Epidemiology of reported *Yersinia enterocolitica* infections in Germany, 2001-2008

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Abstract

Background

Yersiniosis is the third most common zoonotic bacterial disease in Germany and the European Union a significant public health problem in other industrialized countries as well. Sequelae of Yersinia enterocolitica infections, such as e.g., reactive arthritis, have been reported to occur. Consumption of pork and pork products, especially eaten raw or undercooked, is an important risk factor of yersiniosis. Infection with Y. enterocolitica is notifiable through the national surveillance system for infectious diseases in Germany, and several thousands of yersiniosis cases are reported each year. Here, we present recent data on the epidemiology of reported yersiniosis in Germany.

Methods

We analyzed surveillance data on yersiniosis, accessed through the national level database (SurvNet), with regard to time trends, demographical and geographical distribution, serotypes, and hospitalization, for the time period 2001 through 2008. Data were accessed through the national level database (SurvNet).

Results

A total of 47,627 cases of yersiniosis were reported from 2001 through 2008. The mean annual incidence of yersiniosis was 7.2/100,000 population. A downward trend in the number of reportable cases has occurred since 2002. Almost all Y. enterocolitica infections were reported as single cases, i.e., with no apparent links to other cases. The number of reported infections showed substantially less seasonal variation than in other zoonotic enteric diseases. The incidence was highest
among in children under five years (58/100,000 population), in particular among in one-year-old children (108/100,000 population). Almost 97% of infections were acquired domestically. High incidence occurred was highest in the eastern German federal states Thuringia, Saxony, and Saxony-Anhalt. Differences in incidences across federal states were driven primarily by incidence differences in children under five years. Hospitalization was reported for 17% of cases, The proportion of hospitalized cases was highest among teenagers. Almost 90% of all Y. enterocolitica strains were diagnosed as serotype O:3, which is the serotype most frequently isolated from pigs.

Conclusions

Yersiniosis is a zoonotic foodborne disease of relevance to public health relevance in Germany because of its high incidence and risk for sequelae. The incidence of reported yersiniosis in Germany varies markedly from state to state, mainly due to incidence difference among young children. More research efforts should be directed towards the elucidation of risk factors of yersiniosis in this age group.

Background

Yersiniosis due to infection with the bacterium Yersinia enterocolitica is a zoonotic gastrointestinal disease in humans. Y. enterocolitica species can be isolated from a variety of domestic and wildlife animals, e.g., pigs, cattle, sheep, goats, dogs, cats, wild boars, and small rodents [1]. Pigs are considered to be the main reservoir of human pathogenic strains, largely because of the high prevalence of these strains in pigs and the high genetic similarity between of porcine and human isolates [2-4]. Infections are thought to be primarily transmitted to humans by food, in particular,
raw or undercooked pork and pork products [1, 5]. However, other risk factors, such as contaminated drinking water or pet animal contact have been reported as well [6-9]. Six different biotypes (biotype 1A, 1B, 2-5) and numerous serotypes of *Y. enterocolitica* have been described. Eleven of those serotypes have been frequently associated with infections in humans [1]. In Europe, most of the human pathogenic *Y. enterocolitica* strains are classified as biotype 4, serotype O:3 [10].

Clinical symptoms of yersiniosis first appear after an incubation period of about five days (range one to eleven days) and include diarrhea, fever, vomiting, tenesma and abdominal pain. In older children and young adults, abdominal pain in the right lower abdomen can occur, which may be mistaken for appendicitis (pseudoappendicitis). Typically, symptoms will disappear within one to two weeks after onset. Sequelae such as reactive arthritis or erythema nodosum sometimes occur in some cases [11]. Yersiniosis contributes substantially to foodborne diseases in industrialized countries and is therefore notifiable through national surveillance systems in most countries within the European Union (EU), including Germany. After campylobacteriosis and salmonellosis, yersiniosis ranks third among the notifiable bacterial zoonoses in Germany and the EU. In 2007, 8,874 confirmed cases of yersiniosis were reported to the European Centre for Disease Control and Prevention (ECDC), 4,987 (56%) of which were those from Germany [12]. There is a paucity of recent comprehensive data on the epidemiology of yersiniosis, e.g., detailed analysis of trends over time or affected population groups is sparse. Here we present results of the analysis of yersiniosis surveillance data from Germany for the time period 2001-2008.
Methods

