.0	5	83.3	35.9-99.6	8	100.0	8	100.0	63.1-100
Luxembourg	0	-	0	-	-	2	100.0	2	100.0	15.8-100	2	0.0	-	-	-
Malta	1	100.0	1	100.0	2.5-100	2	50.0	1	100.0	2.5-100	1	100.0	1	100.0	2.5-100
Netherlands	72	0.0	-	-	-	87	0.0	-	-	-	73	0.0	-	-	-
Poland	59	100.0	59	100.0	93.9-100	62	100.0	51	82.3	70.5-90.8	54	100.0	54	100.0	93.4-100
Portugal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Romania	6	100.0	5	83.3	35.9-99.6	1	100.0	1	100.0	2.5-100	11	100.0	11	100.0	71.5-100
Slovakia	5	0.0	-	-	-	31	0.0	-	-	-	11	0.0	-	-	-
Slovenia	11	100.0	10	90.9	58.7-99.8	5	100.0	5	100.0	47.8-100	7	100.0	6	85.7	42.1-99.6
Spain	129	0.0	-	-	-	91	0.0	-	-	-	107	0.0	-	-	-
Sweden	63	0.0	-	-	-	56	0.0	-	-	-	72	0.0	-	-	-
United Kingdom	176	84.1	139	93.9	88.8-97.2	164	100.0	137	83.5	77-88.9	183	94.0	120	69.8	62.3-76.5
EU total	**1 643**	**38.2**	**612**	**97.6**	**96.1-98.7**	**1 486**	**39.6**	**547**	**93.0**	**90.7-95.0**	**1 642**	**41.5**	**624**	**91.6**	**89.3-93.6**
Iceland	1	0.0	-	-	-	2	50.0	1	100.0	2.5-100	4	0.0	-	-	-
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Norway	22	100.0	22	100.0	84.6-100	21	95.2	20	100.0	83.2-100	30	100.0	30	100.0	88.4-100
EU/EEA total	**1 666**	**39.0**	**634**	**97.7**	**96.2-98.7**	**1 509**	**40.4**	**568**	**93.3**	**91.0-95.1**	**1 676**	**42.4**	**654**	**92.0**	**89.7-93.9**

** Incomplete reporting for 2012*

Table B2.8. Number of deaths and case–fatality ratio (CFR) of confirmed listeriosis cases by EU/EEA countries, 2010–2012

Country	2010					2011					2012				
	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)
Austria	34	100.0	4	11.8	3.3-27.5	26	100.0	2	7.7	1-25.1	36	100.0	1	2.8	0.1-14.5
Belgium	40	0.0	-	-	-	70	0.0	-	-	-	83	0.0	-	-	-
Bulgaria	4	0.0	-	-	-	4	0.0	-	-	-	10	0.0	-	-	-
Cyprus	1	100.0	0	0.0	0-97.5	2	100.0	0	0.0	0-84.2	1	100.0	0	0.0	0-97.5
Czech Republic	26	100.0	5	19.2	6.6-39.4	35	100.0	8	22.9	10.4-40.1	32	100.0	5	15.6	5.3-32.8
Denmark	62	0.0	-	-	-	49	0.0	-	-	-	50	0.0	-	-	-
Estonia	5	100.0	2	40.0	5.3-85.3	3	100.0	0	0.0	0-70.8	3	100.0	1	33.3	0.8-90.6
Finland	71	0.0	-	-	-	43	0.0	-	-	-	61	0.0	-	-	-
France	312	100.0	59	18.9	14.7-23.7	282	100.0	46	16.3	12.2-21.2	348	88.8	63	20.4	16-25.3
Germany	377	100.0	27	7.2	4.8-10.3	330	98.8	23	7.1	4.5-10.4	412	99.0	35	8.6	6.1-11.7
Greece	10	0.0	-	-	-	10	50.0	0	0.0	0-52.2	11	90.9	4	40.0	12.2-73.8
Hungary	20	100.0	10	50.0	27.2-72.8	11	100.0	4	36.4	10.9-69.2	13	100.0	2	15.4	1.9-45.5
Ireland	10	50.0	0	0.0	0-52.2	7	42.9	0	0.0	0-70.8	11	36.4	0	0.0	0-60.2
Italy*	137	0.0	-	-	-	100	0.0	-	-	-	36	0.0	-	-	-
Latvia	7	100.0	3	42.9	9.9-81.6	7	100.0	2	28.6	3.7-71	6	100.0	2	33.3	4.3-77.7
Lithuania	5	80.0	2	50.0	6.8-93.2	6	100.0	0	0.0	0-45.9	8	100.0	2	25.0	3.2-65.1
Luxembourg	0	-	0	-	-	2	0.0	-	-	-	2	0.0	-	-	-
Malta	1	100.0	0	0.0	0-97.5	2	100.0	0	0.0	0-84.2	1	100.0	0	0.0	0-97.5
Netherlands	72	97.2	9	12.9	6.1-23	87	98.9	2	2.3	0.3-8.2	73	94.5	7	10.1	4.2-19.8
Poland	59	86.4	18	35.3	22.4-49.9	62	75.8	12	25.5	13.9-40.4	54	83.3	18	40.0	25.7-55.7
Portugal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Romania	6	100.0	2	33.3	4.3-77.7	1	100.0	0	0.0	0-97.5	11	100.0	6	54.5	23.4-83.3

Country	2010					2011					2012				
	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)
Slovakia	5	100.0	0	0.0	0-52.2	31	93.5	1	3.4	0.1-17.8	11	90.9	4	40.0	12.2-73.8
Slovenia	11	100.0	5	45.5	16.8-76.6	5	100.0	0	0.0	0-52.2	7	100.0	1	14.3	0.4-57.9
Spain	129	0.0	-	-	-	91	0.0	-	-	-	107	0.0	-	-	-
Sweden	63	0.0	-	-	-	56	0.0	-	-	-	72	0.0	-	-	-
United Kingdom	176	72.2	35	27.6	20-36.2	164	84.8	27	19.4	13.2-27	183	76.0	47	33.8	26-42.3
EU total	1 643	64.6	181	17.0	14.8-19.4	1 486	68.3	127	12.5	10.5-14.7	1 642	67.7	198	17.8	15.6-20.2
Iceland	1	0.0	-	-	-	2	50.0	0	0.0	0-97.5	4	0.0	-	-	-
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Norway	22	90.9	2	10.0	1.2-31.7	21	85.7	4	22.2	6.4-47.6	30	76.7	5	21.7	7.5-43.7
EU/EEA total	1 666	64.9	183	16.9	14.7-19.3	1 509	68.5	131	12.7	10.7-14.9	1 676	67.7	203	17.9	15.7-10.2

– Not reported/not calculated

** Incomplete reporting for 2012*

Table B2.9. Number and distribution of confirmed listeriosis cases diagnosed from different specimen type, as reported by EU/EEA countries in 2012

Specimen	Cases	
	Cases	Percentage (%)
Blood	502	70.8
Cerebral spinal fluid	150	21.2
Other sterile site	57	8.0
Total	**709**	**100.0**

Source: Austria, Estonia, France, Hungary, Luxembourg, the Netherlands, Poland, Romania and United Kingdom; EEA country: Norway

Annex C. Non-typhoidal salmonellosis

Table C3.1. Number and proportion of confirmed non-typhoidal salmonellosis cases by origin of infection (domestic/travel-related) as reported by EU/EEA countries, 2010–2012

Country	Confirmed cases reported	Domestic cases		Travel-related cases		Unknown	
		N	%	N	%	N	%
Austria	5 384	2241	41.6	648	12.0	2 495	46.3
Belgium	9 447	-	-	-	-	9 447	100.0
Bulgaria^	2 917	-	-	-	-	2 917	100.0
Cyprus	336	-	-	-	-	336	100.0
Czech Republic	26 953	26 461	98.2	492	1.8	0	0.0
Denmark	3 985	1 622	40.7	1 363	34.2	1 000	25.1
Estonia	1 005	938	93.3	67	6.7	0	0.0
Finland	6 749	1 068	15.8	5 383	79.8	298	4.4
France	24 574	-	-	-	-	24 574	100.0
Germany	69 308	62 809	90.6	5 409	7.8	1 090	1.6
Greece	1 172	1095	93.4	27	2.3	50	4.3
Hungary	17 584	17 561	99.9	23	0.1	0	0.0
Ireland	969	409	42.2	366	37.8	194	20.0
Italy[§]	9 549	-	-	-	-	9 549	100.0
Latvia	2 419	2 392	98.9	27	1.1	0	0.0
Lithuania	6 018	-	-	-	-	6 018	100.0
Luxembourg	472	288	61.0	9	1.9	175	37.1
Malta	377	376	99.7	1	0.3	0	0.0
Netherlands[a]	4 929	4 482	90.9	447	9.1	0	0.0
Poland^	25 609	-	-	-	-	25 609	100.0
Portugal	564	129	22.9	1	0.2	434	77.0
Romania	2 972	212	7.1	0	0.0	2 760	92.9
Slovakia	13 466	13 362	99.2	104	0.8	0	0.0
Slovenia	1 155	-	-	-	-	1 155	100.0
Spain[b]	12 387	12 387	100.0	0	0.0	0	0.0
Sweden	9 421	2 046	21.7	6 907	73.3	468	5.0
United Kingdom~	27 937	6 265	22.4	8 158	29.2	13514	48.4
EU total	**287 658**	**156 143**	**54.3**	**29 432**	**10.2**	**92 826**	**32.3**
Iceland	117	40	34.2	54	46.2	23	19.7
Liechtenstein	-	-	-	-	-	-	-
Norway	4 031	778	19.3	2 678	66.4	575	14.3
EU/EEA total	**291 806**	**156961**	**53.8**	**32 164**	**11.0**	**93 424**	**32.0**

– Not reported/not calculated

^ Aggregated reporting

[§] Incomplete reporting for 2012

[a] Population coverage 64%

[b] Population coverage 25%

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

Table C3.2. Number and notification rates of confirmed domestic non-typhoidal salmonellosis cases by EU/EEA countries, 2010–2012

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	-	-	945	11.2	1 296	15.3
Belgium*	-	-	-	-	-	-
Bulgaria^	-	-	-	-	-	-
Cyprus	-	-	-	-	-	-
Czech Republic	8051	76.6	8 337	79.5	10 073	95.9
Denmark	690	12.5	483	8.7	449	8.0
Estonia	357	26.6	353	26.3	228	17.0

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Finland	326	6.1	335	6.2	407	7.5
France	-	-	-	-	-	-
Germany	21 919	26.9	22 283	27.3	18,607	22.8
Greece	271	2.4	456	4.0	368	3.3
Hungary	5 942	60.3	6 158	62.7	5 461	55.8
Ireland	144	3.2	124	2.7	141	3.1
Italy§	-	-	-	-	-	-
Latvia	877	39.0	985	47.5	530	26.0
Lithuania	-	-	-	-	-	-
Luxembourg	164	32.7	124	24.2	-	-
Malta	160	38.6	128	30.8	88	21.1
Netherlands[a]	1 284	12.1	1 165	10.9	2 033	19.0
Poland^	-	-	-	-	-	-
Portugal	1	0.0	39	0.4	89	0.9
Romania	212	1.0	-	-	-	-
Slovakia	4 897	90.3	3 877	71.9	4 588	84.9
Slovenia	-	-	-	-	-	-
Spain[b]	4 420	38.4	3 786	32.8	4 181	36.2
Sweden	814	8.7	775	8.2	457	4.8
United Kingdom~	2 410	3.9	1 994	3.2	1 861	3.0
EU total**	**52 939**	**19.5**	**52 347**	**20.9**	**50 857**	**20.2**
Iceland	8	2.5	16	5.0	16	5.0
Liechtenstein	-	-	-	-	-	-
Norway	207	4.3	312	6.3	259	5.2
EU/EEA total**	**53 154**	**19.2**	**52 675**	**20.6**	**51 132**	**19.9**

*– Not reported/not calculated*Sentinel surveillance. Population coverage unknown so notification rate not calculated*

^ Aggregated reporting

§ Incomplete reporting for 2012

[a] Population coverage 64%

[b] Population coverage 25%

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

*** For each year shown, notification rates were calculated, with the exception of countries with unknown population coverage. Populations of non- reporting countries have been also excluded. Populations of countries reporting 0 cases have been included.*

Table C3.3. Number and notification rates of confirmed travel-related non-typhoidal salmonellosis cases by EU/EEA countries, 2010–2012

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	60	0.7	246	2.9	342	4.1
Belgium*	-	-	-	-	-	-
Bulgaria^	-	-	-	-	-	-
Cyprus	-	-	-	-	-	-
Czech Republic	158	1.5	162	1.5	172	1.6
Denmark	570	10.3	424	7.6	369	6.6
Estonia	24	1.8	22	1.6	21	1.6
Finland	2 035	38.0	1 668	31.0	1680	31.1
France	-	-	-	-	-	-
Germany	1 824	2.2	1 699	2.1	1 886	2.3
Greece	5	0.0	6	0.1	16	0.1
Hungary	11	0.1	11	0.1	1	0.0
Ireland	126	2.8	117	2.6	123	2.7
Italy§	-	-	-	-	-	-
Latvia	0	0.0	10	0.5	17	0.8
Lithuania	-	-	-	-	-	-
Luxembourg	8	1.6	1	0.2	-	-
Malta	0	0.0	1	0.2	0	0.0

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Netherlands[a]	163	1.5	119	1.1	165	1.5
Poland^	-	-	-	-	-	-
Portugal	0	0.0	1	0.0	0	0.0
Romania	0	0.0	-	-	-	-
Slovakia	45	0.8	20	0.4	39	0.7
Slovenia	-	-	-	-	-	-
Spain[b]	0	0.0	0	0.0	0	0.0
Sweden	2 665	28.5	2 040	21.7	2 202	23.2
United Kingdom~	3 114	5.1	2 590	4.2	2 454	3.9
EU total**	**10 808**	**4.0**	**9137**	**3.6**	**9 487**	**3.8**
Iceland	17	5.4	24	7.5	13	4.1
Liechtenstein	-	-	-	-	-	-
Norway	897	18.5	807	16.4	974	19.5
EU/EEA total**	**11 722**	**4.2**	**9 968**	**3.9**	**10 474**	**4.1**

– Not reported/not calculated

**Sentinel surveillance. Population coverage unknown so notification rate not calculated*

^ Aggregated reporting

[§] Incomplete reporting for 2012

[a] Population coverage 64%

[b] Population coverage 25%

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

*** For each year shown, notification rates were calculated, with the exception of countries with unknown population coverage. Populations of non- reporting countries have been also excluded. Populations of countries reporting 0 cases have been included.*

Table C3.4. Number and notification rates (per 100 000 population) of confirmed non-typhoidal salmonellosis cases by age groups and sex in EU/EEA countries, 2010–2012

Sex	Age group	2010		2011		2012		2010–2012	
		Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Male	< 1 yr	2 004	79.5	2 007	81.9	2 046	82.8	6 057	81.4
	1–4 yrs	9 215	92.2	8 249	84.1	8 565	84.6	26 029	87.0
	5–14 yrs	7 754	31.5	7 370	30.7	7 459	30.2	22 583	30.8
	15–24 yrs	4 584	16.4	4 338	16.0	4 297	15.7	13 219	16.0
	25–44 yrs	7 176	10.9	6 655	10.4	6 379	9.9	20 210	10.4
	45–64 yrs	6 972	11.7	6 429	10.9	6 656	10.9	20 057	11.1
	≥ 65 yrs	5 092	14.8	4 755	14.0	5 001	14.0	14 848	14.3
	Total	**42 797**	**19.0**	**39 803**	**18.1**	**40 403**	**17.8**	**123 003**	**18.3**
Female	< 1 yr	1 779	74.3	1 818	78.1	1 844	78.5	5 441	76.9
	1–4 yrs	8 680	91.4	7 776	83.5	7 819	81.2	24 275	85.4
	5–14 yrs	6 670	28.5	6 220	27.2	6 183	26.3	19 073	27.4
	15–24 yrs	4 696	17.5	4 426	17.1	4 458	17.0	13 580	17.2
	25–44 yrs	7 375	11.4	6 861	11.0	6 849	10.8	21 085	11.0
	45–64 yrs	7 919	12.9	7 346	12.0	7 365	11.7	22 630	12.2
	≥ 65 yrs	6 455	13.7	6 134	13.2	6 464	13.4	19 053	13.5
	Total	**43 574**	**18.5**	**40 581**	**17.6**	**40 982**	**17.3**	**125 137**	**17.8**

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Table C3.5. Number and distribution of the 20 most common* serotypes isolate from confirmed non-typhoidal salmonellosis cases as reported in 2010, 2011 and 2012 by EU/EEA countries

Serotype	2010		2011		2012		Total 2010–2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
ENTERITIDIS	37 023	44.3	34 798	44.3	33 030	41.1	104 851	43.2
TYPHIMURIUM	21 321	25.5	19 401	24.7	17 938	22.3	58 660	24.2
MONOPHASIC *S.* TYPHIMURIUM 1.4.[5].12:i:-	1 410	1.7	3 666	4.7	5 836	7.3	10 912	4.5

Serotype	2010		2011		2012		Total 2010–2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
INFANTIS	1 799	2.2	1 691	2.2	1 935	2.4	5 425	2.2
THOMPSON	195	0.2	223	0.3	1 075	1.3	1 493	0.6
STANLEY	418	0.5	445	0.6	971	1.2	1 834	0.8
NEWPORT	869	1.0	787	1.0	754	0.9	2 410	1.0
DERBY	669	0.8	705	0.9	732	0.9	2 106	0.9
PANAMA	308	0.4	256	0.3	697	0.9	1 261	0.5
KENTUCKY	800	1.0	565	0.7	626	0.8	1 991	0.8
VIRCHOW	711	0.9	482	0.6	532	0.7	1 725	0.7
AGONA	466	0.6	463	0.6	454	0.6	1 383	0.6
BRAENDERUP	392	0.5	281	0.4	454	0.6	1 127	0.5
BOVISMORBIFICANS	411	0.5	386	0.5	410	0.5	1 207	0.5
SAINTPAUL	418	0.5	361	0.5	357	0.4	1 136	0.5
JAVA	376	0.4	245	0.3	316	0.4	937	0.4
ORANIENBURG	279	0.3	363	0.5	311	0.4	953	0.4
HADAR	366	0.4	277	0.4	301	0.4	944	0.4
POONA	247	0.3	555	0.7	294	0.4	1 096	0.5
MONTEVIDEO	286	0.3	367	0.5	290	0.4	943	0.4
Other	14 863	17.8	12 231	15.6	12 968	16.2	40 062	16.5
Total known	**83 627**	**100.0**	**78 548**	**100.0**	**80 281**	**100.0**	**242 456**	**100.0**
Unknown	16 200	16.2	17 429	18.2	15 006	15.7	48 635	16.7
Total	**99 827**		**95 977**		**95 287**		**291 091**	

** Based on serotype data on confirmed non-typhoidal* Salmonella *cases reported in 2012.*

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Table C3.6. Number and proportion of the 20 most common* non-typhoidal *Salmonella* serotypes by origin of infection as reported by EU/EEA countries, 2010–2012

Serotype	Confirmed cases with known serotype	Domestic cases	Travel-related cases		Origin unknown
			Travel to EU/EEA countries	Travel to non-EU/EEA countries	
MONOPHASIC *S.* TYPHIMURIUM 1.4.[5].12:i:-	10 912	2 991	37	72	7 812
MONTEVIDEO	943	341	23	102	477
PANAMA	1 261	521	7	66	667
DERBY	2 106	965	18	42	1 081
KENTUCKY	1 991	499	28	510	954
HADAR	944	265	18	206	455
JAVA	937	289	37	188	423
ORANIENBURG	953	313	20	207	413
NEWPORT	2 410	845	117	392	1 056
SAINTPAUL	1 136	388	13	219	516
POONA	1 096	540	13	70	473
VIRCHOW	1 725	502	37	554	632
BRAENDERUP	1 127	396	17	306	408
AGONA	1 383	566	23	279	515
BOVISMORBIFICANS	1 207	697	19	73	418
TYPHIMURIUM	58 660	35 694	724	1 743	20 499
STANLEY	1 834	707	19	644	464
INFANTIS	5 425	3 509	116	391	1 409
ENTERITIDIS	104 851	76 380	2 654	6 641	19 176
THOMPSON	1 493	1 119	47	59	268

