Surveillance of travel-associated gastrointestinal infections in Norway, 2009–2010: are they all actually imported?

B Guzman-Herrador (BernardoRafael.Guzman.Herrador@fhi.no)[1,2], L Vold[1], K Nygard[1]
1. Norwegian Institute of Public Health, Oslo, Norway
2. European Programme for Intervention Epidemiology Training (EPIET), European Centre for Disease Prevention and Control (ECDC), Stockholm, Sweden

Citation style for this article:
Guzman-Herrador B, Vold L, Nygard K. Surveillance of travel-associated gastrointestinal infections in Norway, 2009–2010: are they all actually imported? . Euro Surveill. 2012;17(41):pii=20294. Available online: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=20294

Article submitted on 15 February 2012 / published on 11 October 2012

The Norwegian Surveillance System for Communicable Diseases (MSIS) includes variables related to travel for clinicians to fill when notifying travel-associated infections. We measured the completeness and validated the travel-history information for salmonellosis, campylobacteriosis, giardiasis and shigellosis reported in 2009–2010. Of all 8,978 selected infections in MSIS, 8,122 (91%) were reported with place of infection of which 5,236 (65%) were notified as acquired abroad, including 5,017 with symptoms. Of these, 2,972 (59%) notifications had information on both date of arrival in Norway and date of symptom onset, so time between travel and illness onset could be assessed. Taking in account the incubation period, of the 1,435 infections reported as travel-associated and for which symptom onset occurred after return to Norway, 1,404 (98%) would have indeed been acquired abroad. We found a high level of completeness for the variable *'place of infection'*. Our evaluation suggests that the validity of this information is high. However, incomplete data in the variables *'return date to Norway'* and 'date of symptoms onset', only allowed assessment of the biological plausibility of being infected abroad for 59% of the cases. We encourage clinicians to report more complete travel information. High quality information on travel-associated gastrointestinal infections is crucial for understanding trends in domestic and imported cases and evaluating implemented control measures.

Background

Increased harmonisation in preventing foodborne infections at the European level and an increase in international travel in recent years has led to the need for better knowledge on the epidemiology of travel-associated infections in Europe. To this effect, the European Centre for Disease Prevention and Control (ECDC) gathers surveillance data including data from the European Travel Medicine Network EuroTravNet [1,2] that is linked to the worldwide surveillance network on travel-associated morbidity GeoSentinel [3].

Already existing national surveillance systems may also provide information on travel-associated infectious diseases. The Norwegian Surveillance System for Communicable Diseases (MSIS) includes several variables on travel history that should be filled in by clinicians when reporting notifiable diseases. This information is notified to the European Surveillance System (TESSy), and is presented in yearly surveillance reports [4].

Travel-associated gastrointestinal infections in Europe and Norway: current situation

Information provided by the EuroTravNet network in 2008 states that gastrointestinal infections are the most frequently notified travel-associated infections in Europe (33%) [5].

In 2009, European Union (EU) and European Economic Area/European Free Trade Association (EEA/EFTA) countries notified 201,605 campylobacteriosis, 109,885 salmonellosis, 7,261 shigellosis, and 16,574 giardiasis confirmed cases to ECDC. The proportion of cases with travel-history information was 72,440 (65.9%) for salmonellosis, 2,583 (35.6%) for shigellosis and 5,371 (32.4%) for giardiasis. There was no data on travel-history information for campylobacter in 2009, but in 2008, of the 193,554 confirmed cases reported, 132,677 had information on travel-history (68.5%). Of those with known travel history, the proportion that was travel-associated varied from 8% of campylobacteriosis cases to 62% of shigellosis cases [6,7].

In Norway, most cases of gastrointestinal infections notified to MSIS in 2010 were reported as travel associated, ranging from approximately 50% of campylobacteriosis cases to around 83% of shigellosis cases [8].

The challenge when notifying gastrointestinal travel-associated infections

Clinicians seeing patients returning from international trips play a critical role in recognising and notifying

travel-associated public health risks [2]. The importance of taking a travel history to establish the possibility of imported infection was highlighted almost 30 years ago by the classical publication '*Unde Venis?*' ('*Where do you come from?*') [9]. However, published studies conclude that there is still insufficient and inadequate travel history recording, which may directly have an impact on public health [10].