Yersiniosis surveillance data from Germany were analyzed for the time period 2001-2008. In Germany, an acute culture-confirmed infection with *Yersinia enterocolitica* is notifiable to the local health department according to the Protection against Infection Act (Infektionsschutzgesetz, IfSG) that came into effect in 2001. Each notification has to be electronically forwarded from the local health department via the state health department to the federal public health institute, the Robert Koch-Institute (RKI), where the national surveillance database is hosted. To ensure comparability of surveillance data across German federal states, surveillance case definitions exist for each notifiable condition. A case of yersiniosis is included in the RKI statistics when the diseased person that is being reported as a case showed clinical symptoms (i.e., at least one of the following: diarrhea, abdominal pain, tenesma, fever with body temperature of 38.5°C or above, and vomiting) and the *Y. enterocolitica* infection was either culture-confirmed from stool or some other clinical material, or confirmed epidemiologically. Epidemiological confirmation of a case is defined as contact with another laboratory-confirmed case, contact with an animal infected with *Y. enterocolitica*, or consumption of food items contaminated with *Y. enterocolitica*. Prior to 2004, patients with clinical symptoms and serological evidence of infection (agglutination reaction (Widal), confirmation of IgA-, IgG- or IgM-antibodies by ELISA or Western blot) also fulfilled the case definition. For the present report, surveillance data of the time period 2001 through 2008 were analyzed. The total number of reported yersiniosis cases was 47,627. Data were accessed through the national level database (SurvNet) at the Robert Koch-Institute and analyzed with Microsoft Excel. Data are openly available via SurvStat®RKI.
Descriptive data analysis was performed using Microsoft Excel.

Results

Time trend

The total number of yersiniosis cases reported in the time period 2001-2008 was 47,627. The annual number of reported *Yersinia enterocolitica* infections ranged from 4,354 to 7,540 (Table 1), corresponding to an annual incidence of 5.3 to 9.2 infections per 100,000 population, respectively, with an average annual incidence of 7.2 infections per 100,000 population. Of all the reported *Yersinia enterocolitica* infections (n=47,627), 99.3% had been laboratory-confirmed and 0.7% had been confirmed epidemiologically. Of the reported laboratory-confirmed infections, 92% had been culture-confirmed. A downward trend in the annual number of reported *Y. enterocolitica* cases and, correspondingly, in the incidence has been observed since 2002 across all age groups and all German federal states, with an overall decrease in reported cases by of 42% in reported cases from 2002 to 2008 (Table 1). In contrast to other important zoonotic enteric diseases, e.g., those caused by *Salmonella* spp. or *Campylobacter* spp., which typically peak during the summer months, the seasonal distribution of reported *Y. enterocolitica* infections was relatively uniform, with only a slight increase in reported cases in the months of June, July, and September. The lowest numbers of *Y. enterocolitica* infections were reported in March and April (Figure 1). The majority of infections with *Y. enterocolitica* (about 98%) was reported as singular cases, i.e., with no apparent links to other cases. From 2001 through 2008, 19 to 53 clusters of yersinioses that affected a total of 40 to 156 persons were
reported to the RKI each year. Most reported clusters consisted of only just two cases, typically from the same household. Clusters with five or more epidemiologically related cases were reported only once or twice a year (data not shown).

**Demographic distribution**

*Y. enterocolitica* infections occurred more frequently in boys and men than in female girls and women persons with mean annual incidences of 8.0/100,000 population and 6.5/100,000 population, respectively. Children were more frequently affected than adults. The average annual incidence of *Y. enterocolitica* infections in children under the age of five was about twelve-fold higher than the average in the German population aged five years and older (57.6/100,000 population vs. 4.9/100,000 population, respectively). The highest incidence of reported *Y. enterocolitica* infections occurred among one-year-old children (107.9/100,000 population) (Figure 2).