** Based on serotype data on confirmed non-typhoidal* Salmonella *cases reported in 2012.*

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Table C3.7. Number and distribution of the 20 most common* serotypes isolate from confirmed domestic non-typhoidal salmonellosis cases as reported between 2010 and 2012 by EU/EEA countries

Serotype	2010		2011		2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
ENTERITIDIS	26 273	51.3	25 892	52.5	24 215	51.0
TYPHIMURIUM	13 367	26.1	11 907	24.1	10 420	21.9
MONOPHASIC *S.* TYPHIMURIUM 1.4.[5].12:i:-	238	0.5	1 203	2.4	1 550	3.3
INFANTIS	1 200	2.3	1 107	2.2	1 202	2.5
THOMPSON	84	0.2	114	0.2	921	1.9
STANLEY	90	0.2	112	0.2	505	1.1
PANAMA	86	0.2	36	0.1	399	0.8
DERBY	285	0.6	356	0.7	324	0.7
BOVISMORBIFICANS	251	0.5	204	0.4	242	0.5
NEWPORT	249	0.5	359	0.7	237	0.5
BRAENDERUP	120	0.2	79	0.2	197	0.4
AGONA	191	0.4	186	0.4	189	0.4
VIRCHOW	187	0.4	155	0.3	160	0.3
KENTUCKY	201	0.4	144	0.3	154	0.3
SAINTPAUL	133	0.3	112	0.2	143	0.3
JAVA	122	0.2	80	0.2	87	0.2
MONTEVIDEO	117	0.2	137	0.3	87	0.2
POONA	110	0.2	355	0.7	75	0.2
ORANIENBURG	101	0.2	146	0.3	66	0.1
HADAR	115	0.2	90	0.2	60	0.1
Other	7 727	15.1	6 587	13.3	6 286	13.2
Total	**51 247**	**100.0**	**49 361**	**100.0**	**47 519**	**100.0**

** Based on serotype data on confirmed non-typhoidal* Salmonella *cases reported in 2012.*

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Table C3.8. Number and distribution of the 20 most common* serotypes isolate from confirmed travel-related non-typhoidal salmonellosis cases as reported between 2010 and 2012 by EU/EEA countries

Serotype	Travel to EU/EEA countries						Travel to non-EU/EEA countries						Total travel-related					
	2010		2011		2012		2010		2011		2012		2010		2011		2012	
	Cases	Per-cent-age (%)	Cases	Per-cent-age (%)	Cases	Per-cent-age (%)	Cases	Per-cent-age (%)	Cases	Per-cent-age (%)	Cases	Per-cent-age (%)	Cases	Per-cent-age (%)	Cases	Per-cent-age (%)	Cases	Per-cent-age (%)
ENTERITIDIS	944	57.1	835	55.8	875	51.4	2 470	38.1	2 053	38.5	2 118	35.7	3414	42.0	2 888	42.3	2 993	39.2
TYPHI-MURIUM	213	12.9	255	17.0	256	15.0	585	9.0	508	9.5	650	11.0	798	9.8	763	11.2	906	11.9
NEWPORT	43	2.6	24	1.6	50	2.9	155	2.4	102	1.9	135	2.3	198	2.4	126	1.8	185	2.4
INFANTIS	40	2.4	27	1.8	49	2.9	126	1.9	123	2.3	142	2.4	166	2.0	150	2.2	191	2.5
MONOPHASIC *S.* TYPHI-MURIUM 1.4.[5].12:i:-	8	0.5	6	0.4	23	1.4	8	0.1	16	0.3	48	0.8	16	0.2	22	0.3	71	0.9
THOMPSON	14	0.8	13	0.9	20	1.2	13	0.2	14	0.3	32	0.5	27	0.3	27	0.4	52	0.7
JAVA	10	0.6	10	0.7	17	1.0	63	1.0	50	0.9	75	1.3	73	0.9	60	0.9	92	1.2
STANLEY	3	0.2	1	0.1	15	0.9	219	3.4	191	3.6	234	3.9	222	2.7	192	2.8	249	3.3
BOVISMOR-BIFICANS	6	0.4	2	0.1	11	0.6	21	0.3	24	0.4	28	0.5	27	0.3	26	0.4	39	0.5
MONTE-VIDEO	5	0.3	8	0.5	10	0.6	33	0.5	37	0.7	32	0.5	38	0.5	45	0.7	42	0.6
BRAENDERUP	6	0.4	2	0.1	9	0.5	123	1.9	83	1.6	100	1.7	129	1.6	85	1.2	109	1.4
KENTUCKY	10	0.6	9	0.6	9	0.5	228	3.5	141	2.6	141	2.4	238	2.9	150	2.2	150	2.0
DERBY	9	0.5	1	0.1	8	0.5	14	0.2	13	0.2	15	0.3	23	0.3	14	0.2	23	0.3
HADAR	6	0.4	5	0.3	7	0.4	87	1.3	55	1.0	64	1.1	93	1.1	60	0.9	71	0.9
AGONA	6	0.4	10	0.7	7	0.4	88	1.4	103	1.9	88	1.5	94	1.2	113	1.7	95	1.2
POONA	5	0.3	3	0.2	5	0.3	22	0.3	23	0.4	25	0.4	27	0.3	26	0.4	30	0.4

Serotype	Travel to EU/EEA countries						Travel to non-EU/EEA countries						Total travel-related					
	2010		2011		2012		2010		2011		2012		2010		2011		2012	
	Cases	Per-cent-age (%)	Cases	Per-cent-age (%)	Cases	Per-cent-age (%)	Cases	Per-cent-age (%)	Cases	Per-cent-age (%)	Cases	Per-cent-age (%)	Cases	Per-cent-age (%)	Cases	Per-cent-age (%)	Cases	Per-cent-age (%)
ORANIEN-BURG	3	0.2	13	0.9	4	0.2	59	0.9	82	1.5	66	1.1	62	0.8	95	1.4	70	0.9
PANAMA	2	0.1	2	0.1	3	0.2	15	0.2	24	0.4	27	0.5	17	0.2	26	0.4	30	0.4
VIRCHOW	22	1.3	12	0.8	3	0.2	238	3.7	144	2.7	172	2.9	260	3.2	156	2.3	175	2.3
SAINTPAUL	2	0.1	8	0.5	3	0.2	88	1.4	59	1.1	72	1.2	90	1.1	67	1.0	75	1.0
Other	295	17.9	251	16.8	318	18.7	1 822	28.1	1 491	27.9	1 669	28.1	2117	26.0	1 742	25.5	1 987	26.0
Total	**1 652**	**100.0**	**1 497**	**100.0**	**1 702**	**100.0**	**6 477**	**100.0**	**5 336**	**100.0**	**5 933**	**100.0**	**8129**	100.0	**6 833**	100.0	**7 635**	100.0

** Based on serotype data on confirmed non-typhoidal* Salmonella *cases reported in 2012.*

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Table C3.9. Number of isolates in confirmed non-typhoidal salmonellosis cases by serotype and age groups, EU/EEA countries, 2010–2012

Age groups	*S.* Enteritidis			*S.* Typhimurium			*S.* Monophasic Typhimurium			*S.* Infantis			*S.* Stanley			*S.* Thompson		
	2010	2011	2012	2010	2011	2012	2010	2011	2012	2010	2011	2012	2010	2011	2012	2010	2011	2012
< 1 yr	1 241	1 131	1 210	801	601	725	64	182	237	203	199	190	8	12	38	8	21	22
1–4 yrs	8 111	7 369	7 307	5 315	3 824	4 292	418	1 164	1 741	256	221	221	45	49	172	23	26	74
5–14 yrs	7 231	6 827	6 545	4 170	3 324	3 506	373	885	1 380	129	119	137	48	56	132	20	25	107
15–24 yrs	3 560	3 436	3 264	2 268	2 003	1 889	112	328	381	208	176	205	67	77	142	20	16	171
25–44 yrs	6 107	5 710	5 239	2 629	2 359	2 273	136	311	485	334	283	375	119	121	231	56	51	188
45–64 yrs	6 260	5 673	5 405	2 750	2 534	2 433	136	362	588	349	313	404	100	89	167	39	40	255
≥ 65 yrs	4 368	4 087	3 966	2 992	2 517	2 525	165	425	765	306	324	386	30	21	86	28	32	255
Total	**36 878**	**34 233**	**32 936**	**20 925**	**17 162**	**17 643**	**1 404**	**3 657**	**5 577**	**1 785**	**1 635**	**1 918**	**417**	**425**	**968**	**194**	**211**	**1 072**

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Table C3.10. Number of hospitalisation in confirmed non-typhoidal salmonellosis cases by EU/EEA countries, 2010–2012

Country	2010					2011					2012				
	Cases	Cases covered (%)	Hospital-isation (N)	Hospital-isation ratio (%)	95% CI (%)	Cases	Cases covered (%)	Hospital-isation (N)	Hospital-isation ratio (%)	95% CI (%)	Cases	Cases covered (%)	Hospital-isation	Hospital-isation ratio (%)	95% CI (%)
Austria	2 179	0.0	-	-	-	1 432	97.5	659	47.2	44.6-49.9	1 773	94.8	706	42.0	39.7-44.4
Belgium	3 169	0.0	-	-	-	3 177	0.0	-	-	-	3 101	0.0	-	-	-
Bulgaria	1 154	0.0	-	-	-	924	0.0	-	-	-	839	0.0	-	-	-
Cyprus	136	0.0	-	-	-	110	0.0	-	-	-	90	85.6	66	85.7	75.9-92.7
Czech Republic	8 209	0.0	-	-	-	8 499	0.0	-	-	-	10 245	0.0	-	-	-
Denmark	1 608	0.0	-	-	-	1 170	0.0	-	-	-	1 207	0.0	-	-	-
Estonia	381	99.2	155	41.0	36-46.2	375	100.0	147	39.2	34.2-44.3	249	100.0	124	49.8	43.4-56.2
Finland	2 437	0.0	-	-	-	2 108	0.0	-	-	-	2 204	0.0	-	-	-
France	7 184	0.0	-	-	-	8 685	0.0	-	-	-	8 705	0.0	-	-	-
Germany	24 833	0.0	-	-	-	23 982	0.0	-	-	-	20 493	0.0	-	-	-
Greece	297	99.7	264	89.2	85.1-92.5	471	100.0	422	89.6	86.5-92.2	404	99.0	365	91.3	88-93.8
Hungary	5 953	100.0	2 168	36.4	35.2-37.7	6 169	100.0	2 244	36.4	35.2-37.6	5 462	100.0	2 018	36.9	35.7-38.2
Ireland	349	83.4	122	41.9	36.2-47.8	311	84.9	99	37.5	31.6-43.6	309	84.8	100	38.2	32.3-44.4
Italy	4 752	0.0	-	-	-	3 344	0.0	-	-	-	1 453	0.0	-	-	-
Latvia	877	0.0	-	-	-	995	0.0	-	-	-	547	0.0	-	-	-
Lithuania	1 962	0.0	-	-	-	2 294	0.0	-	-	-	1 762	0.0	-	-	-
Luxembourg	211	0.0	-	-	-	125	0.0	-	-	-	136	0.0	-	-	-
Malta	160	0.0	-	-	-	129	38.8	17	34.0	21.2-48.8	88	70.5	16	25.8	15.5-38.5
Netherlands	1 447	0.0	-	-	-	1 284	0.0	-	-	-	2 198	0.0	-	-	-
Poland	9 257	0.0	-	-	-	8 400	0.0	-	-	-	7 952	0.0	-	-	-
Portugal	205	92.2	162	85.7	79.9-90.4	174	99.4	148	85.5	79.4-90.4	185	99.5	134	72.8	65.8-79.1
Romania	1 285	8.9	102	89.5	82.3-94.4	989	92.4	784	85.8	83.3-88	698	94.0	563	85.8	82.9-88.4

Country	2010					2011					2012				
	Cases	Cases covered (%)	Hospital-isation (N)	Hospital-isation ratio (%)	95% CI (%)	Cases	Cases covered (%)	Hospital-isation (N)	Hospital-isation ratio (%)	95% CI (%)	Cases	Cases covered (%)	Hospital-isation	Hospital-isation ratio (%)	95% CI (%)
Slovakia	4 942	0.0	-	-	-	3 897	0.0	-	-	-	4 627	0.0	-	-	-
Slovenia	363	0.0	-	-	-	400	0.0	-	-	-	392	0.0	-	-	-
Spain	4 420	0.0	-	-	-	3 786	0.0	-	-	-	4 181	0.0	-	-	-
Sweden	3 612	0.0	-	-	-	2 887	0.0	-	-	-	2 922	0.0	-	-	-
United Kingdom	9 670	1.8	50	29.1	22.4-36.5	9 455	1.7	38	23.5	17.2-30.8	8 812	1.6	42	29.8	22.4-38.1
EU total	101 052	7.3	3 023	40.9	39.8-42.0	95 572	10	4 558	45.7	44.7-46.7	91 034	10	4 134	45.1	44.1-46.1
Iceland	34	0.0	-	-	-	45	0	-	-	-	38	0	-	-	-
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Norway	1 370	96.3	296	22.4	20.2-24.8	1 290	97	335	26.7	24.2-29.2	1 371	98	340	25.3	23-27.7
EU/EEA total	102 456	8.5	3 319	38.1	37.1-39.1	96 907	12	4 893	43.6	42.6-44.5	92 443	11	4 474	42.5	41.6-43.5

– Not reported/not calculated

Table C3.11. Number of deaths and case–fatality ratio (CFR) in confirmed non-typhoidal salmonellosis cases, EU/EEA countries, 2010–2012

Country	2010					2011					2012				
	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths	CFR (%)	95% CI (%)
Austria	2 179	0.0	-	-	-	1 432	100.0	2	0.14	0.02-0.5	1 773	100.0	1	0.06	0-0.31
Belgium	3 169	0.0	-	-	-	3 177	0.0	-	-	-	3 101	0.0	-	-	-
Bulgaria	1 154	0.0	-	-	-	924	0.0	-	-	-	839	0.0	-	-	-
Cyprus	136	99.3	1	0.74	0.02-4.06	110	100.0	2	1.82	0.22-6.41	90	100.0	0	0.00	0.00-4.02
Czech Republic	8 209	100.0	10	0.12	0.06-0.22	8 499	100.0	12	0.14	0.07-0.25	10 245	100.0	16	0.16	0.09-0.25
Denmark	1 608	0.0	-	-	-	1 170	0.0	-	-	-	1 207	0.0	-	-	-
Estonia	381	100.0	3	0.79	0.16-2.28	375	100.0	1	0.27	0.01-1.48	249	100.0	0	0.00	0.00-1.47
Finland	2 437	0.0	-	-	-	2 108	0.0	-	-	-	2 204	0.0	-	-	-
France	7 184	0.0	-	-	-	8 685	0.0	-	-	-	8 705	0.0	-	-	-
Germany	24 833	99.4	26	0.11	0.07-0.15	23 982	99.3	24	0.10	0.06-0.15	20 493	99.7	27	0.13	0.09-0.19
Greece	297	100.0	3	1.01	0.21-2.92	471	100.0	0	0.00	0.00-0.78	404	92.6	3	0.80	0.17-2.33
Hungary	5 953	99.4	9	0.15	0.07-0.29	6 169	100.0	3	0.05	0.01-0.14	5 462	100.0	5	0.09	0.03-0.21
Ireland	349	37.5	0	0.00	0.00-2.78	311	41.2	1	0.78	0.02-4.28	309	40.1	0	0.00	0.00-2.93
Italy	4 752	0.0	-	-	-	3 344	0.0	-	-	-	1 453	0.0	-	-	-
Latvia	877	100.0	0	0.00	0.00-0.42	995	100.0	3	0.30	0.03-0.79	547	100.0	1	0.2	0.02-0.67
Lithuania	1 962	0.0	-	-	-	2 294	0.0	-	-	-	1 762	0.0	-	-	-
Luxembourg	211	0.0	-	-	-	125	0.0	-	-	-	136	0.0	-	-	-
Malta	160	100.0	0	0.00	0.00-2.28	129	100.0	0	0.00	0.00-2.82	88	100.0	1	1.14	0.03-6.17
Netherlands	1 447	0.0	-	-	-	1 284	0.0	-	-	-	2 198	0.0	-	-	-
Poland	9 257	0.0	-	-	-	8 400	0.0	-	-	-	7 952	0.0	-	-	-
Portugal	205	85.9	0	0.00	0.00-2.07	174	89.7	1	0.64	0.02-3.52	185	94.6	2	1.14	0.14-4.07
Romania	1 285	93.1	2	0.17	0.02-0.60	989	88.5	0	0.00	0.00-0.42	698	96.8	0	0.00	0.00-0.54
Slovakia	4 942	91.9	2	0.04	0.01-0.16	3 897	93.8	1	0.03	0.00-0.15	4 627	92.5	0	0.00	0.00-0.09
Slovenia	363	0.0	-	-	-	400	0.0	-	-	-	392	0.0	-	-	-
Spain	4 420	0.0	-	-	-	3 786	0.0	-	-	-	4 181	0.0	-	-	-
Sweden	3 612	0.0	-	-	-	2 887	0.0	-	-	-	2 922	0.0	-	-	-
United Kingdom	9 670	0.1	6	100.00	54.1-100	9 455	0.1	7	100.00	59.04-100	8 812	0.1	6	100.00	54.1-100
EU total	101 052	46.2	62	0.13	0.10-0.17	95 572	49.0	57	0.12	0.09-0.15	91 034	48.9	62	0.14	0.10-0.18
Iceland	34	0.0	-	-	-	45	0.0	-	-	-	38	0.0	-	-	-
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Norway	1 370	63.2	0	0.00	0.00-0.43	1 290	71.1	3	0.33	0.07-0.95	1371	62.0	0	0.00	0.00-0.43
EU/EEA total	102 456	46.4	62	0.13	0.10-0.17	96 907	49.2	60	0.12	0.09-0.16	92 443	49.1	62	0.13	0.10-0.17

– Not reported/not calculated

Table C3.12. Number and distribution of confirmed non-typhoidal salmonellosis cases diagnosed from different specimen type as reported by EU/EEA countries in 2010–2012 (N=146 744)

Specimen	2010		2011		2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
Faeces	49 819	96.5	41 378	95.9	50 020	96.2
Blood	982	1.9	962	2.2	983	1.9
Urine	522	1.0	534	1.2	661	1.3

Specimen	2010		2011		2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
Pus	23	0.0	20	0.0	28	0.1
Cerebrospinal fluid	5	0.0	5	0.0	8	0.0
Other	266	0.5	255	0.6	273	0.5
Total	**51 617**	**100.0**	**43 154**	**100.0**	**51 973**	**100.0**

Source: Austria, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, United Kingdom; EEA country: Norway

Annex D. Shigellosis

Table D4.1. Number and proportion of confirmed shigellosis cases by origin of infection (domestic/travel-related) as reported by EU/EEA countries, 2010–2012

