

National Enteric Surveillance Program (NESP)

ANNUAL SUMMARY 2012

PROTECTING CANADIANS FROM ILLNESS



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INNOVATION AND ACTION IN PUBLIC HEALTH.**

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NATIONAL ENTERIC SURVEILLANCE PROGRAM (NESP)

ANNUAL SUMMARY 2012

INCLUDING SEROTYPE AND PHAGE TYPE TABLES
FOR 2012, NESP AND NML

The National Microbiology Laboratory (NML), Centre for Food-borne, Environmental and Zoonotic Infectious Diseases (CFEZID), Public Health Agency of Canada, Provincial Public Health Microbiology Laboratories

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EXECUTIVE SUMMARY

The National Enteric Surveillance Program (NESP) is designed to provide weekly analysis and reporting for laboratory-confirmed isolations of enteric pathogens in Canada, including bacterial, viral and parasitic pathogens. This is an annual summary of data submitted to NESP by provincial/territorial microbiology laboratories in 2012. It is important to note that for some of the pathogens the isolates reported in NESP is only a subset of laboratory isolations within the province and may not reflect the incidence of disease reported through provincial and national notifiable disease surveillance systems.

Salmonella continued to be the most common pathogen reported to NESP in 2012, with *S. Enteritidis* being the most common serovar. However in 2012, there was a decrease in *S. Enteritidis* isolates reported and an increase in *S. Heidelberg*. The number of *E. coli* O157 isolates reported showed a significant decline over the past 5 years, although the number reported in 2012 was similar to 2011. There was an increase in the number of *Shigella sonnei* cases reported in 2012 compared to the previous year. Hepatitis A was added to the list of organisms under surveillance in July 2012 in order to improve multi-jurisdictional outbreak detection.

This report includes reference tables with a complete list of species and serotype data reported to NESP and phage types of isolates reported in 2012 at the National Microbiology Laboratory (NML).

This report also summarizes the extra-intestinal isolation sites and travel-associated infections reported through NESP. Although travel history is largely under-reported in NESP, 240 (1.4%) enteric infections were identified as associated with international travel. *Salmonella* infections were the most common followed by parasites. Travel to Asia and the Caribbean was the most frequent destination identified by travellers with travel-associated enteric infections.

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INTRODUCTION

The National Enteric Surveillance Program (NESP) is designed to provide timely analysis and reporting for laboratory-confirmed isolations of enteric pathogens in Canada, including bacterial, viral and parasitic pathogens. In collaboration with related programs such as PulseNet¹ Canada, NESP supports the real-time detection and response to emerging and priority diseases, and is integrated with international efforts to monitor and limit the spread of pathogenic microorganisms.

NESP is based on the collection of weekly aggregate laboratory data from across Canada, as submitted by the provincial public health microbiology laboratories to the National Microbiology Laboratory (NML) at the Public Health Agency of Canada (PHAC) in Winnipeg, MB. Laboratories submit genus, species and serotype information on enteric microorganisms isolated from human patients. Data are submitted to the NML either directly or using a web-based application facilitated through the Canadian Network for Public Health Intelligence (CNPHI). Compilation and analysis of these weekly data is conducted jointly between the NML and the Centre for Food-borne, Environmental and Zoonotic Infectious Diseases (CFEZID) and a weekly report is produced. The report alerts provincial/territorial and federal partners to significant increases in the number of cases of enteric illness. To support communication of laboratory surveillance findings, the online webNESP application of CNPHI allows partners to perform real-time data analysis, trending and display of their data. PulseNet Canada uses these data in conjunction with laboratory DNA fingerprinting (Pulsed field gel electrophoresis or PFGE) data to detect disease clusters and outbreaks. The resulting data analyses are shared on CNPHI's Canadian Laboratory Surveillance Network (CLSN) between provincial public health microbiology laboratories, the Canadian Food Inspection Agency (CFIA), Health Canada (HC), PHAC and provincial/territorial epidemiologists. Notably, the coordinated assessment of laboratory evidence collected through these two complementary laboratory surveillance networks allows for the interpretation of clinical microbiological evidence during multi-jurisdictional epidemiologic investigations, as described in the *Food-borne Illness Outbreak Response Protocol* (FIORP)².

This annual report is a summary of the weekly data collected from all provincial public health microbiology laboratories, and is being produced so that longer term national trends on the incidence of enteric pathogens in Canada can be analyzed. For some organisms, the number of isolates reported to NESP is only a **subset of laboratory isolations within the province and may not reflect the incidence of disease either provincially or nationally**. However, within each disease group, the data may indicate changes in reported trends.