The lack of standardised case definitions for travel-associated infections makes the reporting and comparison of rates between countries difficult. In Europe, there is no general agreement on how to define a travel-associated infection. Information on travel-associated infections compiled at the international level, such as through TESSy, originates from multiple sources. Data from diverse European countries may therefore not be directly comparable due to differences in surveillance and national definitions. Additionally, guidelines for classifying 'travel-associated' cases versus 'domestic' cases may not exist at the country level. In Norway, for example, there are no strict criteria for defining a case with gastrointestinal infection as travel-associated. This is determined by the reporting clinician, based on time of symptom onset, place of travel, return date and incubation period of the disease. The endemic level of the infection in Norway is also taken into account when clinicians report a case as travel-associated or domestic. Since the endemic level of most notifiable gastrointestinal infections is very low in Norway, clinicians may report a case as travel associated without taking into account the incubation period for that specific infection in relation to when the patient returned to Norway from a high-endemic country.

In order to evaluate the quality of the travel-associated information on gastrointestinal infections available in MSIS, we measured the completeness of the travel-associated variables of gastrointestinal infections notified (specifically salmonellosis, campylobacteriosis, giardiasis and shigellosis) in MSIS during 2009–2010. We also validated the information about place of infection, Norway/abroad, by looking at the reported time between travel and time of symptom onset compared to the expected incubation period of the disease.

Methods

We considered '*travel-associated gastrointestinal infection cases*' to be any registered cases of salmonellosis, campylobacteriosis, giardiasis and shigellosis in MSIS where the variable '*place of infection*' was a country other than Norway. To be included in our study, a case's symptom onset date had to be between January 2009 and December 2010.

In Norway, clinicians report notifiable diseases using a paper form. When reporting, the clinician should state whether the patient acquired the disease in Norway or abroad. If the disease is reported as acquired abroad, the country visited and the date of arrival in Norway should be specified. Once the notification is filled-in, it is sent by post to the Norwegian Institute of Public Health (NIPH) where it is entered into MSIS.

Table 1

Variables related to gastrointestinal infections extracted from the Norwegian Surveillance System for Communicable Diseases, Norway, 2009–2010

Variable	Definition
Diagnosis	Salmonellosis, campylobacteriosis, giardiasis, shigellosis
Microorganism	Species, subspecies
Place of infection	Abroad /Norway
Return date to Norway	Date of arrival to Norway after travel
Date of onset of symptoms	Date of symptom onset

Variables related to diagnosis, microorganism, place of infection, date of return to Norway after travel, and date of symptom onset were extracted from MSIS (Table 1).

To measure the completeness of the data on travel-associated infections we analysed the variables '*place of infection*', '*return date to Norway*' and '*date of onset of symptoms*' for all cases of salmonellosis, campylobacteriosis, shigellosis and giardiasis notified to MSIS during the study period. For *Salmonella* infections we also did separate analyses for *S.* Typhimurium and *S.* Enteritidis as the endemic levels of these serovars are known to be very different within Norway.

Further analyses included only cases reported as having acquired infection abroad.

In order to validate the information, we used the variables '*date of onset of symptoms*' and '*return date to Norway*' to measure the time between travel and illness onset. We excluded all cases registered as asymptomatic (diagnosed, for example, as a result of a routine screening), since they would not have a recorded date of symptom onset. We then selected the cases where the variables '*date of onset of symptoms*' and '*return date to Norway*' were complete and studied the distribution of cases' dates of symptom onset around the return date to Norway after travel.

For those cases with symptom onset after arrival in Norway, we compared the number of days between the return date to Norway and the date of symptom onset to the incubation period described in the literature for each infection, to assess the plausibility of the case having been infected while travelling. As reference, we used two thresholds for each infection, the most common incubation period and the maximum incubation period (Table 2) [11,12].