Country	Confirmed cases reported	Domestic cases		Travel-related cases		Unknown	
		N	%	N	%	N	%
Austria	191	45	23.6	107	56.0	39	20.4
Belgium	999	0	0.0	0	0.0	999	100.0
Bulgaria^	2 171	0	0.0	0	0.0	2 171	100.0
Cyprus	2	2	100.0	0	0.0	0	0.0
Czech Republic	810	0	0.0	0	0.0	810	100.0
Denmark	287	44	15.3	165	57.5	78	27.2
Estonia	102	58	56.9	44	43.1	0	0.0
Finland	376	22	5.9	349	92.8	5	1.3
France [a]	2 101	43	2.0	397	18.9	1 661	79.1
Germany	1 879	891	47.4	970	51.6	18	1.0
Greece	169	158	93.5	3	1.8	8	4.7
Hungary	138	130	94.2	8	5.8	0	0.0
Ireland	131	38	29.0	66	50.4	27	20.6
Italy	30	1	3.3	8	26.7	21	70.0
Latvia	24	16	66.7	8	33.3	0	0.0
Lithuania	134	89	66.4	35	26.1	10	7.5
Luxembourg	43	1	2.3	1	2.3	41	95.3
Malta	6	4	66.7	2	33.3	0	0.0
Netherlands	1 747	467	26.7	1 249	71.5	31	1.8
Poland	55	30	54.5	11	20.0	20	36.4
Portugal	19	5	26.3	1	5.3	13	68.4
Romania	1 018	0	0.0	0	0.0	1 018	100.0
Slovakia	1 355	443	32.7	6	0.4	906	66.9
Slovenia	74	6	8.1	17	23.0	51	68.9
Spain	421	0	0.0	0	0.0	421	100.0
Sweden	1339	201	15.0	1 133	84.6	5	0.4
United Kingdom	5 972	951	15.9	1 799	30.1	3 222	54.0
EU total	**21 593**	**3 645**	**16.9**	**6 379**	**29.5**	**11 575**	**53.6**
Iceland	4	0	0.0	2	50.0	2	50.0
Liechtenstein	–	–	–	–	–	–	–
Norway	372	99	26.6	244	65.6	29	7.8
EU/EEA total	**21 969**	**3 744**	**17.0**	**6625**	**30.2**	**11 606**	**52.8**

– Not reported/not calculated

^ Aggregated reporting

[a] Population coverage 44%

Table D4.2. Number and notification rates of confirmed domestically acquired shigellosis cases by EU/EEA countries, 2010–2012

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	14	0.2	12	0.1	19	0.2
Belgium*	–	–	–	–	–	–
Bulgaria^	–	–	–	–	–	–
Cyprus	0	0.0	2	0.2	0	0.0
Czech Republic	–	–	–	–	–	–
Denmark	13	0.2	31	0.6	0	0.0
Estonia	28	2.1	9	0.7	21	1.6
Finland	12	0.2	7	0.1	3	0.1
France [a]	0	0.0	37	0.1	6	0.0
Germany	337	0.4	329	0.4	225	0.3
Greece	32	0.3	46	0.4	80	0.7
Hungary	61	0.6	37	0.4	32	0.3
Ireland	20	0.4	10	0.2	8	0.2

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Italy*	–	–	–	–	1	–
Latvia	4	0.2	10	0.5	2	0.1
Lithuania	27	0.8	31	1.0	31	1.0
Luxembourg	1	0.2	0	0.0	0	0.0
Malta	2	0.5	2	0.5	0	0.0
Netherlands	147	0.9	162	1.0	158	0.9
Poland	10	0.0	12	0.0	8	0.0
Portugal	0	0.0	0	0.0	5	0.0
Romania	–	–	–	–	–	–
Slovakia	0	0.0	0	0.0	443	8.2
Slovenia	5	0.2	0	0.0	1	0.0
Spain	–	–	–	–	–	–
Sweden	83	0.9	85	0.9	33	0.3
United Kingdom~	273	0.4	313	0.5	365	0.6
EU total**	**1 069**	**0.3**	**1 135**	**0.3**	**1 441**	**0.3**
Iceland	0	0.0	0	0.0	0	0.0
Liechtenstein	–	–	–	–	–	–
Norway	22	0.5	66	1.3	11	0.2
EU/EEA total**	**1 091**	**0.3**	**1 201**	**0.3**	**1 452**	**0.3**

– Not reported/not calculated

**Sentinel surveillance. Population coverage unknown so notification rate not calculated*

^ Aggregated reporting

[a] Population coverage 44%

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

*** For each year shown, notification rates were calculated, with the exception of countries with unknown population coverage. Also excluded were populations of countries which did not report data. Populations of countries which reported 0 cases were included.*

Table D4.3. Number and notification rates of confirmed travel-related shigellosis cases by EU/EEA countries, 2010–2012

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	51	0.6	21	0.2	35	0.4
Belgium*	–	–	–	–	–	–
Bulgaria^	–	–	–	–	–	–
Cyprus	0	0.0	0	0.0	0	0.0
Czech Republic	–	–	–	–	–	–
Denmark	76	1.4	60	1.1	29	0.5
Estonia	18	1.3	13	1.0	13	1.0
Finland	147	2.7	119	2.2	83	1.5
France [a]	0	0.0	199	0.3	198	0.3
Germany	342	0.4	335	0.4	293	0.4
Greece	0	0.0	1	0.0	2	0.0
Hungary	2	0.0	6	0.1	0	0.0
Ireland	26	0.6	25	0.5	15	0.3
Italy*	–	–	–	–	8	–
Latvia	7	0.3	0	0.0	1	0.0
Lithuania	15	0.5	9	0.3	11	0.4
Luxembourg	1	0.2	0	0.0	0	0.0
Malta	0	0.0	2	0.5	0	0.0
Netherlands	367	2.2	380	2.3	502	3.0
Poland	0	0.0	6	0.0	5	0.0
Portugal	0	0.0	0	0.0	1	0.0
Romania	–	–	–	–	–	–
Slovakia	0	0.0	0	0.0	6	0.1
Slovenia	9	0.4	3	0.1	5	0.2
Spain	–	–	–	–	–	–

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Sweden	473	5.1	367	3.9	293	3.1
United Kingdom~	892	1.4	368	0.6	539	0.9
EU total**	**2 426**	**0.6**	**1 914**	**0.5**	**2 039**	**0.5**
Iceland	0	0.0	1	0.3	1	0.3
Liechtenstein	–	–	–	–	–	–
Norway	97	2.0	86	1.7	61	1.2
EU/EEA total**	**2 523**	**0.6**	**2 001**	**0.5**	**2101**	**0.5**

– Not reported/not calculated

** Sentinel surveillance. Population coverage unknown so notification rate not calculated*

^ Aggregated reporting

[a] Population coverage 44%

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

*** For each year shown, notification rates were calculated, with the exception of countries with unknown population coverage. Also excluded were populations of countries which did not report data. Populations of countries which reported 0 cases were included.*

Table D4.4. Notification rates of confirmed shigellosis cases by age groups and sex in EU/EEA countries, 2010–2012

Sex	Age group	2010		2011		2012		2010–2012	
		Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Male	< 1 yr	60	2.7	81	3.3	86	3.2	227	3.1
	1–4 yrs	316	3.6	368	3.8	412	3.8	1 096	3.7
	5–14 yrs	432	2.0	416	1.8	390	1.5	1 238	1.7
	15–24 yrs	338	1.4	277	1.0	293	1.0	908	1.1
	25–44 yrs	1 255	2.2	1 244	2.0	1 239	1.8	3 738	2.0
	45–64 yrs	680	1.3	742	1.3	698	1.1	2 120	1.2
	≥ 65 yrs	193	0.7	193	0.6	200	0.5	586	0.6
	Total	**3 274**	**1.7**	**3 321**	**1.5**	**3 318**	**1.4**	**9 913**	**1.5**
Female	< 1 yr	48	2.3	77	3.3	87	3.4	212	3.0
	1–4 yrs	317	3.8	333	3.6	400	3.8	1 050	3.7
	5–14 yrs	388	1.9	385	1.7	456	1.8	1 229	1.8
	15–24 yrs	498	2.1	411	1.6	384	1.3	1 293	1.6
	25–44 yrs	1 126	2.0	1 007	1.6	941	1.4	3 074	1.7
	45–64 yrs	682	1.3	638	1.1	623	0.9	1 943	1.1
	≥ 65 yrs	215	0.5	202	0.5	224	0.4	641	0.5
	Total	**3 274**	**1.6**	**3 053**	**1.4**	**3 115**	**1.2**	**9 442**	**1.4**

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Table D4.5. Number of reported *Shigella* isolates by species and age groups, EU/EEA countries, 2010–2012

Age groups	*S.* flexneri			*S.* sonnei			*S.* boydii			*S.* dysenteriae			Shigella spp		
	2010	2011	2012	2010	2011	2012	2010	2011	2012	2010	2011	2012	2010	2011	2012
< 1 yr	17	36	111	21	15	38	2	1	3	1	0	3	2	5	10
1–4 yrs	211	169	301	211	246	308	17	14	17	9	11	14	17	33	29
5–14 yrs	227	186	215	330	324	375	24	15	14	19	6	20	23	45	44
15–24 yrs	243	164	196	383	314	340	38	28	26	23	13	13	32	20	23
25–44 yrs	648	498	647	1307	1039	1131	96	76	81	61	52	35	57	75	70
45–64 yrs	348	304	403	782	653	643	68	47	52	30	28	32	35	48	44
≥ 65 yrs	124	87	141	191	175	180	24	19	34	16	7	15	20	27	22
Total	**1 818**	**1 444**	**2 014**	**3 225**	**2 766**	**3 015**	**269**	**200**	**227**	**159**	**117**	**132**	**186**	**253**	**242**

Source: Austria, Belgium, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Sweden, United Kingdom; EEA countries: Iceland and Norway

Table D4.6. Number and proportion of reported *Shigella flexneri* serotypes by origin of infection as reported by EU/EEA countries, 2010–2012

Serotype	Confirmed cases with known serotype	Domestic cases	Travel-related cases		Origin unknown/missing
			Travel to EU/EEA countries	Travel to non-EU/EEA countries	
2a	890	14.9	0.9	27.5	56.6
3a	582	18.6	3.6	20.6	57.2
6	471	13.0	0.0	40.6	46.5
1b	418	9.3	1.4	33.3	56.0
2b	162	11.1	0.0	48.8	40.1
2	115	26.1	1.7	24.3	47.8
3b	60	25.0	0.0	6.7	68.3
X	34	23.5	0.0	17.6	58.8
Y	33	12.1	0.0	30.3	57.6
4	74	5.4	0.0	24.3	70.3
4a	36	5.6	0.0	77.8	16.7
1	54	18.5	0.0	25.9	55.6
3	46	10.9	6.5	17.4	65.2
1a	42	16.7	2.4	19.0	61.9
4c	22	9.1	0.0	22.7	68.2
5	1	100.0	0.0	0.0	0.0
Total	**3 040**	**14.7**	**1.3**	**29.7**	**54.2**

Source: Austria, Belgium, Estonia, Finland (only 2010), France, Greece (only 2012), Hungary, Ireland (only 2012), Lithuania, Sweden, United Kingdom; EEA country: Norway

Table D4.7. Number and distribution of reported *Shigella flexneri* serotypes isolate from confirmed domestic cases as reported between 2010 and 2012 by EU/EEA countries

Serotype	2010		2011		2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
3a	39	24.5	17	18.7	52	26.4
2a	61	38.4	37	40.7	35	17.8
6	12	7.5	14	15.4	35	17.8
2	8	5.0	2	2.2	20	10.2
1b	14	8.8	6	6.6	19	9.6
2b	4	2.5	5	5.5	9	4.6
X	1	0.6	1	1.1	6	3.0
3b	8	5.0	2	2.2	5	2.5
1	1	0.6	4	4.4	5	2.5
Y	0	0.0	1	1.1	3	1.5
1a	3	1.9	1	1.1	3	1.5
4	2	1.3	0	0.0	2	1.0
3	2	1.3	1	1.1	2	1.0
4c	1	0.6	0	0.0	1	0.5
5	1	0.6	0	0.0	0	0.0
4a	2	1.3	0	0.0	0	0.0
Total	**159**	**100.0**	**91**	**100.0**	**197**	**100.0**

Source: Austria, Belgium, Estonia, Finland (only 2010), France, Greece (only 2012), Hungary, Ireland (only 2012), Lithuania, Sweden, United Kingdom; EEA country: Norway

Table D4.8. Number and distribution of reported *Shigella flexneri* serotypes isolate from travel-related infections acquired travelling to EU/EEA countries, EU/EEA countries, 2010–2012

Serotype	2010		2011		2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
3a	4	44.4	5	55.6	12	52.2
1b	1	11.1	1	11.1	4	17.4
2a	3	33.3	1	11.1	4	17.4
3	0	0.0	1	11.1	2	8.7

Serotype	2010		2011		2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
2	0	0.0	1	11.1	1	4.3
1a	1	11.1	0	0.0	0	0.0
Total	**9**	**100.0**	**9**	**100.0**	**23**	**100.0**

Source: Austria, Belgium, Estonia, Finland (only 2010), France, Greece (only 2012), Hungary, Ireland (only 2012), Lithuania, Sweden, United Kingdom; EEA country: Norway

Table D4.9. Number and distribution of reported *Shigella flexneri* serotypes isolate from travel-related infections acquired travelling to non-EU/EEA countries, EU/EEA countries, 2010–2012

Serotype	2010		2011		2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
2a	87	26.1	70	28.0	88	27.5
6	75	22.5	43	17.2	73	22.8
1b	54	16.2	34	13.6	51	15.9
3a	48	14.4	28	11.2	44	13.8
2b	23	6.9	29	11.6	27	8.4
4a	10	3.0	9	3.6	9	2.8
2	14	4.2	8	3.2	6	1.9
3	2	0.6	2	0.8	4	1.3
1	5	1.5	5	2.0	4	1.3
4	2	0.6	12	4.8	4	1.3
1a	3	0.9	1	0.4	4	1.3
Y	3	0.9	4	1.6	3	0.9
4c	1	0.3	2	0.8	2	0.6
X	3	0.9	2	0.8	1	0.3
3b	3	0.9	1	0.4	0	0.0
Total	**333**	**100.0**	**250**	**100.0**	**320**	**100.0**

Source: Austria, Belgium, Estonia, Finland (only 2010), France, Greece (only 2012), Hungary, Ireland (only 2012), Lithuania, Sweden, United Kingdom; EEA country: Norway

Table D4.10. Distribution of the six most commonly reported *Shigella flexneri* serotypes by and age groups, EU/EEA countries, 2010–2012 (N=2 608)

Age groups	2a			3a			6			1b			2b			2		
	2010	2011	2012	2010	2011	2012	2010	2011	2012	2010	2011	2012	2010	2011	2012	2010	2011	2012
< 1 yr	7	6	9	0	2	0	0	2	4	1	3	3	1	0	0	0	0	8
1–4 yrs	52	29	42	18	9	18	22	10	29	21	7	17	8	6	3	10	4	10
5–14 yrs	36	35	35	14	13	20	24	18	20	20	5	18	10	4	4	3	2	1
15–24 yrs	51	25	39	17	8	14	25	17	18	28	15	21	12	6	6	8	6	5
25–44 yrs	128	65	113	113	45	120	67	25	53	40	29	56	19	13	12	20	13	2
45–64 yrs	62	38	62	52	20	60	33	22	38	37	26	29	13	17	17	13	6	1
≥ 65 yrs	17	8	19	19	9	7	10	6	20	20	6	12	4	0	6	1	0	1
Total	**353**	**206**	**319**	**233**	**106**	**239**	**181**	**100**	**182**	**167**	**91**	**156**	**67**	**46**	**48**	**55**	**31**	**28**

Source: Austria, Belgium, Estonia, Finland (only 2010), France, Greece (only 2012), Hungary, Ireland (only 2012), Lithuania, Sweden, United Kingdom; EEA country: Norway

Table D4.11. Hospitalisation of confirmed shigellosis cases by EU/EEA countries, 2010–2012

Country	2010					2011					2012				
	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)
Austria	98	81.6	27	33.8	23.6–45.2	36	94.4	10	29.4	15.1–47.5	57	98.2	15	26.8	15.8–40.3
Belgium	342	0.0	–	–	–	317	0.0	–	–	–	340	0.0	–	–	–
Bulgaria	596	0.0	–	–	–	798	0.0	–	–	–	777	0.0	–	–	–
Cyprus	0	–	0	–	–	2	100.0	1	50.0	1.3–98.7	0	–	0	–	–
Czech Republic	387	0.0	–	–	–	157	0.0	–	–	–	266	0.0	–	–	–
Denmark	91	100.0	19	20.9	13.1–30.7	91	100.0	23	25.3	16.8–35.5	105	0.0	–	–	–
Estonia	46	100.0	14	30.4	17.7–45.8	22	100.0	9	40.9	20.7–63.7	34	100.0	12	35.3	19.8–53.5
Finland	162	0.0	–	–	–	126	0.0	–	–	–	88	0.0	–	–	–
France	774	0.0	–	–	–	641	0.0	–	–	–	686	0.0	–	–	–
Germany	697	0.0	–	–	–	664	0.0	–	–	–	518	0.0	–	–	–
Greece	33	100.0	33	100.0	89.4–100	47	100.0	43	91.5	79.6–97.6	89	98.9	84	95.5	88.8–98.8

Country	2010					2011					2012				
	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)
Hungary	63	100.0	20	31.7	20.6–44.7	43	100.0	25	58.1	42.1–73	32	100.0	23	71.9	53.3–86.3
Ireland	60	75.0	12	26.7	14.6–41.9	42	83.3	5	14.3	4.8–30.3	29	86.2	5	20.0	6.8–40.7
Italy	–	–	–	–	–	–	–	–	–	–	30	0.0	–	–	–
Latvia	11	0.0	–	–	–	10	100.0	10	100.0	69.2–100	3	100.0	2	66.7	9.4–99.2
Lithuania	42	100.0	32	76.2	60.6–88	40	100.0	27	67.5	50.9–81.4	52	100.0	49	94.2	84.1–98.8
Luxembourg	13	100.0	0	0.0	0–24.7	16	0.0	–	–	–	14	0.0	–	–	–
Malta	2	100.0	1	50.0	1.3–98.7	4	100.0	1	25.0	0.6–80.6	0	–	0	–	–
Netherlands	523	99.4	71	13.7	10.8–16.9	550	99.5	57	10.4	8–13.3	674	99.1	79	11.8	9.5–14.5
Poland	24	0.0	–	–	–	18	0.0	–	–	–	13	0.0	–	–	–
Portugal	6	83.3	5	100.0	47.8–100	3	100.0	3	100.0	29.2–100	10	90.0	7	77.8	40–97.2
Romania	293	100.0	278	94.9	91.7–97.1	371	100.0	339	91.4	88–94	354	100.0	338	95.5	92.8–97.4
Slovakia	370	0.0	–	–	–	536	0.0	–	–	–	449	0.0	–	–	–
Slovenia	31	100.0	6	19.4	7.5–37.5	18	100.0	8	44.4	21.5–69.2	25	100.0	11	44.0	24.4–65.1
Spain	76	0.0	–	–	–	81	0.0	–	–	–	264	0.0	–	–	–
Sweden	557	0.0	–	–	–	454	0.0	–	–	–	328	0.0	–	–	–
United Kingdom	1 881	0.3	3	60.0	14.7–94.7	2 070	7.5	151	96.8	92.7–99	2 021	5.5	108	96.4	91.1–99
EU total	7 178	17.7	521	41.1	38.3–43.8	7157	19.9	712	50.0	47.4–52.7	7 258	20.1	733	50.3	47.7–52.9
Iceland	2	0.0	–	–	–	1	0.0	–	–	–	1	0.0	–	–	–
Liechtenstein	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Norway	132	98.5	31	23.8	16.8–32.1	163	98.8	33	20.5	14.6–27.6	77	100.0	22	28.6	18.9–40
EU/EEA total	7 312	19.1	552	39.5	36.9–42.1	7321	21.6	745	47.0	44.6–49.5	7 336	20.9	755	49.2	46.7–51.7

– Not reported/not calculated

Table D4.12. Number of deaths and case–fatality ratio (CFR) of confirmed shigellosis cases by EU/EEA countries, 2010–2012