¹ PulseNet Canada, National Microbiology Laboratory, Public Health Agency of Canada: <http://www.nml-lnm.gc.ca/Pulsenet/index-eng.htm>

² Food-borne Illness Outbreak Response Protocol (FIORP) 2010: To guide a multi-jurisdictional response. Public Health Agency of Canada: <http://www.phac-aspc.gc.ca/zoono/fiorp-pritioa/index-eng.php>

The Canadian Notifiable Diseases Surveillance System (CNDSS) receives data that are collected on a mandatory basis by local health units, forwarded to provincial/territorial health authorities and collated by the Surveillance and Epidemiology Division, Centre for Communicable Diseases and Infection Control, PHAC. These data may be more reliable indicators of total numbers of annual illnesses however the CNDSS is not designed to provide timely information required for cluster or outbreak detection. These 2 surveillance systems (CNDSS and NESP) are complementary in providing both epidemiological and laboratory results; however discrepancies between them do exist. An appendix comparing 2011 data between these two system can be found in Appendix 4.

Data Collection, Analysis and Dissemination:

Provincial public health laboratories receive isolates (or specimens) with accompanying submission forms. Laboratory personnel at each provincial laboratory perform appropriate tests to confirm the identification or subtype of the enteric pathogen. Weekly results from each provincial public health laboratory are summarized onto a NESP report form. The 'report week' for NESP is Sunday to Saturday and is based on the date the laboratory test was completed. The completed NESP report form is faxed or e-mailed to the NML as soon as possible and no later than the second day after a weekend or holiday. An exception to this reporting scheme occurs when the isolate must be sent to another laboratory for completion of the identification. In this case, the isolate is reported at the level of typing or identification attained (e.g. *Salmonella* sp.) for the week in which it was sent to the reference laboratory. The NESP record is then updated when the final identification is received from the reference laboratory (e.g. report in week 35 that one *Salmonella* sp. reported in week 33 has been confirmed as *S. Anatum*). This updated information is submitted with the next weekly NESP report form.

All data sent to NESP are aggregate and anonymous. NESP partners endeavour to include only the number of isolates from new cases identified at the laboratory that week or updates to previously reported numbers. The provincial laboratory will attempt to identify multiple, repeat or follow-up specimens from the same individual and will consider all identical isolates from the same patient that are collected over a 3-month period as a single case.

With respect to data analysis, NESP uses an algorithm to determine whether case counts are significantly higher than expected. The cumulative Poisson probability between the reported case count and the 5-year median value is used to determine statistical significance.

The NESP Weekly Report is sent to all provincial laboratories, at least one epidemiologist or Medical Officer of Health in each province and multiple stakeholders at the federal level. The reports may be shared with other public health professionals, but are not for public distribution. There is no required response by public health professionals to the events or statistical elevations noted in the reports. These reports aim to provide useful and timely information for those responsible for public health action, and they have been used by PHAC, in collaboration with public health partners in provinces, to trigger further public health investigation.

Limitations:

It should be noted that there are some inherent limitations of these data. Not all specimens/isolates are referred from the regional and local laboratories to the provincial public health laboratories and therefore the provincial reports and NESP data may be an under-representation of the true incidence of disease in Canada. For example, *Campylobacter* isolates are not routinely forwarded to provincial or central reference laboratories for further testing beyond genus/species characterizations and are therefore greatly under-represented in NESP. However, *Salmonella* and *E. coli* O157 isolates captured by NESP are more representative of the true incidence of disease in Canada, as the number of cases reported to CNDSS and isolates reported to NESP show a high degree of concurrence for both diseases. In some cases, there may be over-reporting of organisms in NESP due to reporting of multiple specimens from a single patient, but efforts are made to minimize this occurrence. Information regarding extra-intestinal isolation sites, foreign travel, and outbreaks and case clusters are not routinely or consistently reported to NESP from all laboratories and therefore any interpretation should be considered with caution. Outbreaks and clusters reported to NESP do not represent all enteric illness outbreaks identified nationally, nor are the case counts reported to NESP representative of the actual final number of cases that may have been associated with the outbreaks and clusters. Therefore, details regarding outbreaks and case clusters are not included in this report; these are more accurately tracked within PulseNet Canada or through other systems (including Outbreak Summaries application).