Table 2

Reported incubation periods for gastrointestinal diseases considered in this study, surveillance of travel-associated gastrointestinal infections, Norway, 2009–2010

Disease	Most common incubation period (in days)[a]	Maximum incubation period (in days)[a]
Campylobacteriosis	≤ 5	≤ 10
Salmonellosis	≤ 3	≤ 16
Giardiasis	≤ 10	≤ 25
Shigellosis	≤ 4	≤ 7

[a] According to [11,12].

In addition to estimating infection abroad by incubation period, we also used seven days following return from travel as a cut off, as has been used in other studies [13].

Results

A total of 8,978 *Campylobacter, Salmonella, Giardia* and *Shigella* infections were notified in MSIS during the period 2009–2010. The most frequent was campylobacteriosis (5,522 cases, 61.5%), followed by salmonellosis (2,600 cases, 29%), giardiasis (567 cases, 6.3%) and shigellosis (289 cases, 3.2%). Among salmonellosis, the most frequent Salmonella serovar reported was *S.* Enteritidis (1,136 cases, 43.7%), followed by *S.* Typhimurium (348 cases, 13.4%) and the monophasic variant (mv) of *S.* Typhimurium (172 cases, 6.6%) (Table 3).

Completeness of the variable *'place of infection'*

Of all 8,978 gastrointestinal infections, 8,122 (90.5%) had information on place of infection, of which 5,236 (64.5%) were notified as contracted abroad.

Campylobacteriosis was the most frequent travel-associated gastrointestinal infection reported (2,730 cases, 52.1% of all travel-associated gastrointestinal infections) followed by salmonellosis (1,873 cases, 35.8%), giardiasis (435 cases, 8.3%) and shigellosis (198 cases, 3.8%).

Information on place of infection was most frequently missing for giardiasis (64 cases, 11.3%) and salmonellosis (272 cases, 10.5%). Among salmonellosis cases, *S.* Typhimurium (excluding the monophasic variant) was the sevovar for which place of infection was most frequently unknown (50 cases, 14.4% of all *S.* Typhimurium cases (n=348)) (Table 3).

Completeness of *'return date to Norway'* and 'date of onset of symptoms'

Overall, 3,167 (63.1%) of all travel-associated symptomatic cases (n=5,017) had registered a *'return date to Norway'* after a trip. The completeness of this variable by infection ranged from 51.2% for giardiasis (126/246) to 68.8% for salmonellosis caused by *S.* Typhimurium (108/157) (Table 4). The variable *'date of onset of symptoms'* was completed for 4,291 (85.5%) of all travel-associated symptomatic cases, ranging by disease from 61.8% for giardiasis (152/246) to 87.3% for salmonellosis due to *S.* Enteritidis (806/923) (Table 4).

A total of 2,972 (59.2%) of travel associated symptomatic cases had both variables 'date of arrival in Norway' and *'date of onset of symptoms'* completed, ranging by disease from 43.1% for giardiasis (106/246) to 65.6% for salmonellosis due to *S.* Typhimurium (103/157) (Table 4).

Plausibility of having been infected while travelling: time of symptom onset after travel and incubation period

The Figure illustrates the date of symptoms onset in relation to return date to Norway for cases reported as travel-associated. Overall, 1,435/2,972 (48.3%) reported onset of symptoms on the day of return or after return to Norway (Table 5).

In total, 2,893 (97.3%) of the 2,972 cases reported as travel associated indicated onset of symptoms during the stay abroad or within seven days of return to Norway (Figure, Table 6), varying by disease from 91.5% for cases with giardiasis (97/106) to 98.2% for cases with salmonellosis due to *S.* Enteritidis (546/556). Ten cases (four cases of campylobacteriosis, two cases of salmonellosis and four cases of giardiasis) reported symptom onset date as more than one month after return to Norway. Three cases (one case of campylobacteriosis and two cases of salmonellosis) developed symptoms more than one year after return to Norway (Table 6).

The 1,435 cases reported as travel-associated, whose symptom onset occurred after returning to Norway are shown in Table 7. Cases are classified according to time between travel and symptom onset, relative to the respective infections' incubation periods described in the literature. The most common incubation periods as well as the maximum incubation periods for each infection are taken into account. In light of the most common incubation periods, a total of 1,263 (88 %) of the 1,435 cases had onset of illness in Norway compatible with infection acquisition abroad. When maximum incubation periods were considered the number of cases with plausible infection abroad increased to 1,404 (97.8%).

