



National Institute for Public Health
and the Environment
Ministry of Health, Welfare and Sport

Disease burden of food-related pathogens in the Netherlands, 2012

RIVM Letter report 2014-0069
M. Bouwknecht et al.



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Abstract

Disease burden of food-related pathogens in the Netherlands, 2012

The Ministry of VWS has requested RIVM to present an annual update on the number of illnesses caused by 14 enteric pathogens. These pathogens can be transmitted by food, the environment, animals and humans. The number of persons who are ill and who die from the infections is expressed in DALYs (Disability Adjusted Life Years), a measure of the disease burden in the population. Furthermore, the cost-of-illness (COI) related to the 14 food-related pathogens were estimated and expressed in euros. The total disease burden caused by the 14 pathogens increased marginally from 13,900 DALY in 2011 to 14,000 DALY in 2012. The share of foodborne transmission in this burden increased from 6,230 to 6,550 DALY. The COI remained stable compared to 2011 at 412 million euro. The share of foodborne transmission was 175 million euro—an increase of 4% compared to 2011.

The increase in disease burden was a result of the outbreak by *Salmonella* Thompson in smoked salmon. This outbreak (with an estimated 24,000 cases) resulted in a burden of 550 DALYs and a COI of 11 million euro. Note that this estimate does not take into account the economic damage to the firm and retailers nor the costs of NVWA and RIVM in controlling the outbreak. Without this outbreak, the burden estimates would be lower than in 2011 due to a decrease in the incidence of disease by *Campylobacter* spp., *Listeria monocytogenes*, *Toxoplasma gondii* and rotavirus. Furthermore, an increasing trend in norovirus incidence was observed in the period 2001-2012. No explanation for the trend is available.

This research results in more insight in the true incidence of foodborne diseases and the associated disease burden.

Keywords:

food-related disease, disease burden, DALY, trend

Publiekssamenvatting

Ziektelast van via voedsel overdraagbare ziekteverwekkers in Nederland in 2012

Het RIVM onderzoekt jaarlijks hoeveel mensen ziek worden van 14 ziekteverwekkers die via voedsel in het menselijk lichaam terechtkomen (darmpathogenen). Deze ziektelast wordt uitgedrukt in DALY's (Disability Adjusted Life Year), een internationaal gehanteerde maat voor het aantal gezonde levensjaren die verloren gaan aan ziekte of overlijden. Het aantal DALY's als gevolg van de 14 ziekteverwekkers steeg van 6.230 in 2011 tot 6.550 DALY's in 2012.

Daarnaast wordt geschat welke ziektegerelateerde kosten hieraan verbonden zijn (*cost of illness*). Deze omvatten directe zorgkosten, maar ook niet-medische kosten, zoals reiskosten, en indirecte kosten, bijvoorbeeld als gevolg van werkverzuim. De gerelateerde kosten van de 14 ziekteverwekkers die mensen via voedsel opliepen bedroegen in 2012 175 miljoen euro. Dat is een toename van 4 procent ten opzichte van het jaar ervoor.

De stijging van de voedselgerelateerde ziektelast is een gevolg van de uitbraak van *Salmonella* Thompson via gerookte zalm in 2012. Deze uitbraak veroorzaakte naar schatting 24.000 zieken en 11 miljoen euro aan ziektegerelateerde kosten. Zonder deze uitbraak zouden de voedselgerelateerde ziektelast en de kosten lager zijn dan in 2011. Naar verhouding zijn er namelijk minder mensen ziek geworden van een infectie met *Campylobacter* spp., *Listeria monocytogenes*, *Toxoplasma gondii* en het rotavirus. Wel is het aantal mensen dat ziek werd van een bepaald type *E. coli*-bacterie (STEC O157) gestegen ten opzichte van 2011. Daarnaast nam tussen 2001 en 2012 het aantal mensen dat ziek werd van het norovirus toe; alleen in 2011 daalde dat aantal ten opzichte van het voorgaande jaar. Een verklaring voor deze trend is niet voorhanden.

De onderzochte ziekteverwekkers kunnen niet alleen via voedsel aan de mens worden overgedragen (circa 40 procent), maar ook via het milieu (bijvoorbeeld via oppervlaktewater), dieren, en van mens op mens. De totale ziektelast van alle 'routes' steeg ook, van 13.900 DALY in 2011 naar 14.000 DALY in 2012. De totale kosten bleven nagenoeg gelijk op 412 miljoen euro.

VWS is opdrachtgever van dit onderzoek. De resultaten bieden handvaten om meer zicht te krijgen op het daadwerkelijke aantal voedselinfecties dat mensen jaarlijks oplopen en de bijbehorende ziektelast.

Trefwoorden:

Voedsel-gerelateerde ziekte, ziektelast, DALY, trend

Contents

1	Introduction – 9
2	Methods – 11
2.1	Trend information – 11
2.2	Model corrections – 11
2.3	Disease burden – 11
2.4	Cost of illness – 12
2.5	<i>Salmonella Thompson</i> outbreak due to smoked salmon – 12
3	Results – 13
3.1	Trend information – 13
3.2	Disease incidence – 13
3.3	Disease burden by pathogen – 14
3.4	Cost of illness by pathogen – 14
3.5	Attribution – 14
4	Discussion – 17
	Acknowledgement – 19
	References – 21

1 Introduction

Since 2008, RIVM regularly publishes estimates of the incidence, burden and costs of food-related disease on its web pages in the "Nationaal Kompas Volksgezondheid"¹. The epidemiological estimates of the disease burden are expressed in Disability Adjusted Life Years. The methodology for these estimates is described in detail in a peer-reviewed paper [1]. Data in that paper referred to the year 2009, and an update based on data for the years 2010 and 2011 have been presented [2, 3]. In this report, trend information from surveillance and demographic information was used to update the information to the year 2012.

The economical estimates of the disease burden, the cost-of-illness (COI) expressed in euros, were finalized for all 14 food-related pathogens for the year 2011 [4]. The models were added to the existing disease burden model. The estimates for 2011 are updated to 2012 and the results integrated in this report. The COI for all 14 food-related pathogens will be part of the annual updates from 2012 onwards.

2 Methods

2.1 Trend information

Data on the size and age distribution of the Dutch population, as well as mortality risks and the number of live births and stillbirths were obtained from Statistics Netherlands².

Trend information on the incidence of gastro-enteritis (GE) by pathogen in the general population and consulting the general practitioner was obtained from the following sources (partly also presented in [5]):

- Thermophilic *Campylobacter* spp.: laboratory surveillance
- Shiga-toxin producing *Escherichia coli* O157 (STEC O157): active surveillance
- Non-typhoidal *Salmonella* spp.: laboratory surveillance
- Norovirus: hospitalisation for viral gastro-enteritis (ICD code 86)
- Rotavirus: laboratory surveillance
- Hepatitis A, and perinatal and acquired listeriosis: mandatory notification and active surveillance
- *Cryptosporidium* spp.: a stable incidence since 2003 was assumed, based on laboratory surveillance data from 2001 to 2007
- *Giardia* spp.: a continuing decrease with the rate of -1.03% per year observed between 2001 and 2007 was assumed
- No trend information was available for the GE toxin-producing bacteria (*Bacillus cereus*, *Clostridium perfringens* and *Staphylococcus aureus*), hepatitis-E and toxoplasmosis.