ISOLATES REPORTED BY MAJOR ORGANISM GROUP

NESP collects information on several bacterial, viral and parasitic enteric pathogens. The most frequent enteric pathogens reported in 2012 were *Salmonella* spp. followed by the enteric viruses (Norovirus, Rotavirus and Adenovirus) and *Campylobacter* spp. (Table 1). As mentioned previously, this does not reflect national incidence rates but rather testing and reporting practices within the provincial laboratories.

A total of 16, 934 enteric pathogens were reported to NESP in 2012. The number of cases reported per province and territory for each major organism group is shown in Table 1. A complete list of all organisms reported per province and territory is in Appendix 1.

TABLE 1. NUMBER OF ISOLATES REPORTED TO NESP BY MAJOR ORGANISM GROUP PER PROVINCE/TERRITORY, 2012

GROUP	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	YK	NT	NU
<i>Campylobacter</i> *	520	358	167	128	271	218	155	84	47	41	.	3	2
<i>E. coli</i> †	148	91	28	38	182	91	22	12	12	4	1	.	.
<i>Listeria</i>	8	5	.	4	44	53	4	5	.	1	.	.	.
Parasites*	175	36	119	159	273	247	131	105	26	41	8	.	.
<i>Salmonella</i>	1001	846	148	207	3148	1190	173	151	30	69	1	7	8
<i>Shigella</i>	151	168	164	76	268	144	4	12	1
<i>Vibrio</i>	22	18	1	2	5	2	4	.	7
Viruses*	500	414	620	197	1118	779	263	360	104	153	8	.	.
<i>Yersinia</i>	55	29	46	9	146	29	4	2	.	1	1	.	.
Total	2580	1965	1294	820	5455	2753	760	731	227	310	19	10	10

GROUP	TOTAL	% OF TOTAL ISOLATES REPORTED
<i>Campylobacter</i> *	1994	11.8
<i>E. coli</i> †	629	3.7
<i>Listeria</i>	124	0.7
Parasites*	1320	7.8
<i>Salmonella</i>	6979	41.2
<i>Shigella</i>	988	5.8
<i>Vibrio</i>	61	0.3
Viruses*	4516	26.7
<i>Yersinia</i>	322	1.9
Total	16934	-

* *Campylobacter*, Parasitic (*Giardia*, *Cryptosporidium*, *Entamoeba histolytica/dispar* and *Cyclospora*) and viral infections (Norovirus, Rotavirus and Adenovirus) are not routinely reported to the provincial or central reference laboratories and are greatly under-represented in NESP.

† *E. coli* includes O157 serotype (485 cases) and non-O157 or non-typed serotypes (144 cases).

National incidence rates of the major organism groups over the last six years are shown in Table 2a and 2b. Rates (per 100 000) are based on the number of isolates reported to NESP each year. Isolates of organisms such as *E. coli* O157, *Listeria*, *Salmonella* and *Shigella* are routinely forwarded to provincial microbiology laboratories, and as such NESP incidence rates are considered to be reflective of true incidence rates for these pathogens. The provincial and territorial incidence rates for these organisms are shown in Table 3. Five-year trends in the national incidence rate for *Salmonella*, *Shigella* and *E. coli* O157 are shown in Figure 1. Due to the nature of NESP reporting practices, the number of isolates reported for some pathogens are considered to be an underestimate of the true number of isolates; this is especially true for *Campylobacter*, parasites (*Giardia*, *Cryptosporidium*, *Entamoeba histolytica/dispar* and *Cyclospora*) and enteric viruses (Norovirus, Rotavirus and Adenovirus) as these pathogens are not routinely reported to the provincial or central reference laboratories (Table 2b and Appendix 1). As a result, NESP incidence rates for these pathogens are difficult to interpret and changes in these rates may not be due to actual changes in disease rates.

TABLE 2A. ANNUAL NATIONAL TOTALS AND RATES (PER 100,000) FOR MAJOR ORGANISM GROUPS ROUTINELY REPORTED TO NESP, 2007 TO 2012[†]

GROUP	2007		2008		2009		2010		2011		2012	
	TOTAL	RATE	TOTAL	RATE	TOTAL	RATE	TOTAL	RATE	TOTAL	RATE	TOTAL	RATE
<i>E. coli</i> O157 [‡]	934	2.83	661	1.98	529	1.56	404	1.18	482	1.39	484	1.39
<i>Listeria</i> [*]	132	0.38	124	0.35
<i>Salmonella</i>	6419	19.42	6351	18.99	6084	17.97	7251	21.17	6809	19.68	6979	19.94
<i>Shigella</i>	636	1.92	680	2.03	631	1.86	739	2.16	860	2.49	988	2.82

[†] Rates calculated using the population estimates for Canada as of July 1 for years 2007 to 2012 as reported by Statistics Canada.