With regard to particular infections, between 79.9% salmonellosis cases (446 of 558) and 94% campylobacteriosis cases (739 of 786) developed symptoms after return to Norway within the most common incubation period described in the literature and between 89.4% giardiasis (42 of 47) and 98.6% salmonellosis cases (550 of 558) within the maximum incubation period described.

Table 3

Selected gastrointestinal infections registered in the Norwegian Surveillance System for Communicable Diseases by place of infection, Norway, 2009–2010 (n=8,978)

Place of infection	Campylobacteriosis	Salmonellosis					Shigellosis	Giardiasis	Total
		All salmonellas	*S.* Enteritidis	*S.* Typhimurium	*S.* Typhimurium mv	Other			
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Norway	2,295 (41.6)	455 (17.50)	100 (8.8)	141 (40.5)	47 (27.3)	167 (17.7)	68 (23.5)	68 (12.0)	2,886 (32.2)
Abroad	2,730 (49.4)	1,873 (72.0)	926 (81.5)	157 (45.1)	108 (62.8)	682 (72.3)	198 (68.5)	435 (76.7)	5,236 (58.3)
Unknown	497 (9.0)	272 (10.5)	110 (9.7)	50 (14.4)	17 (9.8)	95 (10.1)	23 (8.0)	64 (11.3)	856 (9.5)
Total	**5,522 (100)**	**2,600 (100)**	**1,136 (100)**	**348 (100)**	**172 (100)**	**944 (100)**	**289 (100)**	**567 (100)**	**8,978 (100)**

Mv: monophasic variant; *S.*: *Salmonella*.

Table 4

Completeness of variables for selected travel-associated gastrointestinal infections registered in the Norwegian Surveillance System for Communicable Diseases, Norway, 2009–2010 (n=5,236)