Country	2010					2011					2012				
	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)
Austria	98	100.0	0	0.00	0–3.7	36	100.0	0	0.00	0–9.7	57	100.0	0	0.00	0–6.3
Belgium	342	0.0	–	–	–	317	0.0	–	–	–	340	0.0	–	–	–
Bulgaria	596	0.0	–	–	–	798	0.0	–	–	–	777	0.0	–	–	–
Cyprus	0	–	0	–	–	2	100.0	0	0.00	0–84.2	0	–	0	–	–
Czech Republic	387	100.0	0	0.00	0–1	157	100.0	0	0.00	0–2.3	266	100.0	0	0.00	0–1.4
Denmark	91	13.2	0	0.00	0–26.5	91	5.5	0	0.00	0–52.2	105	0.0	–	–	–
Estonia	46	100.0	0	0.00	0–7.7	22	100.0	0	0.00	0–15.4	34	100.0	0	0.00	0–10.3
Finland	162	0.0	–	–	–	126	0.0	–	–	–	88	0.0	–	–	–
France	774	0.0	–	–	–	641	0.0	–	–	–	686	0.0	–	–	–
Germany	697	99.1	0	0.00	0–0.5	664	99.8	0	0.00	0–0.6	518	99.4	1	0.19	0–1.1
Greece	33	78.8	0	0.00	0–13.2	47	74.5	0	0.00	0–10	89	67.4	0	0.00	0–6
Hungary	63	100.0	0	0.00	0–5.7	43	100.0	0	0.00	0–8.2	32	100.0	0	0.00	0–10.9
Ireland	60	41.7	0	0.00	0–13.7	42	42.9	0	0.00	0–18.5	29	65.5	0	0.00	0–17.7
Italy	–	–	–	–	–	–	–	–	–	–	30	0.0	–	–	–
Latvia	11	100.0	0	0.00	0–28.5	10	100.0	0	0.00	0–30.9	3	100.0	0	0.00	0–70.8
Lithuania	42	100.0	0	0.00	0–8.4	40	100.0	0	0.00	0–8.8	52	90.4	0	0.00	0–7.6
Luxembourg	13	0.0	–	–	–	16	0.0	–	–	–	14	0.0	–	–	–
Malta	2	100.0	0	0.00	0–84.2	4	100.0	0	0.00	0–60.2	0	–	0	–	–
Netherlands	523	100.0	0	0.00	0–0.7	550	99.5	1	0.18	0–1	674	99.7	1	0.15	0–0.8
Poland	24	0.0	–	–	–	18	100.0	0	0.00	0–18.5	13	100.0	0	0.00	0–24.7
Portugal	6	83.3	0	0.00	0–52.2	3	100.0	0	0.00	0–70.8	10	90.0	0	0.00	0–33.6
Romania	293	100.0	0	0.00	0–1.3	371	96.2	0	0.00	0–1	354	99.4	0	0.00	0–1
Slovakia	370	96.5	0	0.00	0–1	536	98.3	0	0.00	0–0.7	449	99.6	0	0.00	0–0.8
Slovenia	31	100.0	0	0.00	0–11.2	18	100.0	0	0.00	0–18.5	25	100.0	0	0.00	0–13.7
Spain	76	0.0	–	–	–	81	0.0	–	–	–	264	0.0	–	–	–
Sweden	557	0.0	–	–	–	454	0.0	–	–	–	328	0.0	–	–	–
United Kingdom	1 881	0.0	–	–	–	2 070	16.2	3	0.89	0.2–2.6	2 021	12.4	0	0.00	0–1.5
EU total	**7178**	**36.4**	**0**	**0.00**	**0–0.14***	**7157**	**39.7**	**4**	**0.14**	**0.04–0.36**	**7 258**	**38.6**	**2**	**0.07**	**0.01–0.26**
Iceland	2	100.0	0	0.00	0–84.2	1	0.0	–	–	–	1	0.0	–	–	–

Country	2010					2011					2012				
	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)
Liechtenstein	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Norway	132	73.5	0	0.00	0–3.7	163	64.4	0	0.00	0–3.5	77	62.3	0	0.00	0–7.4
EU/EEA total	**7312**	**37.1**	**0**	**0.00**	**0–0.14***	**7321**	**40.2**	**4**	**0.14**	**0.04–0.35**	**7 336**	**38.8**	**2**	**0.07**	**0.01–0.25**

– Not reported/not calculated

Annex E. STEC/VTEC infections

Table E5.1. **Number and proportion of confirmed STEC/VTEC cases by origin of infection (domestic/travel-related) as reported by EU/EEA countries, 2010–2012**

Country	Confirmed cases reported	Domestic cases		Travel-related cases		Unknown	
		N	%	N	%	N	%
Austria	338	175	51.8	42	12.4	121	35.8
Belgium	289	38	13.1	9	3.1	242	83.7
Bulgaria^	1	-	-	-	-	1	100.0
Cyprus	0	0	0	0	0	0	0
Czech Republic	17	16	94.1	1	5.9	0	0
Denmark	586	166	28.3	164	28.0	256	43.7
Estonia	12	9	75.0	3	25.0	0	0.0
Finland	78	54	69.2	14	17.9	10	12.8
France	532	-	-	-	-	532	100.0
Germany	8 086	7 711	95.4	341	4.2	34	0.4
Greece	2	1	50.0	1	50.0	0	0
Hungary	21	20	95.2	1	4.8	0	0
Ireland	884	711	80.4	21	2.4	152	17.2
Italy	134	98	73.1	7	5.2	29	21.6
Latvia	0	0	0	0	0	0	0
Lithuania	3	1	33.3	0	0.0	2	66.7
Luxembourg	42	19	45.2	2	4.8	21	50.0
Malta	4	4	100.0	0	0	0	0
Netherlands	2 372	1 131	47.7	335	14.1	906	38.2
Poland	9	8	88.9	1	11.1	0	0.0
Portugal	-	-	-	-	-	-	-
Romania	5	-	-	-	-	5	100.0
Slovakia	24	24	100.0	0	0.0	0	0
Slovenia	74	24	32.4	3	4.1	47	63.5
Spain	70	51	72.9	2	2.9	17	24.3
Sweden	1 283	600	46.8	588	45.8	95	7.4
United Kingdom~	3 950	1 666	42.2	532	13.5	1 752	44.4
EU total	**18 816**	**12 527**	**66.6**	**2 067**	**11.0**	**4 222**	**22.4**
Iceland	5	4	80.0	0	0.0	1	20.0
Liechtenstein	-	-	-	-	-	-	-
Norway	174	112	64.4	40	23.0	22	12.6
EU/EEA total	**18 995**	**12 643**	**66.6**	**2 107**	**11.1**	**4 245**	**22.3**

– Not reported/not calculated

^ Aggregated reporting

Table E5.2. **Number and notification rates of confirmed domestic STEC/VTEC cases by EU/EEA countries, 2010–2012**

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	1	<0.1	79	0.9	95	1.1
Belgium*	0	-	0	-	38	-
Bulgaria^	-	-	-	-	-	-
Cyprus	0	0	0	0	0	0
Czech Republic	16	0.2	6	0.1	9	0.1
Denmark	76	1.4	90	1.6	0	0
Estonia	4	0.3	4	0.3	1	0.1
Finland	13	0.2	19	0.4	22	0.4
France	-	-	-	-	-	-
Germany	865	1.1	5 390	6.6	1456	1.8
Greece	1	<0.1	0	0	0	0
Hungary	7	0.1	10	0.1	3	<0.1
Ireland	179	4.0	189	4.1	343	7.5
Italy*	28	<0.1	36	0.1	34	0.1

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Latvia	0	0	0	0	0	0
Lithuania	1	<0.1	0	0	0	0
Luxembourg	7	1.4	12	2.3	0	0
Malta	1	0.2	2	0.5	1	0.2
Netherlands	234	1.4	430	2.6	467	2.8
Poland	3	<0.1	4	<0.1	1	<0.1
Portugal	-	-	-	-	-	-
Romania	-	-	-	-	-	-
Slovakia	10	0.2	5	0.1	9	0.2
Slovenia	2	0.1	15	0.7	7	0.3
Spain	0	0	19	<0.1	32	0.1
Sweden	184	2.0	241	2.6	175	1.8
United Kingdom~	442	0.7	611	1.0	613	1.0
EU total**	**2 074**	**0.63**	**7 162**	**2.21**	**3 306**	**1.00**
Iceland	2	0.6	1	0.3	1	0.3
Liechtenstein	-	-	-	-	-	-
Norway	32	0.7	25	0.5	55	1.1
EU/EEA total**	**2 108**	**0.63**	**7 188**	**2.18**	**3362**	**1.00**

– Not reported/not calculated

** Sentinel surveillance. Population coverage unknown so notification rate not calculated*

^ Aggregated reporting

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

*** For each year shown, notification rates were calculated, with the exception of countries with unknown population coverage. Populations of non- reporting countries have been also excluded. Populations of countries reporting 0 cases have been included.*

Table E5.3. Number and notification rates of confirmed travel-related STEC/VTEC cases by EU/EEA countries, 2010–2012

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	6	0.1	18	0.2	18	0.2
Belgium*	1	-	5	-	3	-
Bulgaria^	-	-	-	-	-	-
Cyprus	0	0	0	0	0	0
Czech Republic	1	<0.1	1	<0.1	0	<0.1
Denmark	56	1.0	79	1.4	29	0.5
Estonia	1	0.1	0	0	2	0.1
Finland	5	0.1	3	0.1	6	0.1
France	-	-	-	-	-	-
Germany	56	0.1	168	0.2	117	0.1
Greece	0	0	1	<0.1	0	0
Hungary	0	0	1	<0.1	0	0
Ireland	5	0.1	4	0.1	12	0.3
Italy*	2	-	2	-	3	-
Latvia	0	0	0	0	0	0
Lithuania	0	0	0	0	0	0
Luxembourg	0	0	2	0.4	0	0
Malta	0	0	0	0.0	0	0
Netherlands	77	0.5	132	0.8	126	0.8
Poland	0	0	1	<0.1	0	0
Portugal	-	-	-	-	-	-
Romania	-	-	-	-	-	-
Slovakia	0	0	0	0	0	0
Slovenia	1	<0.1	1	<0.1	1	<0.1
Spain	1	<0.1	1	<0.1	0	0.0
Sweden	136	1.5	226	2.4	226	2.4
United Kingdom~	166	0.3	149	0.2	217	0.3
EU total**	**514**	**0.16**	**794**	**0.24**	**760**	**0.23**

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Iceland	0	0	0	0	0	00
Liechtenstein	-	-	-	-	-	-
Norway	12	0.2	13	0.3	15	0.3
EU/EEA total**	**526**	**0.16**	**807**	**0.24**	**775**	**0.23**

– Not reported/not calculated

** Sentinel surveillance. Population coverage unknown so notification rate not calculated*

^ Aggregated reporting

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

*** For each year shown, notification rates were calculated, with the exception of countries with unknown population coverage. Populations of non- reporting countries have been also excluded. Populations of countries reporting 0 cases have been included.*

Table E5.4. Notification rates of confirmed STEC/VTEC cases by age groups and sex in EU/EEA countries, 2010–2012

Sex	Age group	2010		2011		2012		2010–2012	
		Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate/
Male	< 1 yr	103	3.9	140	5.2	116	4.5	359	4.6
	1–4 yrs	532	5.2	822	7.7	702	6.6	2056	6.5
	5–14 yrs	315	1.2	515	2.0	427	1.7	1257	1.6
	15–24 yrs	171	0.6	406	1.4	232	0.8	809	0.9
	25–44 yrs	246	0.4	773	1.1	388	0.6	1407	0.7
	45–64 yrs	207	0.3	755	1.2	339	0.5	1301	0.7
	≥ 65 yrs	160	0.5	675	1.9	296	0.8	1131	1.1
	Total	**1 734**	**0.7**	**4 086**	**1.7**	**2 500**	**1.1**	**8 320**	**1.2**
Female	< 1 yr	91	3.7	125	4.9	136	5.5	352	4.7
	1–4 yrs	459	4.7	723	7.1	650	6.4	1832	6.1
	5–14 yrs	252	1.0	538	2.2	459	1.9	1249	1.7
	15–24 yrs	208	0.7	579	2.0	377	1.4	1164	1.4
	25–44 yrs	359	0.5	1274	1.9	590	0.9	2223	1.1
	45–64 yrs	326	0.5	1138	1.7	496	0.7	1960	1.0
	≥ 65 yrs	256	0.5	1025	2.1	516	1.0	1797	1.2
	Total	**1 951**	**0.8**	**5 402**	**2.2**	**3 224**	**1.3**	**10 577**	**1.4**

Source: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Table E5.5. Distribution of the 20 most commonly reported STEC/VTEC O-serogroups in confirmed cases as reported by EU/EEA countries, 2010–2012

Antigen O	2010		2011		2012		Total 2010–2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
O157	1 512	61.4	2 190	48.3	1 960	58.8	5 662	54.8
O104	2	0.1	1 066	23.5	7	0.2	1 075	10.4
O26	266	10.8	289	6.4	415	12.5	970	9.4
O103	102	4.1	148	3.3	133	4.0	383	3.7
O91	59	2.4	116	2.6	130	3.9	305	3.0
O145	65	2.6	80	1.8	112	3.4	257	2.5
O111	42	1.7	52	1.1	66	2.0	160	1.5
O146	28	1.1	48	1.1	58	1.7	134	1.3
O128	31	1.3	54	1.2	35	1.1	120	1.2
O63	42	1.7	26	0.6	12	0.4	80	0.8
O113	13	0.5	34	0.7	24	0.7	71	0.7
O rough	19	0.8	28	0.6	24	0.7	71	0.7
O121	14	0.6	27	0.6	27	0.8	68	0.7
O117	27	1.1	17	0.4	22	0.7	66	0.6
O76	11	0.4	21	0.5	21	0.6	53	0.5
O55	6	0.2	21	0.5	25	0.8	52	0.5
O5	10	0.4	22	0.5	6	0.2	38	0.4

Antigen O	2010		2011		2012		Total 2010–2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
O125	11	0.4	14	0.3	10	0.3	35	0.3
O174	15	0.6	13	0.3	7	0.2	35	0.3
O177	7	0.3	18	0.4	4	0.1	29	0.3
Other	180	7.3	250	5.5	235	7.1	665	6.4
Total known	**2 462**	**100.0**	**4 534**	**100.0**	**3 333**	**100.0**	**10 329**	**100.0**
Unknown/missing/NT*	1 248	33.6	5 002	52.5	2 415	42.0	8 665	45.6
Total reported	**3 710**		**9 536**		**5 748**		**18 994**	

** NT = serologically untypable*

Source: Austria, Belgium, Czech Republic, Denmark, Estonia (only 2011), Finland (only 2010), France, Germany (Source: DE-SURVNET@RKI-7.1), Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, Malta (only 2010-2011), the Netherlands, Poland, Romania, Slovenia, Spain, Sweden, United Kingdom; EEA countries: Iceland and Norway

Table E5.6. The 20 most commonly reported STEC/VTEC flagellar H-antigens in confirmed cases in the EU/EEA, 2010–2012

Antigen H	2010		2011		2012		Total 2010–2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
H7	204	35.1	200	25.6	210	28.3	614	29.2
H-**	148	25.4	162	20.7	231	31.1	541	25.7
H2	69	11.9	51	6.5	55	7.4	175	8.3
H11	34	5.8	48	6.1	47	6.3	129	6.1
H21	16	2.7	37	4.7	33	4.4	86	4.1
H6	26	4.5	46	5.9	23	3.1	95	4.5
H19	16	2.7	16	2.0	17	2.3	49	2.3
H25	3	0.5	6	0.8	16	2.2	25	1.2
H8	6	1.0	7	0.9	15	2.0	28	1.3
H28	4	0.7	12	1.5	14	1.9	30	1.4
H14	4	0.7	6	0.8	11	1.5	21	1.0
H34	9	1.5	11	1.4	6	0.8	26	1.2
H30	5	0.9	2	0.3	6	0.8	13	0.6
H16	2	0.3	2	0.3	6	0.8	10	0.5
H12	5	0.9	8	1.0	6	0.8	19	0.9
H18	7	1.2	4	0.5	6	0.8	17	0.8
H4	3	0.5	129	16.5	5	0.7	137	6.5
H10	3	0.5	2	0.3	4	0.5	9	0.4
H9	2	0.3	2	0.3	3	0.4	7	0.3
H1	2	0.3	6	0.8	2	0.3	10	0.5
Other	14	2.4	24	3.1	26	3.5	64	3.0
Total known	**582**	**100.0**	**781**	**100.0**	**742**	**100.0**	**2105**	**100.0**
Unknown/missing/NT*	3 128	84.3	8 755	52.5	5 006	87.1	16 889	88.9
Total reported	**3 710**		**9 536**		**5 748**		**18 994**	

** NT = serologically untypable*

*** H- = flagellar antigen missing (non-motile strains)*

Source: Austria, Belgium, Czech Republic, Denmark, France, Hungary, Ireland, Luxembourg (only 2010-2011), the Netherlands, Poland, Romania (only 2010-2011), Spain, Sweden, United Kingdom (only 2011); EEA country: Norway

Table E5.7. Shiga toxin genes of 20 most commonly reported STEC/VTEC O-antigen groups by intimin (eae) subtypes in the EU/EEA, 2010–2012 (N=7 712)

Serotypes	Intimin (*eae*) positive (6 176)							Intimin (*eae*) negative (1 536)						
	stx1 positive		*stx2* positive		*stx1* & *stx2* positive		Total	*stx1* positive		*stx2* positive		*stx1* & *stx2* positive		Total
	N	%	N	%	N	%	(N)	N	%	N	%	N	%	(N)
O157	54	1.2	2910	62.2	1714	36.6	**4 678**	0	0.0	8	88.9	1	11.1	**9**
O104	0	0.0	1	33.3	2	66.7	**3**	0	0.0	148	98.0	3	2.0	**151**
O26	342	61.7	135	24.4	77	13.9	**554**	9	81.8	2	18.2	0	0.0	**11**
O103	275	96.8	3	1.1	6	2.1	**284**	2	50.0	1	25.0	1	25.0	**4**
O91	0	0.0	1	50.0	1	50.0	**2**	288	84.7	15	4.4	37	10.9	**340**
O145	19	12.3	132	85.7	3	1.9	**154**	-	-	-	-	-	-	**-**

Serotypes	Intimin (*eae*) positive (6 176)							Intimin (*eae*) negative (1 536)						
	stx1 positive		*stx2* positive		*stx1* & *stx2* positive		Total	*stx1* positive		*stx2* positive		*stx1* & *stx2* positive		Total
	N	%	N	%	N	%	(N)	N	%	N	%	N	%	(N)
O111	48	49.0	29	29.6	21	21.4	**98**	2	50.0	1	25.0	1	25.0	**4**
O146	0	0.0	1	100.0	0	0.0	**1**	30	17.8	68	40.2	71	42.0	**169**
O128	1	6.7	9	60.0	5	33.3	**15**	9	14.1	26	40.6	29	45.3	**64**
O63	0	0.0	57	95.0	3	5.0	**60**	-	-	-	-	-	-	**-**
O113	0	0.0	12	100.0	0	0.0	**12**	4	5.9	18	26.5	46	67.6	**68**
Orough	21	67.7	8	25.8	2	6.5	**31**	87	58.0	29	19.3	34	22.7	**150**
O121	0	0.0	47	97.9	1	2.1	**48**	1	16.7	4	66.7	1	16.7	**6**
O117	1	100.0	0	0.0	0	0.0	**1**	51	92.7	4	7.3	0	0.0	**55**
O76	2	33.3	3	50.0	1	16.7	**6**	44	74.6	1	1.7	14	23.7	**59**
O55	1	9.1	10	90.9	0	0.0	**11**	26	100.0	0	0.0	0	0.0	**26**
O5	26	92.9	0	0.0	2	7.1	**28**	3	37.5	0	0.0	5	62.5	**8**
O125	0	0.0	12	100.0	0	0.0	**12**	0	0.0	1	50.0	1	50.0	**2**
O174	-	-	-	-	-	-	**-**	4	10.3	20	51.3	15	38.5	**39**
O177	27	65.9	10	24.4	4	9.8	**41**	1	100.0	0	0.0	0	0.0	**1**
Other*	65	47.4	61	44.5	11	8.0	**137**	135	36.5	166	44.9	69	18.6	**370**
Total	**882**	**14.3**	**3441**	**55.7**	**1853**	**30.0**	**6 176**	**696**	**45.3**	**512**	**33.3**	**328**	**21.4**	**1 536**