[‡] Only cases of *E. coli* O157 are included in this table, as *E. coli* non-O157 is not consistently reported by provinces.

^{*} Reporting of *Listeria monocytogenes* to NESP began in July 2010.

TABLE 2B. ANNUAL NATIONAL TOTALS AND RATES (PER 100,000) FOR MAJOR ORGANISM GROUPS UNDER-REPORTED TO NESP, 2007 TO 2012[†]

GROUP	2007		2008		2009		2010		2011		2012	
	TOTAL	RATE	TOTAL	RATE	TOTAL	RATE	TOTAL	RATE	TOTAL	RATE	TOTAL	RATE
<i>Campylobacter</i>	1959	5.93	1614	4.83	1751	5.17	1837	5.36	1938	5.60	1994	5.69
Parasites	1678	5.08	1783	5.33	1570	4.64	1585	4.63	1190	3.44	1320	3.78
Viruses	4657	14.09	3248	9.71	3184	9.40	4662	13.61	4441	12.83	4516	12.90
<i>Vibrio</i>	37	0.11	39	0.12	47	0.14	51	0.15	47	0.14	61	0.17
<i>Yersinia</i>	488	1.48	414	1.24	382	1.13	341	1.00	381	1.10	322	0.92

[†] Rates calculated using the population estimates for Canada as of July 1 for years 2007 to 2012 as reported by Statistics Canada.

TABLE 3. RATES (PER 100,000) PER PROVINCE/TERRITORY FOR SELECT MAJOR ORGANISM GROUPS ROUTINELY REPORTED TO NESP, 2012[†]

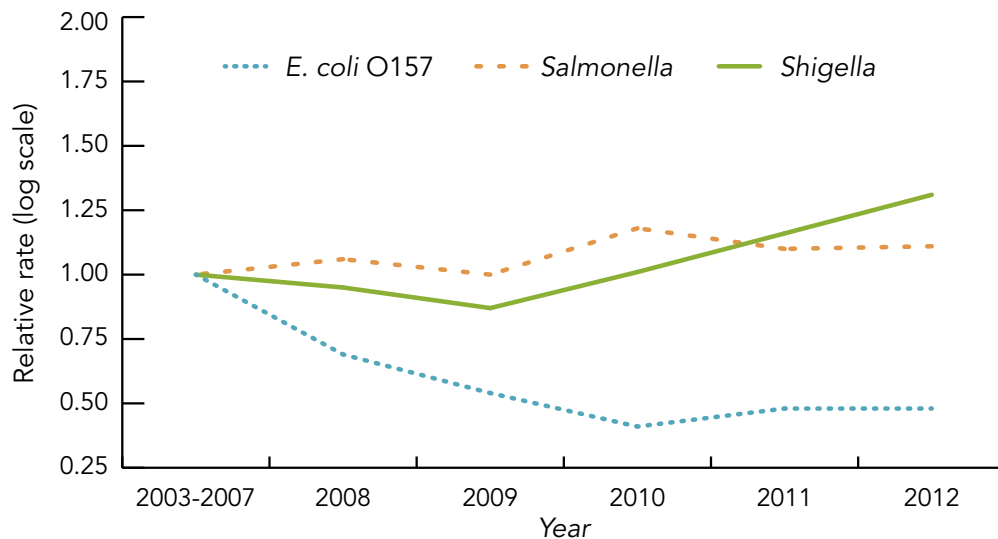
	BC	AB	SK	MB	ON	QC	NB
<i>E. coli</i> O157 [‡]	1.38	2.28	2.58	0.87	1.28	0.87	2.91
<i>Listeria</i>	0.17	0.13	-	0.31	0.32	0.66	0.53
<i>Salmonella</i>	21.58	21.68	13.16	16.29	23.25	14.73	22.90
<i>Shigella</i>	3.26	4.27	15.09	5.98	1.98	1.78	0.53

	NS	PEI	NFLD	YK	NWT	NU
<i>E. coli</i> O157 [‡]	1.27	8.21	0.39	2.75	-	-
<i>Listeria</i>	0.53	-	0.19	-	-	-
<i>Salmonella</i>	15.93	20.52	13.44	2.75	16.16	20.57
<i>Shigella</i>	1.27	0.68	-	-	-	-

[†] Rates calculated using updated postcensal population estimates for Canada, the provinces and the territories as of July 1, 2012 from Statistics Canada.