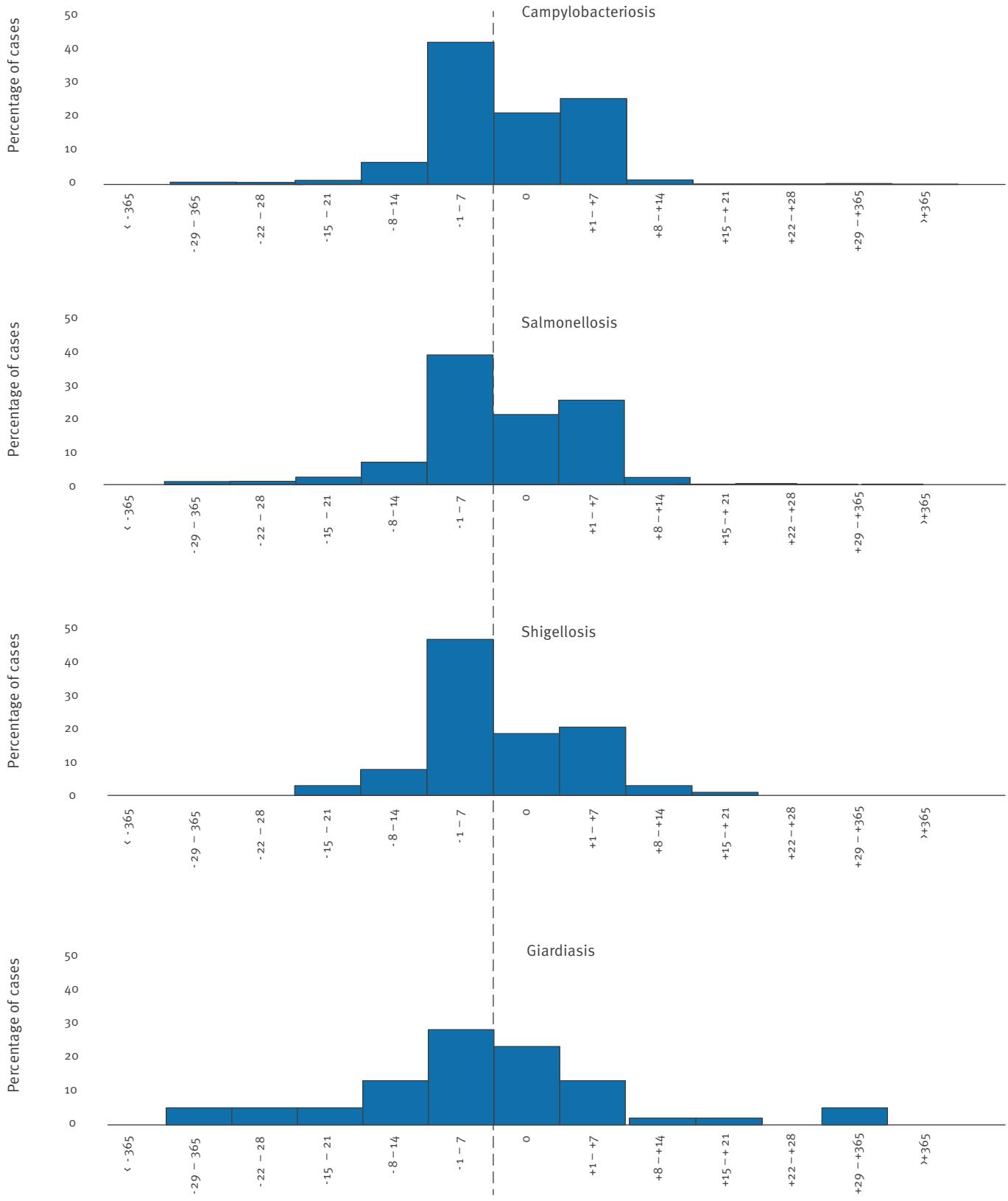
Type of infection	Reported travel-associated cases	Reported symptomatic travel-associated cases	Completeness of variables for symptomatic travel-associated cases		
			With reported 'return date to Norway'	With reported 'date of onset of symptoms'	With reported 'return date to Norway' and 'date of onset of symptoms'
	n	n	n (%)[a]	n (%) [a]	n (%) [a]
Campylobacteriosis	2,730	2,713	1,700 (62.7)	2,362 (87.1)	1,616 (59.6)
Salmonellosis					
All salmonellas	1,873	1,863	1,222 (65.6)	1,613 (86.6)	1,143 (61.4)
S. Enteritidis	926	923	600 (65.0)	806 (87.3)	556 (60.2)
S. Typhimurium	157	157	108 (68.8)	135 (86.0)	103 (65.6)
S. Typhimurium mv	108	108	70 (64.8)	94 (87.0)	68 (63.0)
Other	682	675	444 (65.8)	578 (85.6)	416 (61.6)
Shigellosis	198	195	119 (61.0)	164 (84.1)	107 (54.9)
Giardiasis	435	246	126 (51.2)	152 (61.8)	106 (43.1)
Total	**5,236**	**5,017**	**3,167 (63.1)**	**4,291 (85.5)**	**2,972 (59.2)**

Mv: monophasic variant; *S.*: *Salmonella*.

[a] The percentage is calculated relative to the respective total reported symptomatic travel-associated cases.

Figure

Distribution of travel-associated cases of gastrointestinal infection reported to the Norwegian Surveillance System for Communicable Diseases by date of symptom onset relative to travel-return date to Norway, 2009–2010 (n=2,972)



Interval of days of symptom onset before (-) or after (+) return date to Norway (0).

Table 5

Travel-associated cases with symptom onset before travel-return to Norway among travel-associated cases with known travel-return and symptom onset dates registered in the Norwegian Surveillance System for Communicable Diseases, by gastrointestinal infection, Norway, 2009–2010 (n=2,972)

Type of infection	Symptom onset before travel return to Norway	Total travel-associated cases
	n (%)	n (%)
Campylobacteriosis	830 (51.4)	1,616 (100)
Salmonellosis		
All salmonellas	585 (51.2)	1,143 (100)
S. Enteritidis	268 (48.2)	556 (100)
S. Typhimurium	49 (47.6)	103 (100)
S. Typhimurium mv	30 (44.1)	68 (100)
Other	238 (57.2)	416 (100)
Shigellosis	63 (58.9)	107 (100)
Giardiasis	59 (55.7)	106 (100)
Total	**1,537 (51.7)**	**2,972 (100)**

Mv: monophasic variant; *S.*: *Salmonella*.