**Geographical distribution**

Each year, about 97% of reported yersiniosis infections with available information on the most likely country of infection were acquired domestically (Table 2). The mean annual incidence of reported *Y. enterocolitica* infections varied across the 16 German federal states, being highest in the eastern states Thuringia (23 cases per 100,000 population), Saxony (17 cases per 100,000 population), and Saxony-Anhalt (17 cases per 100,000 population), and lowest in the southern states Bavaria (five cases per 5/100,000 population) and Baden-Wuerttemberg (three cases per 3/100,000 population) (Figure 3). High overall annual incidences in federal states were mainly
due mainly to high incidences among children. Across federal states, mean annual incidences among children <5 years of age aged four years and younger differed by a factor of almost 30 (e.g., Thuringia: 413 cases per 100,000 population, Baden-Wuerttemberg: 14 cases per 100,000 population). In comparison, incidences among adults (≥18 years or older) differed only by a factor of about three across federal states (e.g., Mecklenburg-Western Pomerania: six cases per 6/100,000 population, Baden-Wuerttemberg: two cases per 2/100,000 population). From 2001 through 2008 Over the period of analysis, a decrease in the number of reported yersinioses was observed for all federal states.

Serotypes

By far, the most commonly reported human pathogenic Y. enterocolitica serotype was O:3 (Table 1). Of all notified cases with information on serotype, 89% were attributed to serotype O:3, 6% to serotype O:9, 0.8% to serotype O:5,27, 0.2% to serotype O:8, and 4% to other, non-specified serotypes. In the observed time period, the number of reported cases with no available information on serotype decreased annually, from about 33% in 2001 to 12% in 2008 (Table 1). The distribution of serotypes among reported cases varied according to age groups. More than 90% of Y. enterocolitica infections among persons under 20 years of age were caused by serotype O:3, compared with 70% among patients ≥60 years and older. The proportion of infections caused by serotype O:9 was higher in adults ≥40 years of age than in younger patients (Table 3).

The causative agent was classified as Y. enterocolitica serotype O:3 in 89% of reported infections that were acquired in Germany or in other countries of the European Union and the European Free Trade Association (EFTA: EU plus...
Iceland, Liechtenstein, Norway, Switzerland). This percentage was only 77% when *Y. enterocolitica* infections were acquired in non-European countries. *Y. enterocolitica* serotype O:8 infections were more frequently imported from non-European countries than infections due to other serotypes (Table 2).

**Clinical aspects**

Diarrhea and abdominal pain were the most common symptoms of reported *Y. enterocolitica* infections (Table 4). Compared to other serotypes, abdominal pain and fever were reported less frequently (34% and 11%, respectively), but diarrhea, vomiting and tenesma were reported more frequently (94%, 10%, and 3%, respectively) when infections were caused by *serotype O:8* infections. The percentage of patients with *Y. enterocolitica* infection for which a hospital stay was reported remained stable at about 17% throughout the observed time period regardless of diagnosed serotype, with the exception of serotype O:8 (with 39% of patients being hospitalized). The proportion of hospitalized patients varied with by age, being and was highest for the teenagers group (10–19 years; 28% hospitalized) and among elderly patients (≥60 years of age and older; 25% hospitalized). The median length of stay in the hospital was 4 days, but this varied with by sex, age group, and serotype. It was prolonged in patients that were female, older than ≥20 years of age, and if isolates belonged to serotypes other than O:3. The hospitalization rate was highest (34%) and the median length of hospital stay was 8 days, when the pathogen was classified as *serotype O:8*. Between 2001 and 2008, fourteen deaths due to *Y. enterocolitica* infection were reported to the national surveillance database. Six of the deceased persons had been over 60 years of age.
years. Serotypes of the *Y. enterocolitica* isolates were reported for seven of the fourteen deaths and included O:3 (5 deaths) and O:9 (2 deaths).

**Discussion**

We present German surveillance data on yersiniosis due to *Yersinia enterocolitica* infection for the time period 2001-2008 has been analyzed. The incidence of *Y. enterocolitica* infection was highest among children aged four years and younger, in particular one-year-old children. In addition to consumption of pork, other risk factors of yersiniosis should be considered for this age group. A recent case-control study that had been conducted in Sweden among children under seven years of age identified, in addition to pork consumption, contact to domestic animals, in particular dogs and cats, and use of a pacifier as risk factors [8]. Age-specific risk factors, with evidence of environmental transmission, have also been demonstrated for infections with Shiga toxin-producing *E. coli* (STEC) and *Campylobacter* spp. [15, 16]. A high incidence of yersiniosis among young children has been reported for other countries, and acute diarrheal illnesses caused by enteric pathogens other than *Y. enterocolitica*, e.g., infections with *Salmonella* spp., *Campylobacter* spp., or *E. coli* including STEC, also occur at high frequencies among infants [17-20]. Factors that could contribute to the high incidence in reported diarrheal illnesses in this age group may include an increased rate of exposure to enteric pathogens as a result of fecal-oral contamination [21], predisposition to infection due to an immature and unchallenged immune system [21], higher frequency of physician consultations among parents of infants [22], or
higher frequency of submission of stool samples for diagnosis by physicians when infants have been affected.