Trends in hospitalizations for gastro-enteritis as primary cause (ICD codes 20-93; 558.9) were obtained from the National Medical Register up until 2010. From 2011 onwards these data were obtained from Dutch Hospital Data (DHD). Data for 2006-2010 were extracted from the DHD database to ascertain that the change in data source did not affect the estimated number of hospitalizations. Estimates were indeed similar (data not shown).

Age-specific excess mortality risks from campylobacteriosis and salmonellosis were assumed constant. Fatalities due to listeriosis and STEC O157 were obtained from active surveillance. Age-specific case fatality ratios for norovirus and rotavirus, originally obtained from German surveillance data, and for protozoan pathogens, originally obtained from the international literature, were assumed constant.

2.2 Model corrections

No model corrections were made in 2012.

2.3 Disease burden

Disease burden calculations were not changed compared to previous years; hence all differences in the results for 2012 compared to 2011 will reflect the impact of trends in the underlying information on demographics and pathogen incidence.

² <http://statline.cbs.nl/statweb/>, accessed August 5 2013

2.4 Cost of illness

The baseline year for the COI estimates was 2011. The cost-of-illness estimates were updated to 2012 by multiplying all prices with the consumer price index for 2012 provided by Statistics Netherlands³.

2.5 *Salmonella* Thompson outbreak due to smoked salmon

The large *Salmonella* Thompson outbreak in the Netherlands caused by the consumption of smoked salmon [6] required a specific approach for the attribution part, because all DALYs and COI of this outbreak are attributable to the 'fish & shellfish' category of the 'food' pathway. To this end the disease burden model was run twice: once with a trend estimate based on the total number of reported salmonellosis cases and once with a trend estimate based on the reported salmonellosis cases minus all reported cases caused by *S. Thompson*. The difference in DALY and COI between the two was considered to be related to the outbreak. All attribution results for salmonellosis were based on the second model run, with the burden due to the outbreak subsequently added to the 'fish & shellfish' category.

3

<http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=71311NED&D1=0&D2=0&D3=64,77,90,103,116,129,142,155,168,181,194,219,232&HDR=T&STB=G1,G2&VW=T>

3 Results

3.1 Trend information

The number of inhabitants in the Netherlands slightly increased with 80,000 inhabitants in 2012 (Table 1). There was a decrease in all age classes except these ages 12-17 and 65+. The number of live births decreased by approximately 4,000 to 176,000 in 2012 (Table 2). A decrease was observed in in age classes (of mothers) except the age-class 45+, showing a slight increase. The number of stillbirths (24 weeks or more gestational age) in 2012 was 564, lower than the 620 cases reported for 2011. The number of hospitalizations for gastroenteritis remained fairly stable at 22,400.

Trend information for specific pathogens is presented in Table 3. A summary of trends (in comparison with 2011) is discussed below:

- The incidence of **campylobacteriosis** (laboratory confirmed cases) **decreased by 5%** from 51.3 to 48.8 cases per 100,000 inhabitants.
- The incidence of **salmonellosis** (laboratory confirmed cases) **increased by 70%** from 12.2 to 20.7 per 100,000 inhabitants; this increase is due to the *Salmonella* outbreak related to smoked salmon in 2012 [6].
- The incidence of gastroenteritis by **rotavirus** (laboratory confirmed cases) **decreased further by 15%** from 23.7 to 20.1 cases per 100,000 inhabitants; there is **no significant trend** since 2007.
- The incidence of hospitalizations for viral gastroenteritis (a proxy for the **incidence of gastroenteritis by norovirus**) **increased** from 19.4 to 19.7 cases per 100,000 inhabitants; there is **an increasing trend** ($p < 0.001$) **since 2001** with an average increase of 0.9 cases per 100,000 inhabitants per year.
- The incidence of **acquired listeriosis** (active surveillance) **decreased** from 79 cases in 2011 to 71 cases in 2012. There were 8 **fatalities**, **considerably more** than the 4 fatalities in 2011, but still less than the exceptionally high number of 13 fatal cases in 2010. The statistical life expectancy of fatal cases was 13.7 years; in the DALY model half of this life expectancy is used for calculating years of life lost to correct for comorbidity. Including new data from 2012, the probability of developing **meningitis** as a consequence of acquired listeriosis was updated to **25%** (95% confidence interval 21-29%).
- The incidence of **perinatal listeriosis** (active surveillance) was 6 cases with no fatalities. The number of perinatal cases and mortality were **similar to previous years**.
- The incidence of diseases caused by **STEC O157** (active surveillance) was 85 with 31 hospitalizations (of 77 cases for which this information is known). The number of STEC cases, including the number of hospitalized cases, was **higher than in previous years**. There were no fatal cases recorded.
- The incidence of **hepatitis A** (notified cases) **remained similar** to 2011 with 121 cases and 28 hospitalizations; the incidence was lowest among those recorded in the years 2006-2012. The number of hospitalized cases was similar to previous years.

3.2 Disease incidence

The incidence of gastroenteritis by pathogen, of disease by non-gastrointestinal pathogens and of sequelae by pathogen in 2012 is presented in Tables 4-6, and Figure 1. There were increases in the incidence of salmonellosis, *E. coli* O157 and norovirus in the general population while the incidence of campylobacteriosis, listeriosis, giardiasis, rotavirus and HAV decreased in comparison to 2011. The estimated incidence of the remaining pathogens was

unchanged, mostly because no trend information was available. The increase in salmonellosis was mainly due to the outbreak of *S. Thompson*, leading to an estimated 24,000 cases. The number of deaths attributed to the outbreak was 4 [7]. The estimated total number of cases by the 14 pathogens decreased from 1,750,000 in 2011 to 1,725,000 in 2012 and was at the lowest level since 2009. The total number of deaths was for 2012 was 218 (219 in 2011). In comparison with 2011, there were considerably less sequelae due to campylobacteriosis, whereas sequelae due to salmonellosis increased considerably (Table 6).

3.3 Disease burden by pathogen

The burden by pathogen is presented in Table 7 and Figure 2. The total burden of the 14 pathogens increased marginally from 13,900 in 2011 to 14,000 DALY in 2012. The largest burden at population level was caused by *Toxoplasma gondii* and *Campylobacter* (both ~3,500 DALY), followed by *Salmonella* and norovirus (both ~1,800). In general, estimates for 2012 were lower than or equal to the estimates for 2011, except for salmonellosis, norovirus and acquired listeriosis. The largest relative difference with 2011 was observed for perinatal listeriosis and rotavirus, with about 65% and 12%, respectively, decrease in burden. Due to the higher number of fatal acquired listeriosis cases compared to 2011, its burden increased considerably (from 47 to 72 DALY), resulting in a corresponding increase in the burden per 1,000 cases. Perinatal listeriosis was the disease outcome with the highest individual burden among all pathogens (9.2 DALY per case), followed by perinatal toxoplasmosis (6.3 DALY per case).