Fourteen campylobacteriosis cases (1.8%), eight salmonellosis cases (1.4%), five giardiasis cases (10.6%) and four of 44 shigellosis cases (9.1%) would have had symptom onset outside the maximun incubation period range defined in the literature, if the infections had been acquired abroad.

Discussion

The results of the evaluation of the travel information reported in MSIS indicate a high level of completeness with regards to the variable '*place of infection*'. Approximately 90% of gastrointestinal infections notified to MSIS were reported with known origin. Compared to studies published in other Scandinavian countries, such as Sweden, the level of completeness found in MSIS is higher for campylobacteriosis [14], but lower for shigellosis [15] and salmonellosis [16]. The reported level of completeness found in our study is also higher than the level of completeness reported by a Canadian study [17].

The validity of the travel information of those cases reported as travel associated is also high according to our assessment on time of illness onset related to the time of travel. The time of illness onset after travel for the majority of cases fell within the maximum incubation period reported in the literature and indicates good judgement among clinicians when reporting. This information supports the assertion that most gastrointestinal infections notified in Norway are travel associated. The low endemic level is considered to be caused by low endemic levels of the pathogens causing the diseases considered in this study in the food chain in Norway and historical low level of imports of animals and animal products in Norway [18]. Of note is the high proportion of notified travel-associated infections with symptom onset on the day of return to Norway or the prior week. This might be explained by patients who got infected shortly before returning to Norway first sought medical attention at arrival because of persisting symptoms.

Shigellosis and giardiasis were the infections most frequently classified as travel associated although illness onset occurred after the common incubation period after return to Norway. 11% of travel-associated reported giardiasis cases and 9% of shigellosis cases did not occur within a plausible incubation period. The fact that the endemic level of these two diseases in Norway is low may lead clinicians to code them as travel-associated without taking into account the incubation-period of the disease. The endemic level of different serovars of salmonellosis may also play a role in clinicians' judgement when reporting. None of *S.* Typhimurium cases notified appeared to be misclassified. However, three *S.* Enteritidis cases reported as travel-associated had illness onset after the maximum incubation period after returning from abroad. Epidemiology of these two Salmonella serovars in Norway are very different: *S.* Typhimurium is the most common serovar that causes domestic salmonellosis in Norway and in addition to *S.* diarizonae the only serovar existing in Norwegian animals [19], while most *S.* Enteritidis cases are acquired abroad [8]. Therefore, clinicians might classify a *S.* Enteritidis case as travel-associated with less consideration of the number of days since return to Norway. Three cases reported as travel-associated had a date of onset of symptoms more than one year after return from travel abroad. We think this is probably due to data entry errors of the dates rather than inaccuracy when reporting. It is also important to bear in mind that despite the biological plausibility of the calculated incubation period, it does not ensure that the infection occurred abroad as the source is not verified.

We only managed to assess the biological plausibility of the travel history in 59% of all cases reported as travel-associated as these were the only notifications with both variables *'return date to Norway'* and *'date of onset of symptoms'* completed. Giardiasis was by far the infection in which information regarding these variables was most frequently missing. The complex clinical course of giardiasis, which can be intermittent and chronic, might have contributed to the low completeness [20]. Having been able to better assess the biological plausibility for this pathogen would have been useful, since the endemic level of this parasite in Norway is not very well described [21].