– Not reported/not calculated

** 'Other serotypes' includes 39 Intimin (eae) positive O-serogroups and 94 Intimin (eae) negative O-serogroups*

Source: Austria, Belgium, Czech Republic, Denmark, France, Germany (source: DE-NRZ-VTEC), Greece, Hungary, Ireland, Italy, Luxembourg, the Netherlands, Poland, Romania, Slovenia, Spain, Sweden, United Kingdom; EEA country: Norway

Table E5.8. Shiga toxin genes of 20 most commonly reported STEC/VTEC AntigenO by HUS syndrome in EU/EEA countries, 2010–2012 (N=6 316)

Serotype	HUS+							HUS-						
	stx1 positive		*stx2* positive		*stx1* & *stx2* positive		Total	*stx1* positive		*stx2* positive		*stx1* & *stx2* positive		Total
	N		%		N		%	N		%		(N)		N
O157	1	0.3	257	88.6	32	11.0	**290**	35	1.1	1964	60.1	1270	38.8	**3 269**
O104	0	0.0	38	97.4	1	2.6	**39**	0	0.0	207	98.1	4	1.9	**211**
O26	8	9.9	52	64.2	21	25.9	**81**	327	62.5	87	16.6	109	20.8	**523**
O103	1	25.0	1	25.0	2	50.0	**4**	230	95.8	4	1.7	6	2.5	**240**
O91	1	20.0	4	80.0	0	0.0	**5**	265	87.2	10	3.3	29	9.5	**304**
O145	0	0.0	15	100.0	0	0.0	**15**	9	7.7	100	85.5	8	6.8	**117**
O111	0	0.0	9	52.9	8	47.1	**17**	38	53.5	20	28.2	13	18.3	**71**
O146	-	-	-	-	-	-	**-**	25	18.0	55	39.6	59	42.4	**139**
O128	1	50.0	0	0.0	1	50.0	**2**	9	14.1	25	39.1	30	46.9	**64**
O63	-	-	-	-	-	-	**-**	0	0.0	40	93.0	3	7.0	**43**
O113	0	0.0	1	100.0	0	0.0	**1**	2	3.2	21	33.3	40	63.5	**63**
Orough	0	0.0	1	100.0	0	0.0	**1**	102	59.6	34	19.9	35	20.5	**171**
O121	0	0.0	12	92.3	1	7.7	**13**	2	8.7	20	87.0	1	4.3	**23**
O117	-	-	-	-	-	-	**-**	34	97.1	1	2.9	0	0.0	**35**
O76	-	-	-	-	-	-	**-**	33	66.0	4	8.0	13	26.0	**50**
O55	0	0.0	4	100.0	0	0.0	**4**	19	76.0	6	24.0	0	0.0	**25**
O5	1	100.0	0	0.0	0	0.0	**1**	20	74.1	0	0.0	7	25.9	**27**
O125	-	-	-	-	-	-	**-**	0	0.0	10	90.9	1	9.1	**11**
O174	0	0.0	0	0.0	2	100.0	**2**	4	12.1	16	48.5	13	39.4	**33**
O177	0	0.0	2	100.0	0	0.0	**2**	25	69.4	8	22.2	3	8.3	**36**
Other*	0	0.0	11	73.3	4	26.7	**15**	153	41.5	165	44.7	51	13.8	**369**
Total	**13**	**2.6**	**407**	**82.7**	**72**	**14.6**	**492**	**1332**	**22.9**	**2797**	**48.0**	**1695**	**29.1**	**5 824**

– Not reported/not calculated

** 'Other serotypes' includes 14 HUS positive O-serogroups and 98 HUS negative O-serogroups.*

Source: Austria, Belgium, Czech Republic, Denmark, Estonia, France, Germany (source: DE-NRZ-VTEC), Greece, Hungary, Ireland, Italy, the Netherlands, Poland, Romania, Slovenia, Spain, Sweden, United Kingdom; EEA country: Norway

Table E5.9. Relative distribution of the five most commonly reported serotypes in 2012 by age groups as reported by EU/EEA countries, 2010–2012 (N=1 002)

Age groups	O157:H7		O157:H-		O26:H11		O103:H2		O145:H-		Total	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
< 1 yr	17	37.0	10	21.7	11	23.9	7	15.2	1	2.2	**46**	**100.0**
1–4 yrs	143	43.5	62	18.8	58	17.6	44	13.4	22	6.7	**329**	**100.0**
5–14 yrs	118	58.4	42	20.8	12	5.9	24	11.9	6	3.0	**202**	**100.0**
15–24 yrs	55	51.4	21	19.6	4	3.7	16	15.0	11	10.3	**107**	**100.0**
25–44 yrs	70	61.4	18	15.8	9	7.9	10	8.8	7	6.1	**114**	**100.0**
45–64 yrs	79	65.8	20	16.7	9	7.5	9	7.5	3	2.5	**120**	**100.0**
≥ 65 yrs	40	47.6	24	28.6	14	16.7	4	4.8	2	2.4	**84**	**100.0**

Source: Austria, Belgium, Czech Republic, Denmark, France, Hungary, Ireland, Luxembourg, the Netherlands, Poland, Romania, Spain, Sweden, United Kingdom; EEA country: Norway

Table E5.10. Hospitalisation of confirmed STEC/VTEC cases by EU/EEA countries, 2010–2012

Country	2010					2011					2012				
	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)
Austria	88	38.6	34	100	89.7–100	120	94.2	61	54.0	44.4-63.4	130	90.0	49	41.9	32.8-51.4
Belgium	84	14.3	11	91.7	61.5–99.8	100	1.0	1	100.0	2.5-100	105	43.8	18	39.1	25.1-54.6
Bulgaria	0	-	0	-	-	1	0.0	-	-	-	0	-	0	-	-
Cyprus	0	-	0	-	-	0	-	0	-	-	0	-	0	-	-
Czech Republic	1	100	1	100	15.8–100	7	100.0	2	28.6	3.7-71	9	100.0	5	55.6	21.2-86.3
Denmark	178	0.0	-	-	-	215	0.0	-	-	-	193	0.0	-	-	-
Estonia	5	100	4	80.0	28.4-99.5	4	100.0	4	100.0	39.8-100	3	100.0	1	33.3	0.8-90.6
Finland	21	0.0	-	-	-	27	0.0	-	-	-	30	0.0	-	-	-
France	103	0.0	-	-	-	221	0.0	-	-	-	208	0.0	-	-	-
Germany	955	0.0	-	-	-	5558	0.0	-	-	-	1573	0.0	-	-	-
Greece	1	100	1	100	2.5-100	1	100.0	0	0.0	0-97.5	0	-	0	-	-
Hungary	7	100	2	28.6	3.7-71.0	11	100.0	6	54.5	23.4-83.3	3	100.0	1	33.3	0.8-90.6
Ireland	197	86.8	70	40.9	33.5-48.7	275	87.6	74	30.7	24.9-37	412	91.5	154	40.8	35.8-46
Italy	33	9.1	3	100	29.2-100	51	72.5	35	94.6	81.8-99.3	50	98.0	43	87.8	75.2-95.4
Latvia	0	-	0	-	-	0	-	0	-	-	0	-	0	-	-
Lithuania	1	0.0	-	-	-	0	-	0	-	-	2	50.0	1	100	2.5-100
Luxembourg	7	0.0	-	-	-	14	0.0	-	-	-	21	0.0	-	-	-
Malta	1	0.0	-	-	-	2	100.0	0	0.0	0-84.2	1	0.0	-	-	-
Netherlands	478	0.0	-	-	-	845	70.2	100	16.9	13.9-20.1	1049	64.3	112	16.6	13.9-19.6
Poland	3	100	2	66.7	9.4-99.2	5	100.0	4	80.0	28.4-99.5	1	100.0	1	100	2.5-100
Portugal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Romania	2	100	2	100	15.8-100	2	100.0	2	100.0	15.8-100	1	100.0	1	100	2.5-100
Slovakia	10	0.0	-	-	-	5	0.0	-	-	-	9	0.0	-	-	-
Slovenia	20	0.0	-	-	-	25	96.0	12	50.0	29.1-70.9	29	89.7	11	42.3	23.4-63.1
Spain	18	0.0	-	-	-	20	0.0	-	-	-	32	0.0	-	-	-
Sweden	334	0.0	-	-	-	477	0.0	-	-	-	472	0.0	-	-	-
United Kingdom	1 110	60.3	224	33.5	29.9-37.2	1501	72.4	418	38.5	35.6-41.5	1339	61.2	380	46.4	42.9-49.9
EU total	3 657	24.8	354	38.9	35.7-42.2	9487	22.4	719	33.8	31.8-35.9	5672	37.5	777	36.5	34.5-38.6
Iceland	2	0.0	-	-	-	2	0.0	-	-	-	1	0.0	-	-	-
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Norway	52	84.6	16	36.4	22.4-52.2	47	91.5	18	41.9	27-57.9	75	85.3	23	35.9	24.3-48.9
EU/EEA total	3 711	25.6	370	38.8	35.7-42.0	9536	22.8	737	34.0	32.0-36.0	5748	38.1	800	36.5	34.5-38.6

– Not reported/not calculated

Table E5.11. HUS syndrome among reported STEC/VTEC cases by EU/EEA countries, 2010–2012

Country	2010				2011				2012			
	Cases HUS-	Cases HUS+	HUS+ cases (%)	Missing (%)	Cases HUS-	Cases HUS+	HUS+ cases (%)	Missing (%)	Cases HUS-	Cases HUS+	HUS+ cases (%)	Missing (%)
Austria	77	11	12.5	0.0	98	10	9.3	10.0	110	17	13.4	2.3
Belgium	52	19	26.8	15.5	68	13	16.0	19.0	66	16	19.5	21.9
Bulgaria	0	0	-	-	-	-	-	100.0	0	0	-	-

Country	2010				2011				2012			
	Cases HUS-	Cases HUS+	HUS+ cases (%)	Missing (%)	Cases HUS-	Cases HUS+	HUS+ cases (%)	Missing (%)	Cases HUS-	Cases HUS+	HUS+ cases (%)	Missing (%)
Cyprus	0	0	-	0.0	0	0	-	0.0	0	0	-	0.0
Czech Republic	0	1	100.0	0.0	6	1	14.3	0.0	5	4	44.4	0.0
Denmark	172	3	1.7	1.7	196	11	5.3	3.7	0	1	100.0	99.5
Estonia	-	-	-	100.0	3	0	0.0	25.0	3	0	0.0	0.0
Finland	-	-	-	100.0	-	-	-	100.0	-	-	-	100.0
France	44	54	55.1	4.9	109	112	50.7	0.0	82	109	57.1	8.2
Germany	907	48	5.0	0.0	4838	720	13.0	0.0	1517	56	3.6	0.0
Greece	1	0	0.0	0.0	1	0	0.0	0.0	0	0	-	0.0
Hungary	7	0	0.0	0.0	7	4	36.4	0.0	2	1	33.3	0.0
Ireland	143	18	11.2	18.3	185	18	8.9	26.2	308	27	8.1	18.7
Italy	0	33	100.0	0.0	19	27	58.7	9.8	18	32	64.0	0.0
Latvia	0	0	-	0.0	0	0	-	0.0	0	0	-	0.0
Lithuania	-	-	-	100.0	0	0	-	0.0	-	-	-	100.0
Luxembourg	-	-	-	100.0	-	-	-	100.0	-	-	-	100.0
Malta	1	0	0.0	0.0	2	0	0.0	0.0	-	-	-	100.0
Netherlands	347	7	2.0	25.9	636	17	2.6	22.7	860	15	1.7	16.6
Poland	2	1	33.3	0.0	3	2	40.0	0.0	0	1	100.0	0.0
Portugal	-	-	-	-	-	-	-	-	-	-	-	-
Romania	2	0	0.0	0.0	2	0	0.0	0.0	1	0	0.0	0.0
Slovakia	1	0	0.0	90.0	3	0	0.0	40.0	3	0	0.0	66.7
Slovenia	10	1	9.1	45.0	19	5	20.8	4.0	23	0	0.0	20.7
Spain	8	0	0.0	55.6	10	2	16.7	40.0	22	9	29.0	3.1
Sweden	0	2	100.0	99.4	34	23	40.4	88.1	0	7	100.0	98.5
United Kingdom	791	28	3.4	26.2	1237	40	3.1	14.9	296	57	16.1	73.6
EU total	**2 565**	**226**	**8.1**	**23.7**	**7 476**	**1 005**	**11.9**	**10.6**	**3 316**	**352**	**9.6**	**35.3**
Iceland	-	-	-	100.0	-	-	-	100.0	-	-	-	100.0
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-	-
Norway	36	5	12.2	21.2	37	6	14.0	8.5	56	4	6.7	20.0
EU/EEA total	**2 601**	**231**	**8.1**	**23.7**	**7 513**	**1 011**	**11.9**	**10.6**	**3 372**	**356**	**9.5**	**35.1**

– Not reported/not calculated

Table E5.12 a, b. Symptoms reported for STEC/VTEC-related HUS and non-HUS cases in the EU/EEA, 2010–2012

a. HUS cases

Symptom	HUS positive cases					
	2010		2011		2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
Bloody diarrhoea	60	75.0	583	79.6	103	56.6
Diarrhoea	20	25.0	149	20.4	79	43.4
Total	**80**	**100.0**	**732**	**100.0**	**182**	**100.0**

b. Non-HUS cases

Symptom	HUS negative cases					
	2010		2011		2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
Bloody diarrhoea	508	26.4	2 827	43.8	766	28.2
Diarrhoea	1 413	73.6	3 633	56.2	1 946	71.8
Total	**1 921**	**100.0**	**6 460**	**100.0**	**2 712**	**100.0**

Source: Austria, Belgium, Czech Republic, Denmark, Germany, Greece, Hungary, Ireland, Italy, Malta, the Netherlands, Poland, Romania, Slovenia, Spain, United Kingdom; EEA country: Norway

Table E5.13. Number of deaths and case–fatality ratio (CFR) of confirmed STEC/VTEC cases by EU/EEA country, 2010–2012

Country	2010					2011					2012				
	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)
Austria	88	100	2	2.27	0.28-7.97	120	100	2	1.67	0.20-5.89	130	100	0	0.00	0.00-2.80
Belgium	84	0	-	-	-	100	0	-	-	-	105	24.8	0	0.00	0.00-13.23
Bulgaria	0	-	0	-	-	1	0	-	-	-	0	-	0	-	-
Cyprus	0	-	0	-	-	0	-	0	-	-	0	-	0	-	-
Czech Republic	1	100	0	0.00	0.00-84.19	7	100	0	0.00	0.00-40.96	9	100	0	0.00	0.00-33.63
Denmark	178	100	0	0.00	0.00-2.05	215	100	0	0.00	0.00-1.70	193	100	0	0.00	0.00-1.89
Estonia	5	100	0	0.00	0.00-52.18	4	100	0	0.00	0.00-60.24	3	100	0	0.00	0.00-70.76
Finland	21	0	-	-	-	27	0	-	-	-	30	0	-	-	-
France	103	0	-	-	-	221	0	-	-	-	208	1.0	2	100	15.81-100
Germany	955	99.0	2	0.21	0.03-0.76	5 558	98.2	50	0.92	0.68-1.21	1 573	99.9	5	0.32	0.10-0.74
Greece	1	0	-	-	-	1	100	0	0.00	0.0-97.5	0	-	0	-	-
Hungary	7	100	0	0.00	0.00-40.96	11	100	0	0.00	0.00-28.49	3	100	0	0.00	0.00-70.76
Ireland	197	59.4	0	0.00	0.00-3.10	275	38.5	0	0.00	0.00-3.42	412	64.1	0	0.00	0.00-1.39
Italy	33	100	2	6.06	0.74-20.23	51	88.2	1	2.22	0.06-11.77	50	100	0	0.00	0.00-7.11
Latvia	0	-	0	-	-	0	-	0	-	-	0	-	0	-	-
Lithuania	1	0	-	-	-	0	-	0	-	-	2	100	0	0.00	0.00-84.19
Luxembourg	7	0	-	-	-	14	0	-	-	-	21	0	-	-	-
Malta	1	100	0	0.00	0.00-97.5	2	100	0	0.00	0.00-84.19	1	100	0	0.00	0.00-97.50
Netherlands	478	74.5	2	0.56	0.07-2.01	845	88.0	0	0.00	0.00-0.49	1 049	70.6	3	0.40	0.08-1.18
Poland	3	100	0	0.00	0.00-70.76	5	100	0	0.00	0.00-52.18	1	100	0	0.00	0.00-97.50
Portugal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Romania	2	100	0	0.00	0.00-84.19	2	100	0	0.00	0.00-84.19	1	100	0	0.00	0.00-97.50
Slovakia	10	90	0	0.00	0.00-33.63	5	60.0	0	0.00	0.00-70.76	9	66.7	0	0.00	0.00-45.93
Slovenia	20	100	0	0.00	0.00-16.84	25	100	0	0.00	0.00-13.72	29	100	0	0.00	0.00-11.94
Spain	18	0	-	-	-	20	0	-	-	-	32	0	-	-	-
Sweden	334	0	-	-	-	477	0	-	-	-	472	0	-	-	-
United Kingdom	1 110	28.6	0	0.00	0.00-1.15	1 501	49.4	3	0.40	0.08-1.18	1 339	22.4	2	0.67	0.08-2.39
EU total	3 657	56.9	8	0.38	0.17-0.76	9 487	78.9	56	0.75	0.57-0.97	5 672	58.7	12	0.36	0.19-0.63
Iceland	2	0	-	-	-	2	0	-	-	-	1	0	-	-	-
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Norway	52	50	0	0.00	0.00-13.23	47	74.5	0	0.00	0.0-10.0	75	54.7	0	0.00	0.00-8.60
EU/EEA total	3 711	56.8	8	0.38	0.16-0.75	9 536	78.9	56	0.74	0.56-0.97	5 748	58.7	12	0.36	0.18-0.62

– Not reported/not calculated

Table E5.14. Number and distribution of confirmed STEC/VTEC cases diagnosed from different specimen type as reported by EU/EEA countries in 2010–2012

Specimen	2010		2011		2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
Faeces	2 136	98.7	3 045	99.3	2 286	98.6
Blood	27	1.2	17	0.6	18	0.8
Urine	1	0.0	1	0.0	2	0.1
Other	1	0.0	4	0.1	13	0.6
Total	**2 165**	**100.0**	**3 067**	**100.0**	**2 319**	**100.0**

Source: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Greece, Hungary, Italy, Lithuania, Luxemburg, Malta, the Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, United Kingdom; EEA country: Norway

Annex F. Typhoid/paratyphoid fever

Table F6.1. **Number and proportion of confirmed *Salmonella* Typhi cases by origin of infection (domestic/travel-related) as reported by EU/EEA countries, 2010–2012**

Country	Confirmed cases reported	Domestic cases		Travel-related cases		Unknown	
		N	%	N	%	N	%
Austria	24	1	4.2	10	41.7	13	54.2
Belgium	67	0	0	0	0	67	100.0
Bulgaria	-	-	-	-	-	-	-
Cyprus	0	-	-	-	-	-	-
Czech Republic	9	0	0	9	100.0	0	0
Denmark	45	3	6.7	18	40.0	24	53.3
Estonia	2	1	50.0	1	50.0	0	0
Finland	15	0	0	14	93.3	1	6.7
France	424	0	0	0	0	424	100.0
Germany	188	13	6.9	170	90.4	5	2.7
Greece	16	5	31.3	9	56.3	2	12.5
Hungary	1	0	0	1	100.0	0	0
Ireland	31	3	9.7	24	77.4	4	12.9
Italy*	258	0	0	0	0	258	100.0
Latvia	1	0	0	1	100.0	0	0
Lithuania	1	0	0	0	0	1	100.0
Luxembourg	0	-	-	-	-	-	-
Malta	2	0	0	2	100.0	0	0
Netherlands	67	8	11.9	57	85.1	2	3.0
Poland	-	-	-	-	-	-	-
Portugal	36	6	16.7	5	13.9	25	69.4
Romania	1	0	0	1	100.0	0	0
Slovakia	1	1	100.0	0	0	0	0
Slovenia	4	0	0	0	0	4	100.0
Spain	68	54	79.4	0	0	14	20.6
Sweden	50	5	10.0	44	88.0	1	2.0
United Kingdom	808	37	4.6	485	60.0	286	35.4
EU total	**2 119**	**137**	**6.5**	**851**	**40.1**	**1 131**	**53.4**
Iceland	0	-	-	-	-	-	-
Liechtenstein	-	-	-	-	-	-	-
Norway	44	1	2.3	40	90.9	3	6.8
EU/EEA total	**2 163**	**138**	**6.4**	**891**	**41.1**	**1 134**	**52.5**