3.4 Cost of illness by pathogen

The total COI did not change in 2012 compared to 2011 and was estimated at 460 M€ (discounted at 4%: 412 M€) (Table 8). The three pathogens causing the largest discounted COI are norovirus (110 M€), *Campylobacter* spp. (73 M€) and rotavirus (65 M€). The lowest contribution to the COI was by hepatitis E-virus (0.2 M€). The average cost per case were largest for perinatal *Listeria* (0.8 M€), followed by congenital *Toxoplasma gondii* infections (0.1 M€). The trends in COI compared to 2011 followed the trends in DALYs, with a pronounced increase of 12 M€ in COI for *Salmonella* and of 3 M€ for norovirus, and an equal or slightly decreased COI for the other pathogens.

3.5 Attribution

The attribution results for DALYs and COI are presented in Tables 9 and 10. The foodborne disease burden increased by 5% from 6,250 to 6,550 DALY. The increase is attributable to the *Salmonella* outbreak related to smoked salmon, which caused an estimated additional foodborne burden of ~500 DALY. All non-food routes decreased by 3-4% in DALYs compared to 2011. Among food pathways, all estimated DALYs decreased compared to 2011 with 2-4%, except for the category 'fish & shellfish'. The latter increased by 224% from 400 to 900 DALYs (attributable to the *Salmonella* outbreak). The highest burden was attributed to pork (20%) followed by poultry (17%), beef & mutton (15%) and fish & shellfish (15%). Foods from animal origin caused 41% of all food-related cases, but 61% of the burden due to food, indicating that the pathogens associated with these foods tend to cause more severe infections than pathogens associated with other foods.

The total food-related COI increased by 4% from 168 M€ to 175 M€. The COI for the other pathways decreased by 3-5%. Fish & shellfish were the only food group that increased in estimated COI (by 73%), for all other food groups the

COI decreased with 1-4%. The increase in the fish & shellfish category was related to the outbreak of *Salmonella* Thompson in smoked salmon, which was estimated to have increased the COI with 11 M€. The largest contribution to the food-related COI was made by beef, chicken, fish & shellfish and other foods (all 13-14%). Products of animal origin accounted for nearly 50% of the total food-related COI.

4 Discussion

The disease burden of 14 enteric pathogens increased marginally by 100 DALY from 13,900 DALY in 2011 to 14,000 DALY in 2012. The share of foodborne transmission in this burden increased from 6,230 to 6,550 DALY. The increase was a result of the outbreak related to *Salmonella* Thompson on smoked salmon [6], the burden of which was estimated to be 500 DALY, due to an increased incidence of 24,000 cases. The excess number of reported deaths due to the outbreak was 4 [7]. The estimated COI mounted to 11 M€. Note that this latter estimate does not take into account the economic damage to the firm and retailers nor the costs of NVWA and RIVM in controlling the outbreak. When excluding all confirmed and reported *S. Thompson* cases resulted in an estimated foodborne disease burden of ~6000 DALYs, lower than the estimate for 2011. This decrease is related to the decrease in DALYs for most pathogens, except norovirus and acquired listeriosis.

The incidence of campylobacteriosis decreased in 2012 compared to 2011, after a continuously increasing trend from 2003 onwards, leading to a trend break. This increase and subsequent decrease are possibly associated with the use of proton-pump-inhibitors [8, 9]. It was estimated in the referred study that about 27% of the reported campylobacteriosis cases in 2011 was attributable to PPI-use. The use of PPI decreased in 2012, possibly due to changes in the refund policies of healthcare insurance companies and thus coinciding with a decrease in campylobacteriosis incidence.

The incidence, DALY and COI estimates for norovirus increased further in 2012 compared to 2011. For norovirus, no direct trend information is available, and therefore this estimate is based on trends in hospitalisation for viral gastroenteritis, which includes also rotaviruses. Hence the trend in norovirus incidence may be overestimated in the current updates.

The approach for estimating the incidence of STEC O157 is based on a simplification of a complex microsimulation model [10, 11]. This simplification was required for implementation of the STEC model in the full burden model. This simplification at present misses the link between reported STEC cases and incidence, GP visits and hospitalization at population level. The development of sequelae is therefore also not related to the incidence at population level. This approach causes the increased incidence in reported STEC O157 cases (about 30% increase for hospitalized and non-hospitalized cases in 2012 compared to 2011) to not be reflected in the burden and COI estimates. The burden related to STEC O157 might therefore be underestimated in the current and previous years. The extent to which cannot be indicated without further model developments and direct HUS surveillance. This work is planned for the coming years.

From August 2012 onwards, an increase in *Cryptosporidium* infections was observed in several EU countries, including the Netherlands, without a clear cause [12]. In total, 524 faecal samples were found positive for *Cryptosporidium* by eight medical microbiology laboratories (covering about 20% of the Dutch population) in the Netherlands in a 12-week period in 2012. For 2010 and 2011, this number was on average 105. About 85% of the strains belonged to *C. hominis*, the remainder to *C. parvum* (based on 90 samples) [12]. This increase

in *Cryptosporidium* was not taken into account in the current disease burden estimates, as a constant incidence of cryptosporidiosis in the Netherlands is assumed for the model (based on laboratory surveillance data from 2001-2007). A rough estimate suggests that the disease burden for *Cryptosporidium* might have increased two-fold, because a five-fold increase in cases was observed in 12 of 52 weeks (thus: $524/104 \times 12/52 = 1.2$, suggesting the additional disease burden mounts to 1.2 times the original). The data from the eight medical microbiological laboratories (available from at least 2010) might be useful for the annual trend update for *Cryptosporidium* and will be further examined for the next update.

Other important aspects for realization in interpreting results include the absence of trend information for bacterial toxins and toxoplasmosis while trends for *Cryptosporidium* spp. and *Giardia* spp. are extrapolated from trends until 2007, when systematic surveillance was discontinued. Furthermore, attribution data used in this report are based on an expert elicitation study, conducted in 2006 [13]. No time-trends in the expert estimates are available. As a consequence, the changes in incidence and burden as presented in this report need to be interpreted with the appropriate care.

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Table 1. Population in the Netherlands by age group, 2009-12

Age group	2012	2011	2010	2009
0	179,653	184,007	184,586	184,408
1-4	739,083	739,099	740,295	747,148
5-11	1,378,914	1,394,007	1,405,533	1,405,232
12-17	1,189,120	1,184,970	1,184,064	1,191,453
18-64	10,527,210	10,558,770	10,522,183	10,485,731
65+	2,716,368	2,594,946	2,538,328	2,471,815
Total	16,730,348	16,655,799	16,574,989	16,485,787

Table 2. Live births by age of mothers in the Netherlands, 2009-12

Age of mother	2012	2011	2010	2009
-19	1,592	1,717	1,884	1,953
20-24	15,206	15,782	16,417	16,499
25-29	50,371	50,295	51,570	51,459
30-34	67,489	69,174	69,420	68,828
35-39	33,725	35,340	37,213	38,637
40-44	7,212	7,393	7,565	7,252
45+	364	359	328	287
Total	175,959	180,060	184,397	184,915