Surveillance of travel-associated gastrointestinal infections in Europe could benefit from improved

Table 6

Days between arrival in Norway and symptom onset, travel-associated gastrointestinal infections registered in the Norwegian Surveillance System for Communicable Diseases, Norway, 2009–2010 (n=2,972)

Disease	Date of symptom onset after travel return to Norway				Total
	≤7 days	8–30 days	31–365 days	>365 days	
	n (%)	n (%)	n (%)	n (%)	n (%)
Campylobacteriosis	1,585 (98.1)	26 (1.6)	4 (0.2)	1 (0.1)	1,616 (100)
Salmonellosis					
All salmonellas	1,108 (96.9)	31 (2.7)	2 (0.2)	2 (0.2)	1,143 (100)
S. Enteritidis	546 (98.2)	8 (1.4)	1 (0.2)	1 (0.2)	556 (100)
S. Typhimurium	98 (95.1)	5 (4.9)	0 (0)	0 (0)	103 (100)
S. Typhimurium mv	65 (95.6)	3 (4.4)	0 (0)	0 (0)	68 (100)
Other	399 (95.9)	15 (3.6)	1 (0.2)	1 (0.2)	416 (100)
Shigellosis	103 (96.3)	4 (3.7)	0 (0)	0 (0)	107 (100)
Giardiasis	97 (91.5)	5 (4.7)	4 (3.8)	0 (0)	106 (100)
Total	**2,893 (97.3)**	**66 (2.2)**	**10 (0.3)**	**3 (0.1)**	**2,972 (100)**

Mv: monophasic variant; *S.*: *Salmonella*.
Arrival in Norway (day=0).

Table 7

Repartition, by incubation period, of travel-associated cases of gastrointestinal infection with symptom onset after travel return registered in the Norwegian Surveillance System for Communicable Diseases, Norway, 2009–2010 (n=1,435)

Disease/microorganism	Cases n (%) by incubation period			Total n (%)
	Within the commonly reported incubation period[a]	Within the maximum incubation period[a]	Outside the maximum incubation period[a]	
Campylobacteriosis	739 (94.0)	772 (98.2)	14 (1.8)	786 (100)
Salmonellosis				
All salmonellas	446 (79.9)	550 (98.6)	8 (1.4)	558 (100)
S. Enteritidis	241 (83.7)	285 (99.0)	3 (1.0)	288 (100)
S. Typhimurium	41 (75.9)	54(100)	0 (0)	54 (100)
S. Typhimurium mv	25 (65.8)	37(97.4)	1 (2.6)	38 (100)
Other	139 (78.1)	174 (97.8)	4 (2.2)	178 (100)
Shigellosis	39 (88.6)	40 (90.9)	4 (9.1)	44 (100)
Giardiasis	39 (83.0)	42 (89.4)	5 (10.6)	47 (100)
Total	**1,263 (88.0)**	**1,404 (97.8)**	**31 (2.2)**	**1,435 (100)**

Mv: monophasic variant.

[a] According to [11,12].

notification criteria for travel-associated infections. This might simplify reporting duties for clinicians, leading to an increase in reporting completeness. In addition, it may facilitate the comparison of the information sent by different European countries to TESSy, allowing better monitoring of specific infections in particular countries. Having high quality information available can be useful not only for providing specific advice to travellers before a trip to a specific destination, but also for better diagnosis and management of returning travellers. In terms of public health, a correct notification of microorganism and place of infection can allow the rapid identification and response to outbreaks of potential international concern. Information about place of infection is also important in order to be able to evaluate national and European control programs implemented in the food chain to prevent foodborne gastrointestinal infections.

Acknowledgements

We would like to thank Alicia Barrasa, EPIET scientific coordinator, for valuable input on the structure of the manuscript, and Emily MacDonald from the Norwegian Institute of Public Health for reviewing the language in the present manuscript.