All cases reported under serotype 'typhi' without differentiate between serovars S. *typhi and* S. *paratyphi.*

Incomplete reporting for 2012

– Not reported/not calculated

Table F6.2. **Number and proportion of confirmed *Salmonella* Paratyphi* cases by origin of infection (domestic/travel-related) as reported by EU/EEA countries, 2010–2012**

Country	Confirmed cases reported	Domestic cases		Travel-related cases		Unknown	
		N	%	N	%	N	%
Austria	26	3	11.5	9	34.6	14	53.8
Belgium	84	-	-	-	-	84	100.0
Bulgaria	-	-	-	-	-	-	-
Cyprus	3	-	-	-	-	3	100.0
Czech Republic	9	1	11.1	8	88.9	0	0
Denmark	47	5	10.6	25	53.2	17	36.2
Estonia	1	0	0	1	100.0	0	0.0
Finland	15	2	13.3	12	80.0	1	6.7
France	109	-	-	-	-	109	100.0
Germany	155	31	20.0	124	80.0	0	0
Greece	10	5	50.0	5	50.0	0	0
Hungary	4	0	0	4	100.0	0	0
Ireland	13	0	0	9	69.2	4	30.8

Country	Confirmed cases reported	Domestic cases		Travel-related cases		Unknown	
		N	%	N	%	N	%
Italy§	0	-	-	-	-	-	-
Latvia	1	0	0	1	100.0	0	0
Lithuania	3	-	-	-	-	3	100.0
Luxembourg	0	-	-	-	-	-	-
Malta	1	0	0	1	100.0	0	0
Netherlands	126	18	14.3	106	84.1	2	1.6
Poland	-	-	-	-	-	-	-
Portugal	8	3	37.5	0	0	5	62.5
Romania	2	-	-	-	-	2	100.0
Slovakia	14	10	71.4	4	28.6	0	0
Slovenia	2	-	-	-	-	2	100.0
Spain	41	30	73.2	0	0	11	26.8
Sweden	44	4	9.1	40	90.9	0	0
United Kingdom	702	20	2.8	437	62.3	245	34.9
EU total	**1 420**	**132**	**9.3**	**786**	**55.2**	**502**	**35.5**
Iceland	0	-	-	-	-	-	-
Liechtenstein	-	-	-	-	-	-	-
Norway	36	3	8.3	32	88.9	1	2.8
EU/EEA total	**1 456**	**135**	**9.3**	**818**	**56**	**503**	**34.7**

* *Includes serovars* S. *Paratyphi,* S. *Paratyphi A,* S. *Paratyphi B, and* S. *Paratyphi C*

§ *All cases reported under serotype 'typhi' without differentiate between serovars* S. *typhi and* S. *paratyphi. Incomplete reporting for 2012.*

– Not reported/not calculated

Table F6.3. Number and notification rates of confirmed domestic *Salmonella* Typhi cases by EU/EEA countries, 2010–2012

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	0	0	0	0	1	<0.01
Belgium	-	-	-	-	-	-
Bulgaria	-	-	-	-	-	-
Cyprus	-	-	-	-	-	-
Czech Republic	0	0	0	0	0	0
Denmark	1	<0.1	2	<0.1	0	0
Estonia	1	0.1	0	0	0	0
Finland	0	0	0	0	0	0
France	-	-	-	-	-	-
Germany	4	<0.01	2	<0.01	7	<0.01
Greece	1	<0.01	1	<0.01	3	<0.1
Hungary	0	0	0	-	0	-
Ireland	0	0	2	<0.01	1	<0.01
Italy§	-	-	-	-	-	-
Latvia	0	0	0	0	0	0
Lithuania	-	-	-	-	-	-
Luxembourg	0	0	0	0	0	0
Malta	0	0	0	0	0	0
Netherlands	3	<0.1	2	0.01	3	<0.1
Poland	-	-	-	-	-	-
Portugal	4	<0.1	1	0.01	1	0.01
Romania	0	-	-	-	-	-
Slovakia	1	<0.1	0	0	0	0
Slovenia	-	-	-	-	-	-
Spain*	24	0.2	30	0.3	0	0
Sweden	4	<0.1	1	0.01	0	0
United Kingdom~	17	<0.1	15	<0.1	5	<0.01

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
EU total**	**60**	**<0.1**	**56**	**<0.1**	**21**	**<0.01**
Iceland	0	0	0	0	0	0
Liechtenstein	-	-	-	-	-	-
Norway	0	0	1	0.02	0	0
EU/EEA total**	**60**	**<0.1**	**57**	**<0.1**	**21**	**<0.01**

– Not reported/not calculated

§ All cases reported under serotype 'typhi' without differentiate between serovars S. *typhi and* S. *paratyphi. Incomplete reporting for 2012*

** Population coverage 25%*

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

*** For each year shown, notification rates were calculated, with the exception of countries with unknown population coverage. Also excluded were populations of countries which did not report data. Populations of countries which reported 0 cases were included.*

Table F6.4. Number and notification rates of confirmed domestic *Salmonella* Paratyphi* cases by EU/EEA countries, 2010–2012

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	0	0	1	0.01	2	<0.02
Belgium	-	-	-	-	-	-
Bulgaria	-	-	-	-	-	-
Cyprus	-	-	-	-	-	-
Czech Republic	0	0	1	<0.01	0	0
Denmark	1	<0.1	2	<0.1	2	<0.1
Estonia	0	0	0	0	0	0
Finland	1	<0.1	0	0	1	<0.1
France	-	-	-	-	-	-
Germany	12	0.01	12	0.01	7	<0.01
Greece	3	<0.1	1	<0.01	1	<0.01
Hungary	0	0	0	0	0	0
Ireland	0	0	0	0	0	0
Italy§	-	-	-	-	-	-
Latvia	0	0	0	0	0	0
Lithuania	-	-	-	-	-	-
Luxembourg	0	0	0	0	0	0
Malta	0	0	0	0	0	0
Netherlands	3	<0.1	7	<0.1	8	<0.1
Poland	-	-	-	-	-	-
Portugal	2	<0.1	0	0	1	<0.01
Romania	0	0	0	0	0	0
Slovakia	3	0.1	1	<0.1	6	0.1
Slovenia	-	-	-	-	-	-
Spain^	13	0.1	17	0.1	0	0
Sweden	1	0.01	2	<0.1	1	0.01
United Kingdom~	9	0.01	7	<0.1	4	<0.01

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
EU total	**48**	**<0.1**	**51**	**<0.1**	**33**	**0.01**
Iceland	0	0	0	0	0	0
Liechtenstein	-	-	-	-	-	-
Norway	2	<0.1	0	0	1	<0.1
EU/EEA total	**50**	**<0.1**	**51**	**<0.1**	**34**	**0.01**

– Not reported/not calculated

** Includes serovars* S. *Paratyphi,* S. *Paratyphi A,* S. *Paratyphi B, and* S. *Paratyphi C*

§ All cases reported under serotype 'typhi' without differentiate between serovars S. *typhi and* S. *paratyphi. Incomplete reporting for 2012.*

^ Population coverage 25%

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

*** For each year shown, notification rates were calculated, with the exception of countries with unknown population coverage. Also excluded were populations of countries which did not report data. Populations of countries which reported 0 cases were included.*

Table F6.5. Number and notification rates of confirmed travel-related *Salmonella* Typhi cases by EU/EEA countries, 2010–2012

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	4	<0.1	1	<0.1	5	0.1
Belgium	-	-	-	-	-	-
Bulgaria	-	-	-	-	-	-
Cyprus	-	-	-	-	-	-
Czech Republic	4	<0.1	3	<0.1	2	<0.1
Denmark	6	0.1	6	0.1	6	0.1
Estonia	0	0	0	0	1	0.1
Finland	8	0.2	5	0.1	1	0.01
France	-	-	-	-	-	-
Germany	62	0.1	57	0.1	51	0.1
Greece	4	<0.1	4	<0.1	1	<0.01
Hungary	0	0	0	0	1	<0.1
Ireland	8	0.2	10	0.2	6	0.1
Italy§	-	-	-	-	-	-
Latvia	1	<0.1	0	0	0	0
Lithuania	-	-	-	-	-	-
Luxembourg	0	0	0	0	0	0
Malta	0	0	2	0.5	0	0
Netherlands	27	0.2	16	0.1	14	0.1
Poland	-	-	-	-	-	-
Portugal	5	<0.1	0	0	0	0
Romania	1	<0.01	0	0	0	0
Slovakia	0	0	0	0	0	0
Slovenia	-	-	-	-	-	-
Spain*	0	0	0	0	0	0
Sweden	19	0.2	14	0.1	11	0.1
United Kingdom~	202	0.3	155	0.2	128	0.2

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
EU total**	**351**	**0.1**	**273**	**0.1**	**227**	**0.1**
Iceland	0	0	0	0	0	0
Liechtenstein	-	-	-	-	-	-
Norway	16	0.3	14	0.3	10	0.2
EU/EEA total**	**367**	**0.1**	**287**	**0.1**	**237**	**0.1**

– Not reported/not calculated

§ All cases reported under serotype 'typhi' without differentiate between serovars S. *typhi and* S. *paratyphi. Incomplete reporting for 2012.*

** Population coverage 25%*

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

*** For each year shown, notification rates were calculated, with the exception of countries with unknown population coverage. Also excluded were populations of countries which did not report data. Populations of countries which reported 0 cases were included.*

Table F6.6. Number and notification rates of confirmed travel-related *Salmonella* Paratyphi* cases by EU/EEA countries, 2010–2012

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	1	<0.1	1	<0.1	7	<0.1
Belgium	-	-	-	-	-	-
Bulgaria	-	-	-	-	-	-
Cyprus	-	-	-	-	-	-
Czech Republic	1	<0.01	3	<0.1	4	<0.1
Denmark	9	0.2	7	0.1	9	0.2
Estonia	0	0	0	0	1	0.1
Finland	6	0.01	3	0.01	3	0.01
France	-	-	-	-	-	-
Germany	45	0.1	43	0.1	36	0.0
Greece	2	<0.1	2	<0.1	1	<0.01
Hungary	4	<0.1	0	0	0	0
Ireland	3	0.1	2	<0.1	4	0.1
Italy§	-	-	-	-	-	-
Latvia	0	0	1	<0.1	0	0
Lithuania	-	-	-	-	-	-
Luxembourg	0	0	0	0	0	0
Malta	1	0.2	0	0	0	0
Netherlands	36	0.2	31	0.2	39	0.2
Poland	-	-	-	-	-	-
Portugal	0	0	0	0	0	0
Romania	0	0	0	0	0	0
Slovakia	2	<0.1	1	<0.1	1	<0.1
Slovenia	-	-	-	-	-	-
Spain^	0	0	0	0	0	0
Sweden	18	0.2	6	0.1	16	0.2
United Kingdom~	154	0.3	154	0.2	129	0.2

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
EU total**	**282**	**0.1**	**254**	**0.1**	**250**	**0.1**
Iceland	0	0	0	0	0	0
Liechtenstein	-	-	-	-	-	-
Norway	16	0.3	11	0.2	5	0.1
EU/EEA total**	**299**	**0.1**	**254**	**0.1**	**255**	**0.1**

– Not reported/not calculated

** Includes serovars* S. *Paratyphi,* S. *Paratyphi A,* S. *Paratyphi B, and* S. *Paratyphi C*

§ *All cases reported under serotype 'typhi' without differentiate between serovars* S. *typhi and* S. *paratyphi. Incomplete reporting for 2012*

^ Population coverage 25%

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

*** For each year shown, notification rates were calculated, with the exception of countries with unknown population coverage. Also excluded were populations of countries which did not report data. Populations of countries which reported 0 cases were included.*

Table F6.7. Notification rates of confirmed typhoid and paratyphoid fever cases by age groups and sex in EU/EEA countries, 2010–2012

Sex	Age group	2010		2011		2012		2010–2012	
		Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Male	<1 yr	7	2.8	4	1.8	1	0.4	12	1.7
	1–4 yrs	60	6.1	27	3.0	36	3.9	123	4.4
	5–14 yrs	118	4.9	85	3.9	67	3.0	270	3.9
	15–24 yrs	152	5.5	114	4.7	85	3.4	351	4.6
	25–44 yrs	279	4.3	208	3.6	214	3.7	701	3.9
	45–64 yrs	79	1.3	69	1.3	66	1.2	214	1.3
	≥ 65 yrs	14	0.4	17	0.5	21	0.6	52	0.5
	Total	**709**	**3.2**	**524**	**2.6**	**490**	**2.4**	**1 723**	**2.7**
Female	<1 yrs	3	1.3	4	1.9	4	1.9	11	1.7
	1–4 yrs	51	5.5	37	4.4	24	2.7	112	4.2
	5–14 yrs	92	4.0	80	3.8	48	2.2	220	3.4
	15–24 yrs	128	4.9	93	4.0	91	3.8	312	4.3
	25–44 yrs	199	3.1	167	3.0	150	2.6	516	2.9
	45–64 yrs	69	1.1	70	1.3	67	1.2	206	1.2
	≥ 65 yrs	20	0.4	21	0.5	24	0.5	65	0.5
	Total	**562**	**2.4**	**472**	**2.3**	**408**	**1.9**	**1 442**	**2.2**

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Ireland, Lithuania, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA country: Norway

Table F6.8. Number of reported isolates of *Salmonella* Typhi and *S.* Paratyphi serovars by age groups, EU/EEA countries, 2010–2012 (N=3 210)

Age groups	*S.* Typhi			*S.* Paratyphi			*S.* Paratyphi A			*S.* Paratyphi B			*S.* Paratyphi C		
	2010	2011	2012	2010	2011	2012	2010	2011	2012	2010	2011	2012	2010	2011	2012
< 1 yr	6	6	3	1	0	0	1	0	1	3	2	1	0	0	0
1–4 yrs	74	47	40	3	0	2	9	8	7	26	11	11	1	0	0
5–14 yrs	133	119	82	16	2	1	37	32	25	29	15	8	0	2	0
15–24 yrs	163	124	81	15	3	0	79	69	78	28	15	15	0	0	3
25–44 yrs	262	216	204	17	3	2	184	140	149	22	17	16	0	1	1
45–64 yrs	73	72	56	10	0	3	51	59	60	14	9	12	1	0	2
≥ 65 yrs	16	18	14	0	1	2	11	12	15	5	5	12	2	2	2
Total	**727**	**602**	**480**	**62**	**9**	**10**	**372**	**320**	**335**	**127**	**74**	**75**	**4**	**5**	**8**

Source: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Ireland, Lithuania, Malta, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA country: Norway

Table F6.9. Hospitalisation of confirmed typhoid and paratyphoid fever cases by EU/EEA countries, 2010–2012

Country	2010					2011					2012				
	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)
Austria	30	0.0	-	-	-	4	100.0	3	75.0	19.4-99.4	16	100.0	12	75.0	47.6-92.7
Belgium	72	0.0	-	-	-	50	0.0	-	-	-	29	0.0	-	-	-
Bulgaria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyprus	1	0.0	-	-	-	1	0.0	-	-	-	1	100.0	1	100.0	2.5-100
Czech Republic	5	0.0	-	-	-	7	0.0	-	-	-	6	100.0	6	100.0	52.1-100
Denmark	39	0.0	-	-	-	24	0.0	-	-	-	29	0.0	-	-	-
Estonia	1	100.0	1	100.0	2.5-100	0	-	0	-	-	2	100.0	2	100.0	15.8-100
Finland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
France	222	0.0	-	-	-	146	0.0	-	-	-	165	0.0	-	-	-
Germany	128	0.0	-	-	-	114	0.0	-	-	-	101	0.0	-	-	-
Greece	12	100.0	11	91.7	61.5-99.8	8	100.0	8	100.0	63.1-100	6	100.0	6	100.0	54.1-100
Hungary	4	100.0	3	75.0	19.4-99.4	0	-	0	-	-	1	100.0	1	100.0	2.5-100
Ireland	14	71.4	7	70.0	34.8-93.3	16	87.5	10	71.4	41.9-91.6	14	85.7	8	66.7	34.9-90.1
Italy§	134	0.0	-	-	-	89	0.0	-	-	-	35	0.0	-	-	-
Latvia	1	100.0	0	-	-	1	100.0	1	2.5-100	100	0	-	0	-	-
Lithuania	1	0.0	-	-	-	2	0.0	-	-	-	1	0.0	-	-	-
Luxembourg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Malta	1	0.0	-	-	-	2	0.0	-	-	-	0	-	0	-	-
Netherlands	72	100.0	46	63.9	51.7-74.9	56	100.0	29	51.8	38-65.3	65	100.0	33	50.8	38.1-63.4
Poland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Portugal	16	100.0	8	50.0	24.7-75.4	14	100.0	7	50.0	23-77	14	92.9	8	61.5	31.6-86.1
Romania	3	0.0	-	-	-	0	-	0	-	-	0	-	0	-	-
Slovakia	6	0.0	-	-	-	2	0.0	-	-	-	7	0.0	-	-	-
Slovenia	2	0.0	-	-	-	3	0.0	-	-	-	1	0.0	-	-	-
Spain	37	0.0	-	-	-	47	0.0	-	-	-	25	0.0	-	-	-
Sweden	42	0.0	-	-	-	24	0.0	-	-	-	28	0.0	-	-	-
United Kingdom	586	0.3	1	50.0	1.3-98.7	524	0.4	2	100.0	15.8-100	400	0.3	1	100.0	2.5-100
EU total	1 429	8.3	77	64.8	55.5-73.3	1 134	8.7	60	60.2	49.8-70	946	12.6	78	65.5	56.1-71.8
Iceland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Norway	34	100	27	79.4	62.1-91.3	26	100	25	96.2	80.4-99.9	20	90	16	88.9	65.3-98.6
EU/EEA total	1 463	10.5	104	67.5	59.8-75.2	1 160	10.8	85	67.7	58.8-75.9	966	14.3	94	68.1	59.5-76.4

– Not reported/not calculated

§ *All cases reported under serotype 'typhi' without differentiate between serovars* S. *typhi and* S. *paratyphi. Incomplete reporting for 2012.*

Table F6.10. Number of deaths and case-fatality ratio (CFR) of confirmed *Salmonella* Typhi cases by EU/EEA countries, 2010–2012

Country	2010					2011					2012				
	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)
Austria	17	0.0	-	-	-	1	100.0	0	0.00	0-97.5	6	100.0	0	0.00	0-45.9
Belgium	26	0.0	-	-	-	25	0.0	-	-	-	16	0.0	-	-	-
Bulgaria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyprus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Czech Republic	4	100.0	0	0.00	0-60.2	3	100.0	0	0.00	0-70.8	2	100.0	0	0.00	0-80.6
Denmark	21	0.0	-	-	-	10	0.0	-	-	-	14	0.0	-	-	-
Estonia	1	100.0	0	0.00	0-97.5	0	-	0	-	-	1	100.0	0	0.00	0-97.5
Finland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
France	160	0.0	-	-	-	146	0.0	-	-	-	118	0.0	-	-	-
Germany	71	100.0	0	0.00	0-5.1	59	98.3	0	0.00	0-6.2	58	100.0	0	0.00	0-6.2
Greece	7	100.0	0	0.00	0-41	5	100.0	0	0.00	0-52.2	4	100.0	0	0.00	0-60.2
Hungary	0	-	0	-	-	0	-	0	-	-	1	100.0	0	0.00	0-97.5
Ireland	9	55.6	0	0.00	0-52.2	14	42.9	0	0.00	0-45.9	8	75.0	0	0.00	0-45.9