Table 3. Trends in incidence of food-related pathogens, 1999-2012

Year	Ca*	Sa	RV	NV	aLm	aLm fatal	pLm	pLm fatal	O157	O157 hosp	HAV	HAV hosp
	(a)	(a)	(a)	(a)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)
1999	38.7	21.1	19.2	14.2					36			
2000	42.1	20.3	15.7	12.8					43			
2001	44.3	20.4	17.5	11.2					41			
2002	40.8	15.4	16.5	11.8					49			
2003	33.3	20.7	17.5	12.6					57			
2004	40.0	15.6	15.4	13.2					37			
2005	43.8	12.9	21.4	15.6	85	15	6		53			
2006	40.0	16.0	25.5	17.3	59	17	5	1	40		258	39
2007	40.7	11.9	20.1	14.5	60	12	6	1	83		168	27
2008	39.2	15.7	27.1	18.1	51	6	1	1	45		183	35
2009	44.1	11.6	30.9	17.7	76	4	3	1	57	21	176	29
2010	50.2	13.8	35.2	22.2	73	13	4	1	52	21	262	52
2011	51.3	12.2	23.7	19.4	79	4	9	1	65	18 [†]	125	25
2012	48.8	20.7	20.2	19.7	71	8	6	0	85	31 [‡]	121	28

Data sources: see text

* Ca: *Campylobacter* spp.; Sa: *Salmonella* spp.; RV: rotavirus; NV: norovirus; aLm: acquired listeriosis; pLm: perinatal listeriosis; O157: STEC O157; HAV: hepatitis A-virus; hosp: hospitalized.

[†] known for 57 of 65 cases

[‡] known for 77 of 85 cases

(a) per 100,000 inhabitants

(b) reported cases

Table 4. Incidence of gastroenteritis by pathogen in the Netherlands, 2012 (population 16.7 million)

Pathogen	General population (x 1,000)	GP visit (x 1,000)	Hospitalised (x 1,000)	Fatal cases
All causes	4,813 [†] 3,998-5,704 [‡]	222 73-515	22.4	NA [#]
Bacteria – infectious				
<i>Campylobacter</i> spp.	101 15-277	24 12-45	1.1 0.4-2.2	34 21-51
STEC O157	2.1 0.23-8.7	0.3 0.01-0.9	0.03 -	1 0-3
<i>Salmonella</i> spp.	61 4.7-187	9.4 5.0-16	1.1 0.5-2.2	34 30-39
Bacteria – toxin producing				
<i>Bacillus cereus</i>	50 17-119	7.0 1.7-20	0.2 0.07-0.5	0
<i>Clostridium perfringens</i>	170 56-374	31 7.3-80	0.3 0.1-0.6	5 0-19
<i>Staphylococcus aureus</i>	293 129-552	41 12-97	1.5 0.7-2.8	7 0-29
Viruses				
Norovirus	703 482-1009	17 9.7-27	1.9 1.0-3.3	68 30-125
Rotavirus	258 127-461	16 10-24	5.8 4.3-7.7	40 14-88
Protozoa				
<i>Cryptosporidium</i> spp.	28 8.8-70	1.7 0.8-3.0	0.6 0.2-1.2	2 0-7
<i>Giardia</i> spp.	57 29-109	5.0 2.6-9.0	0.5 0.04-1.4	2 0-6

[†] mean

[‡] 2.5-97.5 percentile

[#] not available

Table 5. Incidence of non-gastrointestinal pathogens in the Netherlands, 2012

Pathogen	Incidence	Fatal cases
<i>Listeria monocytogenes</i>		
Perinatal	6*	0
Acquired	71	8
Hepatitis A virus	590 [†]	2
	322-1,031 [‡]	1-3
Hepatitis E virus	53	1
	23-94	0-1
<i>Toxoplasma gondii</i>		
Congenital	356	13
	183-626	7-21
Acquired [^]	426	0
	198-722	

* No uncertainty because *Listeria* cases were acquired through active surveillance

[†] mean

[‡] 2.5-97.5 percentile

[^] Chorioretinitis only

Table 6. Incidence of sequelae by pathogen in the Netherlands, 2012

Pathogen and sequelae	Incidence	Fatal cases
<i>Campylobacter</i> spp.		
Guillain-Barré Syndrome	76 [†] (0-142) [‡]	1 (0-5)
Reactive arthritis	1,839 (777-3,688)	0
Irritable Bowel Syndrome	8,830 (2,579-22,555)	0
Inflammatory Bowel Disease	23 (16-31)	0
STEC O157		
Hemolytic Uraemic Syndrome	22 (15-30)	2 (1-5)
End-Stage Renal Disease	3 (1-4)	1 (1-1)
<i>Salmonella</i> spp.		
Reactive arthritis	771 (275-1,588)	0
Irritable Bowel Syndrome	5,220 (787-15,997)	0
Inflammatory Bowel Disease	8 (6-11)	0
<i>Listeria monocytogenes</i> (perinatal)		
Meningitis	6*	NA
Neurological sequelae of meningitis	3 (1-4)	0
<i>Listeria monocytogenes</i> (acquired)		
Meningitis	18 (15-21)	NA
Neurological sequelae of meningitis	3 (1-4)	0
<i>Toxoplasma gondii</i> (congenital)		
Chorioretinitis 1 st year of life	48 (24-85)	NA
Chorioretinitis later years of life	58 (30-101)	NA
Intracranial calcifications	37 (19-68)	NA
Hydrocephalus	7 (3-14)	NA
Central Nervous System	10 (2-28)	NA
Abnormalities		
<i>Toxoplasma gondii</i> (acquired)		
Chorioretinitis	426 (198-722)	0

[†] mean

[‡] 2.5-97.5 percentile

* No uncertainty because cases were acquired through active surveillance

NA: Not applicable (fatal cases reported in Table 2)

Table 7. Overall disease burden, disease burden per 100,000 inhabitants and mean disease burden per case of illness in the Netherlands, 2012

Pathogen	DALY per year		DALY per 100,000		DALY per 1,000 cases			
	Discount rate		0%	1.5%	0%	1.5%	0%	1.5%
Bacteria – infectious								
<i>Campylobacter</i> spp.	3,472	3,099	20.6	18.4	40	35		
STEC O157	139	108	0.8	0.7	157	124		
<i>Salmonella</i> spp.	1,796	1,604	10.7	9.6	38	33		
<i>Listeria monocytogenes</i> (perinatal)	55	32	0.3	0.2	9,167	5,451		
<i>Listeria monocytogenes</i> (acquired)	72	67	0.4	0.4	999	957		
<i>Listeria monocytogenes</i> (total)	127	99	0.7	0.6	1,635	1,307		
Bacteria – toxin producing								
<i>Bacillus cereus</i>	113	113	0.7	0.7	2.3	2.3		
<i>Clostridium perfringens</i>	538	531	3.2	3.2	3.2	3.1		
<i>Staphylococcus aureus</i>	767	760	4.6	4.5	2.6	2.6		
Viruses								
Norovirus	1,793	1,587	10.7	9.5	2.6	2.3		
Rotavirus	1,416	1,272	8.4	7.6	5.7	5.2		
Hepatitis A virus	96	82	0.6	0.5	167	145		
Hepatitis E virus	23	18	0.1	0.1	460	380		
Protozoa								
<i>Cryptosporidium</i> spp.	72	71	0.4	0.4	3.1	3.0		
<i>Giardia</i> spp.	113	112	0.7	0.7	2.2	2.1		
<i>Toxoplasma gondii</i> (congenital)	2,151	1,262	12.9	7.6	6,338	3,720		
<i>Toxoplasma gondii</i> (acquired)	1,345	1,021	8.1	6.1	3,173	2,405		
<i>Toxoplasma gondii</i> (total)	3,496	2,283	21.0	13.7	4,560	2,971		