Within Germany, the highest incidences of yersiniosis were observed in the federal states Thuringia, Saxony, and Saxony-Anhalt. Similar results were obtained in a joint spatial analysis of four gastrointestinal infectious diseases, including yersiniosis, that took underreporting into account [23]. Alt Though drawing causal inferences from group level data to the individual level is error-prone, it is still interesting to note that, according to a recent national nutrition study, consumption of meat products and sausages was relatively high in those states that reported with the highest incidences of yersiniosis (e.g. Saxony and Thuringia). Unfortunately, published data do not specify the type of meat consumed, so it is not clear making it unclear whether these results are also true for pork products as well [24]. The number of reported *Y. enterocolitica* infections did not show seasonal variability, which may support the hypothesis that the infection is transmitted via food items that are consumed consistently throughout the year, such as meat and meat products [24], rather than being associated with unknown environmental factors. Besides, environmental transmission of zoonotic enteric pathogens, for example, direct contact to animals, for example, seems to be more pronounced in the summer, contributing to the seasonal peak incidences associated within warmer months, as observed for illnesses due to infection with, e.g. caused by, STEC and *Campylobacter* spp. [15, 16].

Children were more frequently infected with *Y. enterocolitica* O:3 than adults, whereas adults ≥ 40 years and older of age were more frequently infected by *Y. enterocolitica* serotype O:9 than younger age groups. It is conceivable that prior
exposure in children to *Y. enterocolitica* O:3 may *conceivably* provide some protection against acquiring acute infections due to the same serotype later in life, but not necessarily from other serotypes whereas it may not protect against infections with other serotypes. Hospitalization was reported for 17% of patients infected with *Y. enterocolitica*, which is lower than the proportion of hospitalizations among reported *Salmonella* spp. infections in Germany (24%), and but *slightly higher than this proportion among* in reported *Campylobacter* spp. infections (14%) (data unpublished data). Hospitalization duration was longer than the median of 4 four days when serotypes other than O:3 were diagnosed as causative agent. Hospitalization rate was highest and length of hospital stay was twice as long as the median when infection was due to serotype O:8, which may support the findings that the course of disease is more severe when caused by with this serotype [25]. However, the total number of reported cases infected with serotype O:8 was low (62 reported cases from 2001 through 2008 over the study period) and in not sufficient for a more detailed analysis. Interestingly, the hospitalization rate was relatively high (28%) among teenagers (age group 10-19 years). It has been described that symptoms of yersiniosis can resemble symptoms of appendicitis in this age group (pseudoappendicitis), which may be a reason account for more frequent hospitalizations [26] and unnecessary appendectomies among teenagers [27].

In Germany, an overall downward the trend in the number of reportable cases of yersiniosis has been observed downward since 2002. The reason for the decline this is uncertain, but can be observed for other gastrointestinal infections caused by enteric pathogens, e.g., salmonellosis, as well [28] with the exception of *Campylobacter* spp. infections. Improved food safety control measures and better hygiene measures
during food preparation at the consumer level are conceivable explanations for the continuing decrease of *Y. enterocolitica* infections. Compared to other European countries, the incidence of yersiniosis in Germany remains relatively high. For example, in 2007, the overall incidence was more than about two-fold higher (6.1/100,000 population) than the average in all European countries reporting to the European Centre for Disease Control and Prevention (ECDC) (2.9/100,000 population) [12]. Several reasons should be considered: First, notification of yersiniosis to the health care system is compulsory and based on laboratory diagnosis of the pathogen. Variability in reporting systems, frequency of diagnosis, and degree of underreporting among European countries may contribute to incidence differences. Second, since consumption of pork is a risk factor of yersiniosis, food preferences may play an important role. Pork is the most frequently consumed meat in Germany with an annual consumption of about 40 kg per capita [29]. Third, prevalence and concentration of *Y. enterocolitica* in food-producing animals and products made from can also result in incidence differences among EU countries.