References

1. Schlagenhauf P, Santos-O'Connor F, Parola P. The practice of travel medicine in Europe. Clin Microbiol Infect. 2010;16(3):203-8.
2. Gautret P, Freedman DO. Travel medicine, a speciality on the move. Clin Microbiol Infect. 2010;16(3):201-2.
3. Torresi J, Leder K. Defining infections in international travellers through the GeoSentinel surveillance network. Nat Rev Microbiol. 2009;7(12):895-901.
4. European Centre for Disease Prevention and Control (ECDC). The European Surveillance System (TESSy). Stockholm: ECDC. [Accessed 09 Oct 2012]. Available from: http://ecdc.europa.eu/en/activities/surveillance/TESSy/Pages/TESSy.aspx
5. Field V, Gautret P, Schlagenhauf P, Burchard GD, Caumes E, Jensenius M, et al. Travel and migration associated infectious diseases morbidity in Europe, 2008. BMC Infect Dis. 2010;10:330.
6. European Centre for Disease Prevention and Control (ECDC). Annual epidemiological report 2011- Reporting on 2009 surveillance data and 2010 epidemic intelligence data. Stockholm: ECDC. 2011. Available from: http://www.ecdc.europa.eu/en/publications/Publications/Forms/ECDC_DispForm.aspx?ID=767
7. European Centre for Disease Prevention and Control (ECDC). Annual epidemiological report on communicable diseases in Europe 2010. Stochholm: ECDC. 2010. Available from: http://ecdc.europa.eu/en/publications/Publications/1011_SUR_Annual_Epidemiological_Report_on_Communicable_Diseases_in_Europe.pdf
8. Vold L, Heier BT, Comelli H, Nygård K, Kapperud G. Årsreport: Matbårne infeksjoner og utbrudd i 2010 [Annual report: food-borne diseases and outbreaks in 2010]. Oslo: Nasjonaltfolkehelseinstitutt; May 2011. Norwegian. Available from: http://www.fhi.no/dokumenter/cd8fa1273d.pdf
9. Schultz MG. Unde venis? (Where have you been?). JAMA. 1984;251(4):512-3.
10. Price VA, Smith RA, Douthwaite S, Thomas S, Almond DS, Miller AR, et al. General physicians do not take adequate travel histories. J Travel Med. 2011;18(4):271-4.
11. Heymann DL, editor. Control of communicable diseases manual. 19th ed. Washington, DC: American Public Health Association; 2008.
12. Nasjonalt folkehelseinstitutt.Smittevernboka. [Manual for communicable diseases control]. Oslo: Nasjonal folkehelseinstitutt; 2009. Norwegian.
13. Johnson LR, Gould LH, Dunn JR, Berkelman R, Mahon BE; Foodnet Travel Working Group. Salmonella infections associated with international travel: A foodborne diseases active surveillance network study (FoodNet) study. Foodborne Pathog Dis. 2011;8(9):1031-7.
14. Ekdahl K, Andersson Y. Regional risks and seasonality in travel-associated campylobacteriosis. BMC Infect Dis. 2004;4(1):54.
15. Ekdahl K, Andersson Y. The epidemiology of travel-associated shigellosis-regional risks, seasonality and serogroups. J Infect. 2005;51(3):222-9.
16. Ekdahl K, De Jong B, Wollin R, Andersson Y. Travel-associated non-typhoidal salmonellosis: geographical and seasonal differences and serotype distribution. Clin Microbiol Infect. 2005;11(2):138-44.
17. Taylor M, MacDougall L, Li M, Galanis E; BC Enteric Policy Working Group. The impact of international travel on the epidemiology of enteric infections, British Columbia, 2008. Can J Public Health. 2010;101(4);332-6.
18. Hofshagen M, Heier B T, Hauge K: Norway 2010 – Trends and source of zoonoses and zoonotic agents in humans foodstuffs, animals and feedingstuffs. Oslo: Norwegian Veterinary Institute; 2010. Available from: http://www.vetinst.no/eng/Publications/Zoonosis-Reports/Zoonosis-Report-2010
19. Emberland KE, Nygård K, Aavitsland P. Salmonellosis and charter tourism: epidemiology and trends of imported human cases to Norway from the Canary Islands and Thailand, 1994–2008. Epidemiol Infect. 2012;140(9):1655-62.
20. Nygård K, Schimmer B, Søbstad Ø, Walde A, Tveit I, Langeland N, et al. A large community outbreak of waterborne giardiasis-delayed detection in a non-endemic urban area. BMC Public Health. 2006;6:141.
21. Robertson LJ, Hanevik K, Escobedo AA, Mørch K, Langeland N. Giardiasis--why do the symptoms sometimes never stop?. Trends Parasitol. 2010;26(2):75-82.