Table 8. Estimated total costs of illness (COI), COI per 100,000 inhabitants and mean COI per case of illness in the Netherlands, 2012

Pathogen	COI per year (M€)		COI per 100,000 (k€)		COI per 1,000 cases (k€)	
	Discount rate		0%	4%	0%	4%
Bacteria – infectious						
<i>Campylobacter</i> spp.	78	73	467	435	774	722
STEC O157	10	5.2	60	30	4,818	2,541
<i>Salmonella</i> spp.	36	34	212	199	569	530
<i>Listeria monocytogenes</i> (perinatal)	5.3	1.8	32	11	882,954	306,311
<i>Listeria monocytogenes</i> (acquired)	2.1	2.0	13	12	29,631	27,716
<i>Listeria monocytogenes</i> (total)	7.4	3.8	44	23	95,808	49,284
Bacteria – toxin producing						
<i>Bacillus cereus</i>	9.3	9.3	55	55	185	185
<i>Clostridium perfringens</i>	26	26	153	153	150	150
<i>Staphylococcus aureus</i>	54	54	319	319	182	182
Viruses						
Norovirus	108	108	633	633	152	152
Rotavirus	65	65	381	381	251	251
Hepatitis A virus	0.8	0.8	5	5	1,416	1,416
Hepatitis E virus	0.2	0.2	1.3	1.3	4,182	4,182
Protozoa						
<i>Cryptosporidium</i> spp.	8.1	8.1	47	47	290	290
<i>Giardia</i> spp.	10	10	62	62	179	179
<i>Toxoplasma gondii</i> (congenital)	52	17	304	99	142,894	46,519
<i>Toxoplasma gondii</i> (acquired)	2.8	2.8	16	16	6,567	6,559
<i>Toxoplasma gondii</i> (total)	55	20	320	115	67,502	24,408
TOTAL	462	412	2,760	2,459		

Table 9. Attribution of the incidence, fatalities and disease burden to the major transmission pathways in the Netherlands, 2012

Transmission pathway	Food	Environment	Human	Animal	Travel	Total*
Incidence (x 1,000)	703 [†]	206	590	86	138	1,724
	327-1,347 [‡]	115-365	370-926	42-168	73-253	927-3,060
Fatal cases	75	35	69	17	23	218
	43-140	19-62	29-130	10-27	13-39	110-400
DALY per year						
not discounted	6,543	2,778	2,323	1,088	1,229	13,961
	3,541-12,007	1,619-4,715	1,217-4,187	581-2,088	645-2,446	7,643-25,362
discounted at 1.5%	5,496	2,177	2,064	947	1,055	11,739
	2,829-10,512	1,225-3,841	1,097-3,725	478-1,869	517-2,074	6,180-22,057
Cost of illness						
undiscounted (M€)	202	74	114	32	40	462
discounted at 4% (M€)	175	60	113	29	36	412

[†] mean; [‡] 2.5-97.5 percentile; * due to 14 pathogens included in this study

Table 10. Attribution of the incidence, fatalities and disease burden of foodborne disease to food groups in the Netherlands, 2012

Food group	Beef/ mutton	Pork	Poultry	Eggs	Dairy	Fish/ shellfish	Fruit/ veg.	Beverages	Cereals	Other foods	Human/ animal	Total*
Incidence (x 1000)	107 41-223	45 18-93	61 22-136	22 6-53	55 24-108	80 53-126	40 18-77	16 8-31	41 18-79	122 54-236	113 65-187	703 327-1,347
Fatal cases	8.8 4.6-19	9.0 5.8-15	12 8.1-19	5.4 4.2-7.3	5.8 3.7-10	6.6 3.6-12	5.5 3.1-10	1.8 1.1-3.4	3.1 1.7-6.1	5.1 2.1-13	11 5.3-22	75 43-140
DALY per year <i>undiscounted</i>	934 462-1,793	1,280 763-2,104	1,089 578-2,103	249 87-623	427 209-824	899 707-1,229	368 190-690	94 39-205	181 72-397	454 176-1,008	568 293-1,053	6,543 3,541-12,007
<i>discounted</i>	747 336-1,523	914 513-1,575	954 474-1,923	221 62-583	367 167-749	829 671-1,148	303 147-595	86 35-194	167 63-376	421 153-956	487 241-925	5,496 2,829-10,512
Cost of illness <i>undiscounted</i>	28.3	26.0	27.4	7.0	15.6	24.9	11.6	3.8	8.8	24.3	24.0	202
<i>discounted</i>	22.6	15.9	25.0	6.6	13.8	22.8	10.0	3.6	8.5	23.5	22.3	175