Country	2010					2011					2012				
	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)
Italy§	134	0.0	-	-	-	89	0.0	-	-	-	35	0.0	-	-	-
Latvia	1	100	0	0.00	0-97.5	0	-	0	-	-	0	-	0	-	-
Lithuania	0	-	0	-	-	0	-	0	-	-	1	0.0	-	-	-
Luxembourg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Malta	0	-	0	-	-	2	100.0	0	0.00	0-84.2	0	-	0	-	-
Netherlands	31	100.0	0	0.00	0-11.2	18	100.0	0	0.00	0-18.5	18	94.4	0	0.00	0-19.5
Poland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Portugal	14	100.0	0	0.00	0-23.2	11	100.0	1	9.09	0.2-41.3	11	81.8	0	0.00	0-33.6
Romania	1	100.0	0	0.00	0-97.5	0	-	0	-	-	0	-	0	-	-
Slovakia	1	100.0	0	0.00	0-97.5	0	-	0	-	-	0	-	0	-	-
Slovenia	2	0.0	-	-	-	1	0.0	-	-	-	1	0.0	-	-	-
Spain	24	0.0	-	-	-	30	0.0	-	-	-	14	0.0	-	-	-
Sweden	23	0.0	-	-	-	16	0.0	-	-	-	11	0.0	-	-	-
United Kingdom	328	0.0	-	-	-	279	0.4	1	100.00	2.5-100	201	0.5	1	100.00	2.5-100
EU total	875	15.8	0	0	0.0-2.69*	709	15	2	1.9	0.23-6.71	520	20.4	1	0.94	0.02-5.29
Iceland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Norway	16	68.8	0	0	0-28.5	15	93.3	0	0	0-23.2	13	46.2	0	0	0-45.9
EU/EEA total	891	16.8	0	0	0.0-2.49*	724	16.7	2	1.68	0.20-5.94	533	21.1	1	0.89	0.02-5.01

– Not reported/not calculated

§ *All cases reported under serotype 'typhi' without differentiate between serovars S. typhi and* S. *paratyphi. Incomplete reporting for 2012.*

** One-sided, 97.5% confidence interval*

Table F6.11. Number of deaths and case–fatality ratio (CFR) of confirmed *Salmonella* Paratyphi* cases by EU/EEA countries, 2010–2012

Country	2010					2011					2012				
	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)
Austria	13	0.0	-	-	-	3	100.0	0	0.00	0-70.8	10	100.0	0	0.00	0-30.9
Belgium	46	0.0	-	-	-	25	0.0	-	-	-	13	0.0	-	-	-
Bulgaria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyprus	1	100.0	0	0.00	0-97.5	1	100.0	0	0.00	0-97.5	1	100.0	0	0.00	0-97.5
Czech Republic	1	100.0	0	0.00	0-97.5	4	100.0	0	0.00	0-60.2	4	100.0	0	0.00	0-60.2
Denmark	18	0.0	-	-	-	14	0.0	-	-	-	15	0.0	-	-	-
Estonia	0	-	0	-	-	0	-	0	-	-	1	100	0	0.00	0-97.5
Finland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
France	62	0.0	-	-	-	0	-	0	-	-	47	0.0	-	-	-
Germany	57	100.0	0	0.00	0-6.3	55	100.0	0	0.00	0-6.5	43	100.0	0	0.00	0-8.2
Greece	5	100.0	0	0.00	0-52.2	3	100.0	0	0.00	0-70.8	2	100.0	0	0.00	0-84.2
Hungary	4	100.0	0	0.00	0-60.2	0	-	0	-	-	0	-	0	-	-
Ireland	5	20.0	0	0.00	0-97.5	2	100.0	0	0.00	0-84.2	6	50.0	0	0.00	0-70.8
Italy§	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Latvia	0	-	0	-	-	1	100	0	0.00	0-97.5	0	-	0	-	-
Lithuania	1	0.0	-	-	-	2	0.0	-	-	-	0	-	0	-	-
Luxembourg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Malta	1	100.0	0	0.00	0-97.5	0	-	0	-	-	0	-	0	-	-
Netherlands	41	100.0	0	0.00	0-8.6	38	100.0	0	0.00	0-9.3	47	100.0	0	0.00	0-7.6
Poland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Portugal	2	100.0	0	0.00	0-84.2	3	66.7	0	0.00	0-84.2	3	100.0	0	0.00	0-70.8
Romania	2	100.0	0	0.00	0-84.2	0	-	0	-	-	0	-	0	-	-
Slovakia	5	80.0	0	0.00	0-60.2	2	50.0	0	0.00	0-97.5	7	100.0	0	0.00	0-41
Slovenia	0	-	0	-	-	2	0	-	-	-	0	-	0	-	-
Spain	13	0.0	-	-	-	17	0.0	-	-	-	11	0.0	-	-	-
Sweden	19	0.0	-	-	-	8	0.0	-	-	-	17	0.0	-	-	-
United Kingdom	258	0.4	1	100.00	2.5-100	245	0.0	-	-	-	199	0.5	1	100.00	2.5-100
EU total	554	21.7	1	0.83	0.02-4.5	425	25.7	0	0.00	0-3.3*	426	28.0	1	0.85	0.02-4.63
Iceland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Country	2010					2011					2012				
	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)
Norway	18	77.8	0	0.00	0-23.2	11	81.8	0	0.00	0-33.6	7	42.9	0	0.00	0-70.8
EU/EEA total	572	23.4	1	0.75	0.02-4.1	436	27.1	0	0.00	0-3.1^	433	28.2	1	0.83	0.02-4.5

– Not reported/not calculated

§ All cases reported under serotype 'typhi' without differentiate between serovars S. *typhi and* S. *paratyphi. Incomplete reporting for 2012.*

^ One-sided, 97.5% confidence interval

** Includes serovars* S. *Paratyphi,* S. *Paratyphi A,* S. *Paratyphi B, and* S. *Paratyphi C*

Table F6.12. Number and distribution of confirmed typhoid and paratyphoid fever cases by specimen type in EU/EEA countries, 2010–2012

Specimen	2010		2011		2012	
	Cases	Percentage (%)	Cases	Percentage (%)	Cases	Percentage (%)
Blood	661	67.7	560	68.5	466	66.4
Faeces	298	30.5	242	29.6	217	30.9
Urine	8	0.8	7	0.9	8	1.1
Pus	1	0.1	2	0.2	1	0.1
Other	9	0.9	6	0.7	10	1.4
Total	**977**	**100.0**	**817**	**100.0**	**702**	**100.0**

Source: Austria, Cyprus, Denmark, Estonia, France, Germany, Greece, Hungary, Ireland, Lithuania, Malta, Portugal, Romania, Slovakia, Slovenia, Spain, United Kingdom; EEA country: Norway

Table F6.13. Multi-drug resistance profiles of *Salmonella* Typhi isolates, EU/EEA countries, 2010–2012

Antimicrobial agent	Resistant type	2010			2011			2012			2010–2012		
		Res^ (N)	Total* (N)	Res^ (%)	Res^ (N)	Total* (N)	Res^ (%)	Res^ (N)	Total* (N)	Res^ (%)	Res^ (N)	Total* (N)	Res^ (%)
AMP, CHL, CIP and NAL, SSS, STR, SXT	ACNSuSTm	45	513	8.8	74	326	22.7	38	331	11.5	157	1 170	13.4
AMP, CHL, CIP and NAL, SSS, STR, SXT, TCY	ACNSuSTmT	11	513	2.1	8	326	2.5	4	331	1.2	23	1 170	2.0
AMP, CHL, SSS, STR, SXT	ACSuSTm	0	513	0.0	1	326	0.3	3	331	0.9	4	1 170	0.3
AMP, CHL, CIP and NAL, SSS, STR	ACNSuS	2	513	0.4	2	326	0.6	2	331	0.6	6	1 170	0.5
AMP, CHL, CIP and NAL, STR, SXT	ACNSTm	2	513	0.4	0	326	0.0	2	331	0.6	4	1 170	0.3
AMP, CHL, CIP and NAL, SSS, STX, TCY	ACNSuTmT	1	513	0.2	0	326	0.0	2	331	0.6	3	1 170	0.3
AMP, CHL, SSS, SXT, TCY	ACSuTmT	8	513	1.6	1	326	0.3	1	331	0.3	10	1 170	0.9
AMP, CHL, SSS, STR, SXT, TCY	ACSuSTmT	2	513	0.4	1	326	0.3	1	331	0.3	4	1 170	0.3
CHL, SSS, SXT	CSuTm	5	513	1.0	0	326	0.0	1	331	0.3	6	1 170	0.5
AMP, CHL, SSS, STR, TCY	ACNSuST	0	513	0.0	2	326	0.6	0	331	0.0	2	1 170	0.2
AMP, CIP and NAL, SXT	ANTm	0	513	0.0	2	326	0.6	0	331	0.0	2	1 170	0.2
CIP and NAL, SSS, STR, SXT, TCY	NSuSTmT	4	513	0.8	1	326	0.3	0	331	0.0	5	1 170	0.4
CHL, CIP and NAL, SSS, STR, SXT, TCY	CNSuSTmT	6	513	1.2	0	326	0.0	0	331	0.0	6	1 170	0.5
	Total	**86**			**92**			**54**			**232**		
	Other multidrug-resistant isolates	19			3			12			34		
	Total	**100**			**95**			**66**			**261**		

^ Res= Number and proportion of resistant strains (total number of resistant strains out of all the tested strains)

** Total indicates the total number of isolates with Multidrug information available*

Source: Estonia, France, Greece, Ireland, Italy, Lithuania, Malta, the Netherlands, Romania, Slovenia, Spain, United Kingdom

Table F6.14. Multi-drug resistance profiles of *Salmonella* Paratyphi** isolates, EU/EEA countries, 2010–2012

Antimicrobial agent	Resistant type	2010			2011			2012			2010–2012		
		Res^ (N)	Total* (N)	Res^ (%)	Res^ (N)	Total* (N)	Res^ (%)	Res^ (N)	Total* (N)	Res^ (%)	Res^ (N)	Total* (N)	Res^ (%)
AMP, CHL, CIP and NAL, SSS, STR, STX, TCY	ACNSuSTmT	1	410	0.2	0	314	0.0	0	284	0.0	1	1 008	0.1
AMP, CHL, CIP and NAL, SSS, TCY	ACNSuT	0	410	0.0	1	314	0.3	0	284	0.0	1	1 008	0.1
AMP, CHL, CIP and NAL, STX, TCY	ACNTmT	0	410	0.0	0	314	0.0	1	284	0.4	1	1 008	0.1

Antimicrobial agent	Resistant type	2010			2011			2012			2010–2012		
		Res^ (N)	Total* (N)	Res^ (%)	Res^ (N)	Total* (N)	Res^ (%)	Res^ (N)	Total* (N)	Res^ (%)	Res^ (N)	Total* (N)	Res^ (%)
AMP, CHL, SSS, STR, TCY	ACSuST	0	410	0.0	0	314	0.0	3	284	1.1	3	1 008	0.3
AMP, GEN, STR	AGS	1	410	0.2	0	314	0.0	1	284	0.4	2	1 008	0.2
AMP, GEN, STX	AGTm	1	410	0.2	0	314	0.0	0	284	0.0	1	1 008	0.1
AMP, KAN, STR	AKS	1	410	0.2	1	314	0.3	0	284	0.0	2	1 008	0.2
AMP, CIP and NAL, CTX, SSS, SXT, TCY	ANCtSuTmT	0	410	0.0	0	314	0.0	1	284	0.4	1	1 008	0.1
AMP, CIP and NAL, CTX, SXT	ANCtTm	0	410	0.0	0	314	0.0	1	284	0.4	1	1 008	0.1
AMP, CIP and NAL, STR, SXT	ANSTm	0	410	0.0	0	314	0.0	1	284	0.4	1	1 008	0.1
AMP, CIP and NAL, TCY	ANT	0	410	0.0	1	314	0.3	0	284	0.0	1	1 008	0.1
AMP, SSS, SXT, TCY	ASuTmT	0	410	0.0	0	314	0.0	1	284	0.4	1	1 008	0.1
CHL, CIP and NAL, STR, TCY	CNST	2	410	0.5	0	314	0.0	0	284	0.0	2	1 008	0.2
CHL, CIP and NAL, SXT	CNTm	2	410	0.5	0	314	0.0	0	284	0.0	2	1 008	0.2
GEN, KAN, STR	GKS	1	410	0.2	0	314	0.0	0	284	0.0	1	1 008	0.1
KAN, STR, SXT	KSTm	0	410	0.0	0	314	0.0	2	284	0.7	2	1 008	0.2
CIP and NAL, STR, SXT	NSTm	1	410	0.2	0	314	0.0	0	284	0.0	1	1 008	0.1
CIP and NAL, SXT, TCY	NTmT	0	410	0.0	0	314	0.0	1	284	0.4	1	1 008	0.1
SSS, SXT, TCY	SuTmT	1	410	0.2	0	314	0.0	0	284	0.0	1	1 008	0.1
	Total	**11**			**3**			**12**			**26**		

^ Res = Number and proportion of resistant strains (total number of resistant strains out of all the tested strains)

** Total indicates the total number of isolates with Multidrug information available*

*** Includes serovars* S. *Paratyphi,* S. *Paratyphi A,* S. *Paratyphi B, and* S. *Paratyphi C*

Source: Denmark, Estonia, France, Germany, Greece, Ireland, Italy, Lithuania, Malta, the Netherlands, Romania, Slovakia, Slovenia, Spain, United Kingdom

Annex G. Yersiniosis

Table G7.1. Number and proportion of confirmed yersiniosis cases by origin of infection (domestic/travel-related), as reported by EU/EEA countries, 2010–2012

Country	Confirmed cases reported	Domestic cases		Travel-related cases		Unknown	
		N	%	N	%	N	%
Austria	333	171	51.4	28	8.4	134	40.2
Belgium	686	61	8.9	0	0.0	625	91.1
Bulgaria ^	20	-	-	-	-	20	100.0
Cyprus	0	0		0		0	
Czech Republic	1 518	1498	98.7	20	1.3	0	0.0
Denmark	709	68	9.6	71	10.0	570	80.4
Estonia	174	165	94.8	9	5.2	0	0.0
Finland	1 641	66	4.0	96	5.9	1479	90.1
France	846	-	-	-	-	846	100.0
Germany	9 413	9 064	96.3	210	2.2	139	1.5
Greece	-	-	-	-	-	-	-
Hungary	233	230	98.7	3	1.3	0	0.0
Ireland	11	2	18.2	0	0.0	9	81.8
Italy	44	14	31.8	4	9.1	26	59.1
Latvia	79	79	100.0	0	0.0	0	0.0
Lithuania	1 074	860	80.1	3	0.3	211	19.6
Luxembourg	-	-	-	-	-	-	-
Malta	1	1	100.0	0	0.0	0	0.0
Netherlands	-	-	-	-	-	-	-
Poland	641	637	99.4	3	0.5	1	0.2
Portugal	-	-	-	-	-	-	-
Romania	100	-	-	-	-	100	100.0
Slovakia	513	512	99.8	1	0.2	0	0.0
Slovenia	54	7	13.0	2	3.7	45	83.3
Spain [a]	809	809	100.0	0	0.0	0	0.0
Sweden	934	710	76.0	160	17.1	64	6.9
United Kingdom	168	17	10.1	1	0.6	150	89.3
EU total	**20 001**	**14 971**	**73.7**	**611**	**3.0**	**4 419**	**22.7**
Iceland	-	-	-	-	-	-	-
Liechtenstein	-	-	-	-	-	-	-
Norway	155	81	52.3	37	23.9	37	23.9
EU/EEA total	**20 156**	**15 052**	**73.5**	**648**	**3.2**	**4 456**	**22.7**

– Did not report/not calculated

^ Aggregated reporting

[a] Population coverage 25%

Table G7.2. Number and notification rates of confirmed domestic yersiniosis cases by EU/EEA country, 2010–2012

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	-	-	76	0.9	95	1.1
Belgium*	-	-	61	0.6	-	-
Bulgaria ^	-	-	-	-	-	-
Cyprus	0	0.0	0	0.0	0	0.0
Czech Republic	443	4.2	456	4.3	599	5.7
Denmark	28	0.5	40	0.7	0	0.0
Estonia	56	4.2	63	4.7	46	3.4
Finland	23	0.4	17	0.3	26	0.5
France*	-	-	-	-	-	-
Germany	3144	3.9	3 298	4.0	2622	3.2
Greece	-	-	-	-	-	-
Hungary	86	0.9	91	0.9	53	0.5
Ireland	1	0.0	1	0.0	-	-

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Italy*	5	0.0	6	0.0	3	0.0
Latvia	23	1.0	28	1.3	28	1.4
Lithuania	427	12.8	256	8.4	177	5.9
Luxembourg	-	-	-	-	-	-
Malta	1	0.2	0	0.0	0	0.0
Netherlands	-	-	-	-	-	-
Poland	203	0.5	233	0.6	201	0.5
Portugal	-	-	-	-	-	-
Romania	-	-	-	-	-	-
Slovakia	166	3.1	166	3.1	180	3.3
Slovenia	6	0.3	1	0.0	0	0.0
Spain[a]	325	2.8	264	2.3	220	1.9
Sweden	218	2.3	256	2.7	236	2.5
United Kingdom ~	10	0.0	-	-	7	0.0
EU total**	**5 165**	**1.4**	**5 313**	**1.4**	**4 493**	**1.2**
Iceland	-	-	-	-	-	-
Liechtenstein	-	-	-	-	-	-
Norway	27	0.6	32	0.7	22	0.4
EU/EEA total**	**5 192**	**1.4**	**5 345**	**1.4**	**4 515**	**1.2**

– Not reported/not calculated

** Sentinel surveillance. Population coverage unknown so notification rate not calculated*

^ Aggregated reporting

[a] Population coverage 25%

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

*** For each year shown, notification rates were calculated, with the exception of countries with unknown population coverage. Populations of non- reporting countries have been also excluded. Populations of countries reporting 0 cases have been included.*

Table G7.3. Number and notification rates of confirmed travel-related yersiniosis cases by EU/EEA country, 2010–2012

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
Austria	-	-	14	0.2	14	0.2
Belgium*	-	-	0	0.0	-	-
Bulgaria^	-	-	-	-	-	-
Cyprus	0	0.0	0	0.0	0	0.0
Czech Republic	4	0.0	4	0.0	12	0.1
Denmark	17	0.3	33	0.6	21	0.4
Estonia	2	0.1	6	0.4	1	0.1
Finland	37	0.7	33	0.6	26	0.5
France*	-	-	-	-	-	-
Germany	63	0.1	83	0.1	64	0.1
Greece	-	-	-	-	-	-
Hungary	1	0.0	2	0.0	0	0.0
Ireland	0	0.0	0	0.0	-	-
Italy*	1	0.0	1	0.0	2	0.0
Latvia	0	0.0	0	0.0	0	0.0
Lithuania	1	0.0	0	0.0	2	0.1
Luxembourg	-	-	-	-	-	-
Malta	0	0.0	0	0.0	0	0.0
Netherlands	-	-	-	-	-	-
Poland	2	0.0	1	0.0	0	0.0
Portugal	-	-	-	-	-	-
Romania	-	-	-	-	-	-
Slovakia	0	0.0	0	0.0	1	0.0
Slovenia	1	0.0	0	0.0	1	0.0
Spain[a]	0	0.0	0	0.0	0	0.0
Sweden	41	0.4	69	0.7	50	0.5

Country	2010		2011		2012	
	Cases	Rate	Cases	Rate	Cases	Rate
United Kingdom ~	1	0.0	0	0.0	0	0.0
EU total**	**171**	**0.1**	**246**	**0.1**	**194**	**0.1**
Iceland	-	-	-	-	-	-
Liechtenstein	-	-	-	-	-	-
Norway	10	0.2	14	0.3	13	0.3
EU/EEA total**	**181**	**0.1**	**260**	**0.1**	**207**	**0.1**

– Not reported/not calculated

** Sentinel surveillance. Population coverage unknown so notification rate not calculated*

^ Aggregated reporting

[a] Population coverage 25%

~ There is no single surveillance system in the UK. Data are representative (as submitted by England and Wales, Scotland and Northern Ireland), however surveillance systems might not be identical.