Surveillance data come with inherent limitations. For example, routine surveillance captures only a fraction of cases that occur in the population. Thus far, the degree of under-ascertainment has not been systematically addressed in Germany. Based on studies that were conducted in other countries, it is estimated that for each culture-confined case of acute diarrheal illness between five and 68 undiagnosed cases exist in the community [22, 30, 31]. Furthermore, a more severe course of disease is more likely to precipitate medical evaluation [32, 33], as is, probably, young age of the patient. Consequently, surveillance data are
unlikely to be representative for the entirety of yersiniosis cases within the community. Surveillance data typically do not typically include detailed clinical information on every reported case, e.g., the presence of chronic diseases or cause of death, or detailed information on the laboratory diagnostic procedures. Despite these limitations, analysis of surveillance data can provide a good overview of the distribution of yersiniosis within the German population. However, identifying the risk factors of *Y. enterocolitica* infections, in particular among young children, requires analytical epidemiological methods. A case-control study is currently being conducted to elucidate and quantify the most important risk factors of *Y. enterocolitica* infections in Germany and to assess sequelae-associated risk factors with the aim of recommending effective preventive measures for improvement that will improve disease control.

**Conclusions**

In Germany, yersiniosis is a zoonotic enteric disease with public health relevance because of its high incidence and the possibility of sequelae. Young children are affected most frequently, in particular one-year-old children, but incidence in this age group varies markedly from state to state. More research efforts are required to elucidate risk factors of *Yersinia enterocolitica* infections, especially in young children.

**Competing interests**

The authors declare that they have no competing interests.
Authors' contributions

BR analyzed the data and wrote the manuscript. KS and DW critically reviewed the manuscript. All authors read and approved the final version.

Acknowledgements

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References


[http://www.mri.bund.de/nn_784780/SharedDocs/Publikationen/nvs_ergebnisbericht_teil2-vs.html]


Figure legends

Figure 1 - Seasonal distribution of reported Yersinia enterocolitica infections in Germany, 2001-2008

Data shows mean monthly incidence per 100,000 population.

Figure 2 - Reported Yersinia enterocolitica infections in Germany by age group and sex, 2001-2008

Data shows mean annual incidence per 100,000 population. Note that age group ranges vary.
Figure 3 - Reported *Yersinia enterocolitica* infections in German federal states, 2001-2008

Data on the map shows mean annual incidence per 100,000 population by federal state.
Tables

Table 1-Annual number of reported *Yersinia enterocolitica* infections according to serotype

The total number of reported infections was 47,627. For serotypes other than O:3, O:9, O:5,27 and O:8, serotype specification was not available from the surveillance data ("other" serotypes). Not all reported infections contained information on serotype ("no information on serotype").

<table>
<thead>
<tr>
<th>Year</th>
<th>Year</th>
<th>Year</th>
<th>Year</th>
<th>Year</th>
<th>Year</th>
<th>Year</th>
<th>Year</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>2001</td>
<td>2002</td>
<td>2003</td>
<td>2004</td>
<td>2005</td>
<td>2006</td>
<td>2007</td>
</tr>
<tr>
<td>O:3</td>
<td>4,304</td>
<td>5,227</td>
<td>4,826</td>
<td>4,672</td>
<td>4,306</td>
<td>3,945</td>
<td>3,935</td>
</tr>
<tr>
<td>O:9</td>
<td>279</td>
<td>325</td>
<td>269</td>
<td>325</td>
<td>282</td>
<td>256</td>
<td>264</td>
</tr>
<tr>
<td>O:5,27</td>
<td>32</td>
<td>29</td>
<td>35</td>
<td>44</td>
<td>48</td>
<td>59</td>
<td>35</td>
</tr>
<tr>
<td>O:8</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>14</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>Other</td>
<td>175</td>
<td>342</td>
<td>432</td>
<td>185</td>
<td>149</td>
<td>155</td>
<td>118</td>
</tr>
<tr>
<td>No information on serotype</td>
<td>2,404</td>
<td>1,617</td>
<td>1,015</td>
<td>953</td>
<td>829</td>
<td>730</td>
<td>628</td>
</tr>
<tr>
<td>Total</td>
<td>7,195</td>
<td>7,540</td>
<td>6,577</td>
<td>6,184</td>
<td>5,628</td>
<td>5,161</td>
<td>4,988</td>
</tr>
</tbody>
</table>
Table 2 – Domestically acquired and imported *Y. enterocolitica* infections

Reported frequency of country of infection is listed for different serotypes (as in percentages). Total number of reported serotypes with available information on country of infection: O:3, n=30,513; O:9, n=2,006; O:5,27, n=265; O:8, n=61; other serotypes, n=1,434. Category “other European countries” includes EU member states (without Germany) plus Iceland, Liechtenstein, Norway, and Switzerland.