† mean; ‡ 2.5-97.5 percentile; * due to 14 pathogens included in this study

Figure 1. Comparison of incidence of food-related pathogens in 2009 through 2012

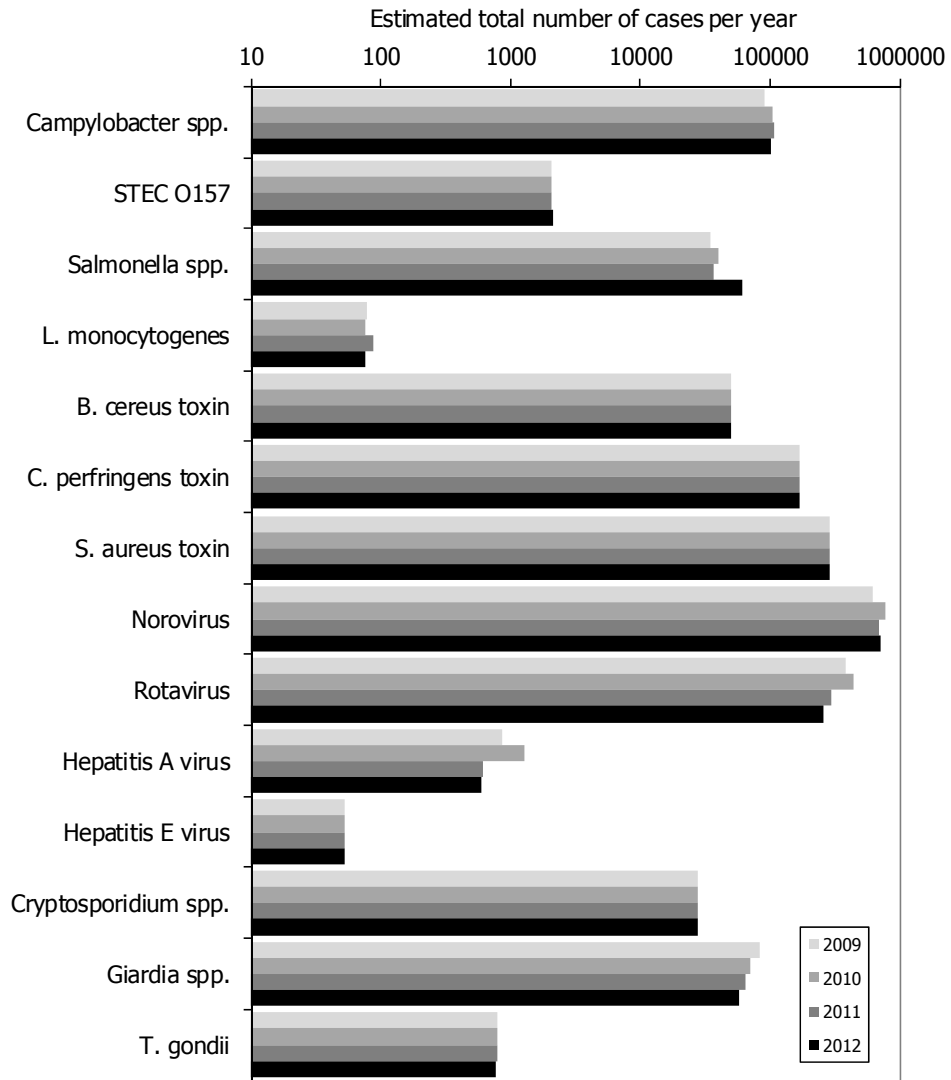
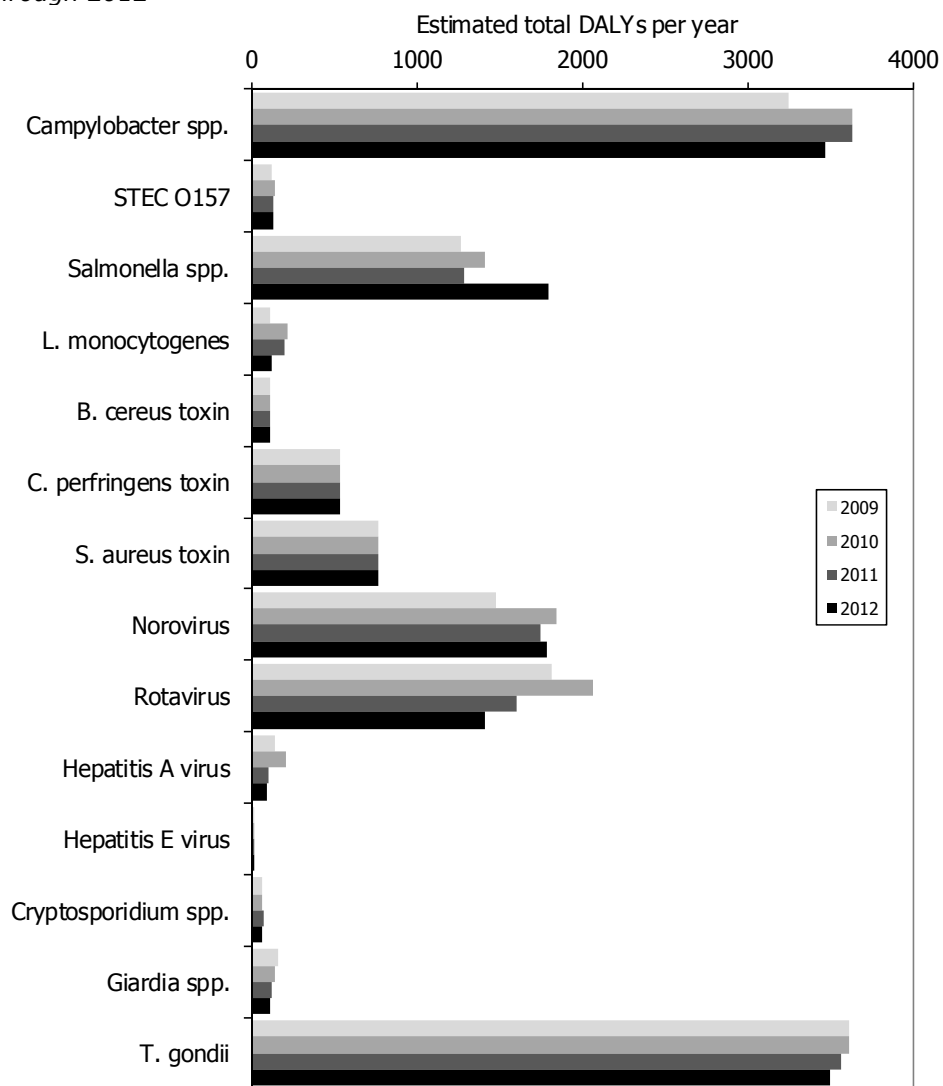


Figure 2. Comparison of disease burden of food-related pathogens in 2009 through 2012



Annex. Detailed results

Summary of results

Pathogen	Incidence (per year)	Deaths (per year)	Disease burden (DALY)		Costs (M€ per year)	
			Undiscounted	Discounted	Undiscounted	Discounted
<i>Campylobacter</i> spp.	100,777	34	3,472		78	73
STEC O157	2,112	4	139		10	5
<i>L. monocytogenes</i>	77	5	127		7	4
<i>Salmonella</i> spp.	60,707	34	1,796		35	32
<i>B. cereus</i> toxine	50,393	0	113		9	9
<i>C. perfringens</i> toxine	169,838	5	538		26	26
<i>S. aureus</i> toxine	292,588	7	767		53	53
Hepatitis-A virus	590	2	96		1	1
Hepatitis-E virus	53	1	23		0	0
Norovirus	703,416	68	1,793		107	107
Rotavirus	257,554	40	1,416		65	65
<i>C. parvum</i>	27,941	2	72		8	8
<i>G. lamblia</i>	57,163	2	113		10	10
<i>T. gondii</i>	782	12	3,496		53	19
Totaal	1,723,991	215	13,961		462	412

Attribution to main pathways, all pathogens

Main pathway	Food	Environment	Human	Animal	Travel	Total
Incidence (per year)	703,303	206,070	590,422	86,370	137,826	1,723,991
Deaths (per year)	75	35	69	17	23	218
Disease burden (DALY)	6,543	2,778	2,323	1,088	1,229	13,961
Disease burden (DALY, discounted)	5,496	2,177	2,064	947	1,055	11,739
Cost of illness (M€, undiscounted)	202	74	114	32	40	462
Cost of illness (M€, discounted at 4%)	175	60	113	29	36	412

Attribution of incidence by pathogen to main pathways

Pathogen	Food	Environment	Human	Animal	Travel	Total
Campylobacter	42,326	20,760	6,349	19,249	12,093	100,777
STEC O157	854	363	215	433	247	2,112
L. monocytogenes	54	5	4	4	10	77
Salmonella	44,179	4,686	3,378	3,342	5,122	60,707
B. cereus toxine	45,001	554	605	554	3,679	50,393
C. perfringens toxine	153,533	3,736	3,567	3,567	5,435	169,838
S. aureus toxine	255,137	10,533	9,363	6,437	11,118	292,588
Hepatitis-A virus	67	66	107	0	350	590
Hepatitis-E virus	7	13	4	6	23	53
Norovirus	117,471	99,885	389,692	35,171	61,197	703,416
Rotavirus	33,482	43,784	149,639	7,727	22,922	257,554
C. parvum	3,325	7,740	7,656	3,744	5,476	27,941
G. lamblia	7,431	13,662	19,836	6,116	10,118	57,163
T. gondii	436	283	7	20	36	782
Total	703,303	206,070	590,422	86,370	137,826	1,723,991