*** For each year shown, notification rates were calculated, with the exception of countries with unknown population coverage. Populations of non- reporting countries have been also excluded. Populations of countries reporting 0 cases have been included.*

Table G7.4. Notification rates of confirmed yersiniosis cases by age group and sex in EU/EEA countries, 2010–2012

Sex	Age group	2010		2011		2012		2010–2012	
		Cases	Rate	Cases	Rate	Cases	Rate	Cases	
Male	< 1 yr	172	8.1	129	6.1	126	6.1	427	6.8
	1–4 yrs	899	10.9	900	10.7	710	8.4	2509	10.0
	5–14 yrs	926	4.6	915	4.5	839	4.1	2680	4.4
	15–24 yrs	512	2.1	530	2.2	451	1.9	1493	2.1
	25–44 yrs	462	0.8	529	0.9	504	0.9	1495	0.9
	45–64 yrs	344	0.7	366	0.7	323	0.6	1033	0.7
	≥ 65 yrs	207	0.7	221	0.8	197	0.7	625	0.7
	Total	**3 522**	**1.8**	**3 590**	**1.9**	**3 150**	**1.6**	**10 262**	**1.8**
Female	< 1 yr	152	7.6	154	7.7	125	6.4	431	7.2
	1–4 yrs	833	10.6	738	9.2	665	8.3	2236	9.4
	5–14 yrs	666	3.5	716	3.7	627	3.3	2009	3.5
	15–24 yrs	325	1.4	343	1.5	344	1.5	1012	1.5
	25–44 yrs	411	0.7	448	0.8	435	0.8	1294	0.8
	45–64 yrs	403	0.8	443	0.8	400	0.7	1246	0.8
	≥ 65 yrs	252	0.6	298	0.7	299	0.7	849	0.7
	Total	**3 042**	**1.5**	**3 140**	**1.6**	**2 895**	**1.4**	**9 077**	**1.5**

Source: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA country: Norway

Table G7.5. Number of isolates and relative distribution of reported yersiniosis cases by species and age group (N=18 831), EU/EEA countries, 2010–2012

Age groups	*Yersinia enterocolitica*			*Yersinia pseudotuberculosis*			*Yersinia* species unspecified			Other *Yersinia* species		
	2010	2011	2012	2010	2011	2012	2010	2011	2012	2010	2011	2012
< 1 yr	272	276	246	0	0	1	1	4	1	5	2	1
1–4 yrs	1558	1 615	1 349	1	0	6	8	8	6	13	3	8
5–14 yrs	1 491	1601	1429	12	5	13	6	11	7	4	6	5
15–24 yrs	789	835	764	13	8	11	4	13	3	11	10	6
25–44 yrs	793	907	876	30	17	23	11	27	9	9	8	14
45–64 yrs	692	746	663	29	18	31	6	14	9	5	10	7
≥ 65 yrs	428	494	464	11	4	16	2	2	3	2	3	7
Total	**6 023**	**6474**	**5 791**	**96**	**52**	**101**	**38**	**79**	**38**	**49**	**42**	**48**

Source: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom; EEA country: Norway

Table G7.6. Proportion of confirmed *Yersinia enterocolitica* cases by serotypes (N=9 579) as reported by EU/EEA countries, 2010–2012

Country	O:3 (n = 8 548)			O:9 (n = 698)			O:8 (n = 186)			O:5_27 (n = 146)			O:1 (n = 1)			Total serotypes reported (N)
	2010	2011	2012	2010	2011	2012	2010	2011	2012	2010	2011	2012	2010	2011	2012	
Austria	70	74	65	12	12	12	-	-	-	-	-	1	-	-	1	**247**
Estonia	21	16	10	-	-	-	-	-	-	-	-	-	-	-	-	**47**
Germany	2588	2440	1864	163	209	201	30	40	37	30	59	45	-	-	-	**7706**
Hungary	55	21	27	1	-	-	-	-	-	-	-	-	-	-	-	**104**
Italy	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**
Lithuania	-	161	101	-	-	2	-	-	-	-	-	-	-	-	-	**264**
Norway	48	29	37	2	27	3	-	-	0	1	1	1	-	-	-	**149**
Poland	55	40	114	1	2	1	20	55	3	-	-	-	-	-	-	**291**
Romania	5	9	5	-	-	-	-	-	-	-	-	-	-	-	-	**19**
Slovakia	18	60	69	-	-	-	-	-	-	-	1	1	-	-	-	**149**
Slovenia	14	9	-	1	-	-	-	-	-	-	-	-	-	-	-	**24**
Spain	-	52	33	-	-	-	-	-	-	-	-	-	-	-	-	**85**
Sweden	122	174	141	12	16	21	1	-	-	1	5	-	-	-	-	**493**

– Not reported/not calculated

Table G7.7. Distribution of confirmed Yersinia enterocolitica cases by serotype and age groups (N=9 607), EU/EEA countries, 2010–2012

Age groups	Serotype O:3			Serotype O:9			Serotype O:8			Serotype O:5_27			Serotype Others*		
	2010	2011	2012	2010	2011	2012	2010	2011	2012	2010	2011	2012	2010	2011	2012
< 1 yr	85	114	99	6	4	6	2	5	0	0	1	1	0	0	0
1–4 yrs	855	856	692	40	42	42	22	38	8	3	11	7	0	3	0
5–14 yrs	944	973	765	37	41	50	9	15	6	4	8	11	1	1	1
15–24 yrs	440	435	372	22	33	34	3	9	3	4	7	8	3	4	1
25–44 yrs	311	353	267	38	54	36	6	3	9	7	14	8	1	2	2
45–64 yrs	230	234	172	21	50	46	7	12	4	4	13	4	3	6	3
≥ 65 yrs	132	116	98	28	42	26	2	13	10	10	12	8	2	2	0
Total	**2 997**	**3 081**	**2 465**	**192**	**266**	**240**	**51**	**95**	**40**	**32**	**66**	**47**	**10**	**18**	**7**

Source: Austria, Estonia, Germany, Hungary, Italy, Lithuania, Poland, Romania, Slovakia, Slovenia, Spain and Sweden; EEA country: Norway

** 'Others' includes isolates reported as Antigen O5 (25–44 years n=2; 45–64 years n=2) and isolates reported as 'other'.*

Table G7.8. Hospitalisation of confirmed yersiniosis cases by EU/EEA country, 2010–2012

Country	2010					2011					2012				
	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)
Austria	84	0	-	-	-	119	94.1	49	43.8	34.4-53.4	130	95.4	41	33.1	24.9-42.1
Belgium	216	0	-	-	-	214	0	-	-	-	256	0	-	-	-
Bulgaria	5	0	-	-	-	4	0	-	-	-	11	0	-	-	-
Cyprus	0	-	0	-	-	0	-	0	-	-	0	-	0	-	-
Czech Republic	447	0	-	-	-	460	0	-	-	-	611	0	-	-	-
Denmark	193	0	-	-	-	225	0	-	-	-	291	0	-	-	-
Estonia	58	98.3	29	50.9	37.3-64.4	69	100	39	56.5	44-68.4	47	1 000	24	51.1	36.1-65.9
Finland	522	0	-	-	-	554	0	-	-	-	565	0	-	-	-
France	238	0	-	-	-	294	0	-	-	-	314	0	-	-	-
Germany	3 346	0	-	-	-	3381	0	-	-	-	2686	0	-	-	-
Greece	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hungary	87	100	18	20.7	12.8-30.7	93	100	22	23.7	15.5-33.6	53	100	14	26.4	15.3-40.3
Ireland	3	66.7	2	100	15.8-100	6	83.3	3	60.0	14.7-94.7	2	100	2	100	15.8-100
Italy	15	80.0	3	25.0	5.5-57.2	15	0		-	-	14	0	0	-	-
Latvia	23	0	-	-	-	28	100	13	46.4	27.5-66.1	28	100	7	25	14.7-45.4
Lithuania	428	100	335	78.3	74.1-82.1	370	100	258	69.7	64.8-74.4	276	99.6	173	62.9	56.9-68.6
Luxembourg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Malta	1	100	1	100.0	2.5-100	0	-	0	-	-	0	-	0	-	-
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Poland	205	100	156	76.1	69.7-81.8	235	100	177	75.3	69.3-80.7	201	100	115	57.2	50.1-64.2

Country	2010					2011					2012				
	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)	Cases	Cases covered (%)	Hospi-talisation (N)	Hospi-talisation ratio (%)	95% CI (%)
Portugal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Romania	27	96.3	23	88.5	69.9-97.6	47	100	38	80.9	66.7-90.9	26	84.6	19	86.4	65.1-97.1
Slovakia	166	0	-	-	-	166	0	-	-	-	181	0	-	-	-
Slovenia	16	100	9	56.3	29.9-80.3	16	100	5	31.3	11-58.7	22	100	12	54.5	32.2-75.6
Spain	325	0	-	-	-	264	0	-	-	-	220	0	-	-	-
Sweden	281	0	-	-	-	350	0	-	-	-	303	0	-	-	-
United Kingdom	55	20.0	11	100.0	71.5-100	59	0	-	-	-	54	16.7	9	100	66.4-100
EU total	6 741	12.5	587	69.5	66.2-72.6	6 969	14.0	604	61.9	58.8-65.0	6 291	12.2	416	54.3	51.2-57.6
Iceland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Norway	52	86.5	6	13.3	5.1-26.8	60	95.0	15	26.3	15.5-39.7	43	95.3	11	26.8	14.2-42.9
EU/EEA total	6 793	13.1	593	66.6	63.4-69.7	7 029	14.7	619	60.0	57.0-63.0	6 334	12.7	427	53.2	50.3-56.4

– Not reported/not calculated

Table G7.9. Number of deaths and case–fatality ratio (CFR) of confirmed yersiniosis cases by EU/EEA country, 2010–2012

Country	2010					2011					2012				
	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)	Cases	Cases covered (%)	Deaths (N)	CFR (%)	95% CI (%)
Austria	84	100	0	0	0-4.3	119	100	1	0.84	0.02-4.6	130	100	0	0	0-2.8
Belgium	216	0	-	-	-	214	0	-	-	-	256	0	-	-	-
Bulgaria	5	0	-	-	-	4	0	-	-	-	11	0	-	-	-
Cyprus	0	-	0	-	-	0	-	0	-	-	0	-	0	-	-
Czech Republic	447	100	0	0	0-0.8	460	100	0	0	0-0.8	611	100	0	0	0-0.6
Denmark	193	0	-	-	-	225	0	-	-	-	291	0	-	-	-
Estonia	58	100	0	0	0-6.2	69	100	0	0	0-5.2	47	100	0	0	0-7.6
Finland	522	0	-	-	-	554	0	-	-	-	565	0	-	-	-
France	238	0	-	-	-	294	0	-	-	-	314	0	-	-	-
Germany	3346	99.3	0	0	0-0.1	3381	99.1	0	0	0-0.1	2 686	100	0	0	0-0.1
Greece	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hungary	87	100	0	0	0-4.2	93	100	0	0	0-3.9	53	100	0	0	0-6.7
Ireland	3	66.7	0	0	0-84.2	6	50.0	0	0	0-70.8	2	50	0	0	0-97.5
Italy	15	0	-	-	-	15	0	-	-	-	14	0	-	-	-
Latvia	23	100	0	0	0-14.8	28	100	0	0	0-12.3	28	100	0	0	0-12.3
Lithuania	428	80.6	0	0	0-1.1	370	100	0	0	0-1	276	100	0	0	0-1.3
Luxembourg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Malta	1	100	0	0	0-97.5	0	-	0	-	-	0	-	0	-	-
Netherlands	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Poland	205	86.8	0	0	0-2.1	235	84.7	0	0	0-1.8	201	93	0	0	0-2
Portugal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Romania	27	100	0	0	0-12.8	47	100	0	0	0-7.6	26	85	0	0	0-15.4
Slovakia	166	91.0	0	0	0-2.4	166	95.2	0	0	0-2.3	181	93	0	0	0-2.2
Slovenia	16	100	0	0	0-20.6	16	100	0	0	0-20.6	22	100	0	0	0-15.4
Spain	325	0	-	-	-	264	0	-	-	-	220	0	-	-	-
Sweden	281	0	-	-	-	350	0	-	-	-	303	0	-	-	-
United Kingdom	55	21.8	0	0	0-26.5	59	0	-	-	-	54	13	0	0	0-41
EU total	6 741	70.5	0	0	0-0.08*	6 969	70.5	1	0.02	<0.001-0.1	6 291	65.8	0	0	0-0.09*
Iceland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Liechtenstein	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Norway	52	61.5	0	0	0-10.9	60	63.3	0	0	0-9.3	43	67	0	0	0-11.9
EU/EEA total	6 793	70.4	0	0	0-0.08*	7 029	70.4	1	0.02	<0.001-0.1	6 334	65.8	0	0	0-0.09*

– Not reported/not calculated

** One-sided, 97.5% confidence interval.*

Annex H. EU case definitions

Campylobacteriosis (*Campylobacter* spp.)

EU case definition

According to Commission Decision 2012/506/EU

Clinical criteria

Any person with at least one of the following three:

- Diarrhoea
- Abdominal pain
- Fever

Laboratory criteria

- Isolation of *Campylobacter spp.* from stool or blood

Differentiation of *Campylobacter spp.* should be performed if possible

Epidemiological criteria

At least one of the following five epidemiological links:

- Animal to human transmission
- Human-to-human transmission
- Exposure to a common source
- Exposure to contaminated food/drinking water
- Environmental exposure

Case classification

A. Possible case N/A

B. Probable case

Any person meeting the clinical criteria and with an epidemiological link

C. Confirmed case

Any person meeting the clinical and the laboratory criteria

Listeriosis (*Listeria monocytogenes*)

EU case definition

According to Commission Decision 2012/506/EU

Clinical criteria

Any person with at least one of the following three:

- Listeriosis of newborns defined as

Stillbirth

OR

At least one of the following five in the first month of life:

- Granulomatosis infantiseptica
- Meningitis or meningoencephalitis
- Septicaemia
- Dyspnoea
- Lesions on skin, mucosal membranes or conjunctivae

Listeriosis in pregnancy defined as at least one of the following three:

- Abortion, miscarriage, stillbirth or premature birth
- Fever
- Influenza-like symptoms

Other forms of listeriosis defined as at least one of the following four:

- Fever
- Meningitis or meningoencephalitis
- Septicaemia
- Localised infections such as arthritis, endocarditis, and abscesses

Laboratory criteria

At least one of the following two:

- Isolation of *Listeria monocytogenes* from a normally sterile site
- Isolation of *Listeria monocytogenes* from a normally non-sterile site in a foetus, stillborn, newborn or the Mother at or within 24 hours of birth

Epidemiological criteria

At least one of the following three epidemiological links:

- Exposure to a common source
- Human-to-human transmission (vertical transmission)
- Exposure to contaminated food/drinking water

Additional information

Incubation period 3–70 days, most often 21 days

Case classification

A. Possible case N/A

B. Probable case

Any person meeting the clinical criteria and with an epidemiological link

C. Confirmed case

Any person meeting the laboratory criteria

OR

Any mother with a laboratory-confirmed listeriosis infection in her foetus, stillborn or newborn

Salmonellosis (*Salmonella spp.* other than *S.* Typhi *and* *S.* Paratyphi)

EU case definition

According to Commission Decision 2012/506/EU

Clinical criteria

Any person with at least one of the following four:

- Diarrhoea
- Fever
- abdominal pain
- Vomiting

Laboratory criteria

Isolation of *Salmonella* (other than *Salmonella typhi* and *Salmonella paratyphi)* from stool, urine, body site (e.g. infected wound) or any normally sterile body fluids and tissues (e.g. blood, CSF, bone, synovial fluid, etc.)

Epidemiological criteria

At least one of the following five epidemiological links:

- Human-to-human transmission
- Exposure to a common source
- Animal to human transmission
- Exposure to contaminated food/drinking water
- Environmental exposure

Case classification

A. Possible case N/A

B. Probable case

Any person meeting the clinical criteria and with an epidemiological link

C. Confirmed case

Any person meeting the clinical and the laboratory criteria

Shiga toxin/verocytotoxin-producing *Escherichia coli* infection (STEC/VTEC)

EU case definition

According to Commission Decision 2012/506/EU

Clinical criteria

STEC/VTEC diarrhoea

Any person with at least one of the following two:

- Diarrhoea
- Abdominal pain

HUS

Any person with acute renal failure and at least one of the following two:

- Microangiopathic haemolytic anaemia
- Thrombocytopenia

Laboratory criteria

At least one of the following four:

- Isolation of an *Escherichia coli* strain that produces Shiga toxin (Stx) or harbours stx1 or stx2 gene(s)
- Isolation of non-sorbitol-fermenting (NSF) *Escherichia coli* O157 (without Stx or stx gene testing)
- Direct detection of stx1 or stx2 gene(s) nucleic acid (without strain isolation)
- Direct detection of free Stx in faeces (without strain isolation)

Only for HUS the following can be used as laboratory criterion to confirm STEC/VTEC:

- *E. coli* serotype-specific (LPS) antibody response

Isolation of an STEC/VTEC strain and additional characterisation by serotype, phage type, eae genes, and subtypes of stx1/stx2 should be performed if possible

Epidemiological criteria

At least one of the following five epidemiological links:

- Human-to-human transmission
- Exposure to a common source
- Animal to human transmission
- Exposure to contaminated food/drinking water
- Environmental exposure

Case classification

A. Possible case of STEC-associated HUS

Any person meeting the clinical criteria for HUS

B. Probable case of STEC/VTEC

Any person meeting the clinical criteria and with an epidemiological link

C. Confirmed case of STEC/VTEC

Any person meeting the clinical and the laboratory criteria

Shigellosis (*Shigella* spp.)

EU case definition

According to Commission Decision 2012/506/EU

Clinical criteria

Any person with at least one of the following four:

- Diarrhoea
- Fever
- Vomiting
- Abdominal pain

Laboratory criteria

- Isolation of *Shigella spp*. from a clinical specimen

Epidemiological criteria

At least one of the following five epidemiological links:

- Human-to-human transmission
- Exposure to a common source
- Animal to human transmission
- Exposure to contaminated food/drinking water
- Environmental exposure

Case classification

A. Possible case N/A

B. Probable case

Any person meeting the clinical criteria and with an epidemiological link

C. Confirmed case

Any person meeting the clinical and the laboratory criteria

Typhoid/paratyphoid fever *(Salmonella typhi/paratyphi)*

EU case definition

According to Commission Decision 2012/506/EU

Clinical criteria

Any person with at least one of the following two:

- Onset of sustained fever

At least two of the following four:

- Headache
- Relative bradycardia
- Non-productive cough
- Diarrhoea, constipation, malaise or abdominal pain

Paratyphoid fever has the same symptoms as typhoid fever, however usually a milder course.

Laboratory criteria

- Isolation of *Salmonella typhi* or *paratyphi* from a clinical specimen

Epidemiological criteria

At least one of the following five epidemiological links:

- Exposure to a common source
- Human-to-human transmission
- Exposure to contaminated food/drinking water

Case classification

A. Possible case N/A

B. Probable case

Any person meeting the clinical criteria and with an epidemiological link

C. Confirmed case

Any person meeting the clinical and the laboratory criteria

Yersiniosis (*Yersinia enterocolitica*, *Yersinia pseudotuberculosis*)

EU case definition

According to Commission Decision 2012/506/EU

Clinical criteria

Any person with at least one of the following five:

- Fever
- Diarrhoea
- Vomiting
- Abdominal pain (pseudoappendicitis)
- Tenesmus

Laboratory criteria

- Isolation of human pathogenic *Yersinia enterocolitica* or *Yersinia pseudotuberculosis* from a clinical specimen

Epidemiological criteria

At least one of the following four epidemiological links:

- Human-to-human transmission
- Exposure to a common source
- Animal to human transmission
- Exposure to contaminated food

Case classification

A. Possible case N/A

B. Probable case

Any person meeting the clinical criteria and with an epidemiological link

C. Confirmed case

Any person meeting the clinical and the laboratory criteria