<table>
<thead>
<tr>
<th>Most likely country of infection</th>
<th>O:3</th>
<th>O:9</th>
<th>O:5,27</th>
<th>O:8</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>97.4</td>
<td>96.4</td>
<td>95.8</td>
<td>95.1</td>
<td>96.7</td>
<td>97.3</td>
</tr>
<tr>
<td>Other European countries</td>
<td>1.9</td>
<td>1.9</td>
<td>1.5</td>
<td>0.0</td>
<td>1.9</td>
<td>1.9</td>
</tr>
<tr>
<td>Non-European countries</td>
<td>0.7</td>
<td>1.7</td>
<td>2.6</td>
<td>4.9</td>
<td>1.4</td>
<td>0.8</td>
</tr>
</tbody>
</table>
Table 3 - Percentage of reported *Yersinia enterocolitica* serotypes according to age group, 2001-2008

Total number of serotypes: O:3, n=34,576; O:9, n=2,277; O:5,27, n=312; O:8, n=62; other serotypes, n=1,701. For serotypes other than O:3, O:9, O:5,27 and O:8, serotype specification was not available from the surveillance data (“other” serotypes). Percentages may not add up to 100.0% due to rounding.

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>O:3</th>
<th>O:9</th>
<th>O:5,27</th>
<th>O:8</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 4</td>
<td>92.7</td>
<td>4.1</td>
<td>0.3</td>
<td>0.1</td>
<td>2.9</td>
</tr>
<tr>
<td>5 to 9</td>
<td>93.3</td>
<td>3.6</td>
<td>0.3</td>
<td>0.1</td>
<td>2.6</td>
</tr>
<tr>
<td>10 to 19</td>
<td>91.3</td>
<td>4.6</td>
<td>0.5</td>
<td>0.1</td>
<td>3.5</td>
</tr>
<tr>
<td>20 to 39</td>
<td>84.6</td>
<td>7.7</td>
<td>1.4</td>
<td>0.4</td>
<td>5.9</td>
</tr>
<tr>
<td>40 to 59</td>
<td>76.3</td>
<td>11.2</td>
<td>2.0</td>
<td>0.3</td>
<td>10.2</td>
</tr>
<tr>
<td>60 and older</td>
<td>70.3</td>
<td>15.9</td>
<td>3.5</td>
<td>0.6</td>
<td>9.6</td>
</tr>
<tr>
<td>Total</td>
<td>88.8</td>
<td>5.8</td>
<td>0.8</td>
<td>0.2</td>
<td>4.4</td>
</tr>
</tbody>
</table>
Table 4 – Symptoms of *Y. enterocolitica* infections

Frequency of reported symptoms (as percentages) is listed for different serotypes. Total number of serotypes: O:3, n=34,576; O:9, n=2,277; O:5,27, n=312; O:8, n=62; other serotypes, n=1,701. For serotypes other than O:3, O:9, O:5,27 and O:8, serotype specification was not available from the surveillance data (“other” serotypes).

Percentages add up to more than 100% because typically more than one symptom per notified case was reported.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>O:3 (%)</th>
<th>O:9 (%)</th>
<th>O:5,27 (%)</th>
<th>O:8 (%)</th>
<th>Other (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal pain</td>
<td>47.2</td>
<td>50.1</td>
<td>50.6</td>
<td>33.9</td>
<td>39.9</td>
<td>47.1</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>85.8</td>
<td>82.0</td>
<td>77.2</td>
<td>93.5</td>
<td>73.5</td>
<td>85.0</td>
</tr>
<tr>
<td>Vomiting</td>
<td>6.1</td>
<td>5.1</td>
<td>4.5</td>
<td>9.7</td>
<td>3.9</td>
<td>5.9</td>
</tr>
<tr>
<td>Fever</td>
<td>34.0</td>
<td>22.9</td>
<td>17.9</td>
<td>11.3</td>
<td>28.5</td>
<td>33.0</td>
</tr>
<tr>
<td>Tenesma</td>
<td>0.8</td>
<td>0.9</td>
<td>2.9</td>
<td>3.2</td>
<td>1.1</td>
<td>0.9</td>
</tr>
</tbody>
</table>
Figure 1
Figure 2