Attribution of deaths by pathogen to main pathways

Pathogen	Food	Environment	Human	Animal	Travel	Totaal
Campylobacter	14.3	7.0	2.1	6.5	4.1	34.1
STEC O157	1.6	0.7	0.4	0.8	0.5	4.0
L. monocytogenes	5.5	0.5	0.4	0.4	1.1	8.0
Salmonella	18.7	4.4	3.2	3.1	4.8	34.2
B. cereus toxine	0.0	0.0	0.0	0.0	0.0	0.0
C. perfringens toxine	4.2	0.1	0.1	0.1	0.1	4.6
S. aureus toxine	6.3	0.3	0.2	0.2	0.3	7.3
Hepatitis-A virus	0.2	0.2	0.3	0.0	1.1	1.9
Hepatitis-E virus	0.1	0.2	0.0	0.1	0.3	0.6
Norovirus	11.4	9.7	37.8	3.4	5.9	68.2
Rotavirus	5.2	6.8	23.2	1.2	3.6	39.9
C. parvum	0.2	0.5	0.5	0.2	0.3	1.7
G. lamblia	0.2	0.4	0.5	0.2	0.3	1.6
T. gondii	7.0	4.5	0.1	0.3	0.6	12.5
Total	74.9	35.2	69.0	16.5	22.9	218.5

Attribution of disease burden (DALY per year, undiscounted) to main pathways

Pathogen	Food	Environment	Human	Animal	Travel	Total
Campylobacter	1,458	715	219	663	417	3,472
STEC O157	57	24	14	28	16	139
L. monocytogenes	88	8	7	7	17	127
Salmonella	1,215	165	119	117	180	1,796
B. cereus toxine	102	1	1	1	8	113
C. perfringens toxine	487	12	11	11	17	538
S. aureus toxine	668	28	25	17	29	767
Hepatitis-A virus	9	11	18	0	58	96
Hepatitis-E virus	2	6	2	3	10	23
Norovirus	300	254	993	90	156	1,793
Rotavirus	184	241	823	42	126	1,416
C. parvum	8	20	20	10	14	72
G. lamblia	14	27	40	12	20	113
T. gondii	1,951	1,266	31	87	161	3,496
Total	6,543	2,778	2,323	1,088	1,229	13,961

Attribution of cost-of-illness (k€ per year, undiscounted) to main pathways

Pathogen	Food	Environment	Human	Animal	Travel	Total
Campylobacter	32,780	16,078	4,917	14,907	9,366	78,048
STEC O157	4,111	1,750	1,038	2,086	1,191	10,176
L. monocytogenes	5,105	494	391	398	989	7,377
Salmonella	23,737	3,071	2,214	2,190	3,356	34,567
B. cereus toxine	8,345	103	112	103	682	9,345
C. perfringens toxine	23,101	562	537	537	818	25,555
S. aureus toxine	46,407	1,916	1,703	1,171	2,022	53,219
Hepatitis-A virus	95	93	152	0	495	836
Hepatitis-E virus	31	55	17	24	95	222
Norovirus	17,858	15,185	59,242	5,347	9,303	106,935
Rotavirus	8,418	11,009	37,623	1,943	5,763	64,756
C. parvum	964	2,244	2,220	1,086	1,588	8,102
G. lamblia	1,333	2,450	3,557	1,097	1,814	10,251
T. gondii	29,455	19,109	475	1,320	2,428	52,787
Total	201,741	74,118	114,198	32,207	39,912	462,176

Attribution of cost-of-illness (k€ per year, discounted at 4%) to main pathways

Pathogen	Food	Environment	Human	Animal	Travel	Total
Campylobacter	30,552	14,985	4,583	13,894	8,729	72,742
STEC O157	2,091	890	528	1,061	606	5,176
L. monocytogenes	2,626	254	201	205	509	3,795
Salmonella	22,117	2,846	2,052	2,030	3,111	32,155
B. cereus toxine	8,345	103	112	103	682	9,345
C. perfringens toxine	23,101	562	537	537	818	25,555
S. aureus toxine	46,407	1,916	1,703	1,171	2,022	53,219
Hepatitis-A virus	95	93	152	0	495	836
Hepatitis-E virus	31	55	17	24	95	222
Norovirus	17,858	15,185	59,242	5,347	9,303	106,935
Rotavirus	8,418	11,009	37,623	1,943	5,763	64,756
C. parvum	964	2,244	2,220	1,086	1,588	8,102
G. lamblia	1,333	2,450	3,557	1,097	1,814	10,251
T. gondii	10,651	6,910	172	477	878	19,087
Total	174,590	59,501	112,698	28,973	36,414	412,176

Attribution to food groups, all pathogens

Food group	Beef & Lamb	Pork	Poultry	Eggs	Dairy	Fish & shellfish	Produce	Beverages	Grains	Other foods	Humans & animals	Total
Incidence (per year)	106,568	45,494	61,050	22,388	55,376	80,281	39,871	16,017	41,207	121,685	113,366	703,302
Deaths (per year)	8.8	9.0	12	5.4	5.8	6.6	5.5	1.8	3.1	5.1	11	75
Disease burden (DALY)	934	1,280	1,089	249	427	899	368	94	181	454	568	6,543
Disease burden (DALY, discounted)	747	914	954	221	367	829	303	86	167	421	487	5,496
Cost of illness (M€, undiscounted)	28.3	26.0	27.4	7.0	15.6	24.9	11.6	3.8	8.8	24.3	24.0	202
Cost of illness (M€, discounted at 4%)	22.6	15.9	25.0	6.6	13.8	22.8	10.0	3.6	8.5	23.5	22.3	175

Attribution of incidence by pathogen to food groups

Pathogen	Beef & Lamb	Pork	Poultry	Eggs	Dairy	Fish & shellfish	Produce	Beverages	Grains	Other foods	Humans & animals	Total
Campylobacter	1,735	2,159	22,814	1,312	3,767	2,963	2,243	720	974	1,397	2,243	42,326
STEC O157	376	55	26	18	63	25	61	31	25	30	144	854
L. monocytogenes	6	5	4	2	13	9	4	1	3	3	3	53
Salmonella	2,494	2,831	2,930	4,395	1,307	25,194	1,247	614	851	1,188	1,128	44,179
B. cereus toxine	3,240	1,575	720	1,620	2,610	900	900	765	7,605	23,986	1,080	45,001
C. perfringens toxine	73,388	12,897	10,901	4,299	6,295	9,980	10,594	3,838	3,992	11,822	5,527	153,533
S. aureus toxine	19,135	20,666	19,901	8,420	37,505	14,798	5,103	4,592	19,135	75,521	30,361	255,137
Hepatitis-A virus	0	0	0	0	0	8	9	3	3	2	42	67
Hepatitis-E virus	0	5	0	0	0	0	1	0	0	0	1	7
Norovirus	3,759	3,642	3,407	2,232	2,349	18,208	8,575	3,642	6,108	5,874	59,675	117,471
Rotavirus	0	937	0	0	569	6,496	7,969	1,473	2,511	1,507	12,020	33,482
C. parvum	871	146	96	90	306	725	688	100	0	100	203	3,325
G. lamblia	1,464	357	230	0	572	959	2,452	238	0	245	914	7,431
T. gondii	100	219	21	0	20	16	25	0	0	10	25	436
Total	106,568	45,494	61,050	22,388	55,376	80,281	39,871	16,017	41,207	121,685	113,366	703,302

Attribution of deaths by pathogen to food groups

Pathogen	Beef &			Eggs	Fish &			Beverages	Grains	Humans &		Total
	Lamb	Pork	Poultry		Dairy	shellfish	Produce			Other foods	animals	
Campylobacter	0.6	0.7	7.7	0.4	1.3	1.0	0.8	0.2	0.3	0.5	0.8	14.3
STEC O157	0.7	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.1	0.3	1.6
L. monocytogenes	0.6	0.5	0.4	0.2	1.4	1.0	0.4	0.1	0.3	0.3	0.3	5.5
Salmonella	2.4	2.7	2.8	4.1	1.2	0.8	1.2	0.6	0.8	1.1	1.1	18.7
B. cereus toxine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C. perfringens toxine	2.0	0.3	0.3	0.1	0.2	0.3	0.3	0.1	0.1	0.3	0.1	4.2
S. aureus toxine	0.5	0.5	0.5	0.2	0.9	0.4	0.1	0.1	0.5	1.9	0.8	6.3
Hepatitis-A virus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2
Hepatitis-E virus	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Norovirus	0.4	0.4	0.3	0.2	0.2	1.8	0.8	0.4	0.6	0.6	5.8	11.4
Rotavirus	0.0	0.1	0.0	0.0	0.1	1.0	1.2	0.2	0.4	0.2	1.9	5.2
C. parvum	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
G. lamblia	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2
T. gondii	1.6	3.5	0.3	0.0	0.3	0.3	0.4	0.0	0.0	0.2	0.4	7.0
Total	8.8	9.0	12.4	5.4	5.8	6.6	5.5	1.8	3.1	5.1	11.5	74.9

Attribution of disease burden (DALY per year, undiscounted) to food groups

Pathogen	Beef & Lamb	Pork	Poultry	Eggs	Dairy	Fish & shellfish	Produce	Beverages	Grains	Other foods	Humans & animals	Total
Campylobacter	60	74	786	45	130	102	77	25	34	48	77	1,458
STEC O157	25	4	2	1	4	2	4	2	2	2	9	57
L. monocytogenes	10	8	6	3	22	16	7	2	5	5	4	88
Salmonella	88	99	103	154	46	547	44	22	30	42	40	1,215
B. cereus toxine	7	4	2	4	6	2	2	2	17	54	2	102
C. perfringens toxine	232	41	35	14	20	32	34	12	13	37	17	487
S. aureus toxine	50	54	52	22	98	39	13	12	50	198	80	668
Hepatitis-A virus	0	0	0	0	0	1	1	0	0	0	7	9
Hepatitis-E virus	0	2	0	0	0	0	0	0	0	0	0	2
Norovirus	10	9	9	6	6	46	22	9	16	15	152	300
Rotavirus	0	5	0	0	3	36	44	8	14	8	66	184
C. parvum	2	0	0	0	1	2	2	0	0	0	1	8
G. lamblia	3	1	0	0	1	2	5	0	0	0	2	14
T. gondii	447	979	94	0	90	72	113	0	0	45	111	1,951
Total	934	1,280	1,089	249	427	899	368	94	181	454	568	6,543

Attribution of cost-of-illness (k€ per year, undiscounted) to food groups

Pathogen	Beef & Lamb	Pork	Poultry	Eggs	Dairy	Fish & shellfish	Produce	Beverages	Grains	Other foods	Humans & animals	Total
Campylobacter	1,344	1,672	17,669	1,016	2,917	2,295	1,737	557	754	1,082	1,737	32,780
STEC O157	1,813	263	127	86	304	119	292	148	119	144	695	4,111
L. monocytogenes	572	475	337	194	1,261	909	388	133	301	286	250	5,105
Salmonella	1,635	1,855	1,920	2,880	856	11,296	817	402	558	778	739	23,737
B. cereus toxine	601	292	134	300	484	167	167	142	1,410	4,448	200	8,345
C. perfringens toxine	11,042	1,941	1,640	647	947	1,502	1,594	578	601	1,779	832	23,101
S. aureus toxine	3,481	3,759	3,620	1,531	6,822	2,692	928	835	3,481	13,736	5,522	46,407
Hepatitis-A virus	0	0	0	0	0	12	12	4.2	4.2	3.0	60	95
Hepatitis-E virus	0	23	0	0	0	1	2	1	0	0	3	31
Norovirus	571	554	518	339	357	2,768	1,304	554	929	893	9,072	17,858
Rotavirus	0	236	0	0	143	1,633	2,004	370	631	379	3,022	8,418
C. parvum	253	42	28	26	89	210	200	29	0	29	59	964
G. lamblia	263	64	41	0	103	172	440	43	0	44	164	1,333
T. gondii	6,745	14,786	1,414	0	1,355	1,090	1,708	0	0	677	1,679	29,455
Total	28,319	25,961	27,447	7,020	15,638	24,865	11,593	3,796	8,788	24,278	24,035	201,741

Attribution of cost-of-illness (k€ per year, discounted at 4%) to food groups

Pathogen	Beef &			Eggs	Dairy	Fish &		Beverages	Grains	Other foods	Humans & animals	Total
	Lamb	Pork	Poultry			shellfish	Produce					
Campylobacter	1,253	1,558	16,467	947	2,719	2,139	1,619	519	703	1,008	1,619	30,552
STEC O157	922	134	65	44	155	61	148	75	61	73	353	2,091
L. monocytogenes	294	244	173	100	649	467	200	68	155	147	129	2,626
Salmonella	1,515	1,719	1,779	2,669	794	10,587	757	373	517	721	685	22,117
B. cereus toxine	601	292	134	300	484	167	167	142	1,410	4,448	200	8,345
C. perfringens toxine	11,042	1,941	1,640	647	947	1,502	1,594	578	601	1,779	832	23,101
S. aureus toxine	3,481	3,759	3,620	1,531	6,822	2,692	928	835	3,481	13,736	5,522	46,407
Hepatitis-A virus	0	0	0	0	0	12	12	4.2	4.2	3.0	60	95
Hepatitis-E virus	0	23	0	0	0	1.5	2.3	1.1	0.0	0.0	3.2	31
Norovirus	571	554	518	339	357	2,768	1,304	554	929	893	9,072	17,858
Rotavirus	0	236	0	0	143	1,633	2,004	370	631	379	3,022	8,418
C. parvum	253	42	28	26	89	210	200	29	0	29	59	964
G. lamblia	263	64	41	0	103	172	440	43	0	44	164	1,333
T. gondii	2,439	5,347	511	0	490	394	618	0	0	245	607	10,651
Total	22,634	15,912	24,977	6,604	13,751	22,804	9,992	3,591	8,491	23,506	22,328	174,590