[‡] Only cases of *E. coli* O157 are included in this table, as *E. coli* non-O157 are not consistently reported by provinces

FIGURE 1. RELATIVE NATIONAL INCIDENCE RATES* OF LAB-CONFIRMED CASES OF *SALMONELLA*, *SHIGELLA* AND *E. COLI* O157 REPORTED TO NESP BY YEAR, 2008 TO 2012

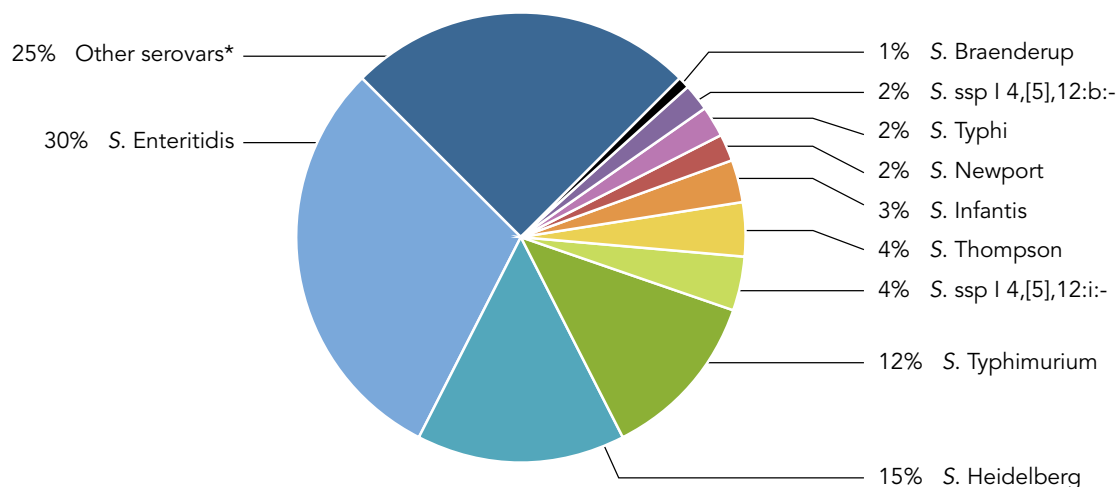


* rates are compared to the 2003-2007 baseline period

SALMONELLA

A total of 6979 *Salmonella* isolates and 220 different serovars were reported to NESP in 2012. The 10 most commonly reported *Salmonella* serovars accounted for 75% of the total *Salmonella* infections reported (Figure 2). The total numbers of isolates identified in each province and territory of the 10 most commonly reported *Salmonella* serovars nationally are listed in Table 4, while a full list of the number of *Salmonella* serovars reported to NESP by each province and territory in 2012 is presented in Appendix 1.

FIGURE 2. PROPORTION OF *SALMONELLA* SEROVARS AS REPORTED TO NESP, 2012 (N=6979)



* Other serovars (1746 isolates) were divided among 210 serovars and 14 isolates were reported as unspecified *Salmonella* species.

TABLE 4. NUMBER OF ISOLATES REPORTED TO NESP PER PROVINCE AND TERRITORY OF THE TEN MOST COMMONLY REPORTED *SALMONELLA* SEROVARS NATIONALLY, 2012

SEROVAR	BC	AB	SK	MB	ON	QC	NB	NS	PEI	NL	YK	NT	NU
Enteritidis	384	343	64	71	788	282	62	73	13	28	-	5	3
Heidelberg	95	100	17	25	473	265	41	33	2	17	-	1	2
Typhimurium	71	61	14	18	479	152	7	7	3	2	-	-	-
ssp I 4,[5],12:i:-	23	40	7	4	130	69	6	-	-	1	1	-	-
Thompson	4	8	1	5	165	66	6	7	1	2	-	-	-
Infantis	23	26	4	3	78	36	8	3	2	1	-	-	-
Newport	24	20	10	2	63	24	6	3	1	-	-	-	-
Typhi	33	18	5	7	74	6	1	-	-	-	-	-	-
ssp I 4,[5],12:b:-	-	7	-	-	85	16	-	-	-	-	-	-	-
Braenderup	28	14	1	4	33	14	3	1	-	-	-	-	.
Top Ten Total	685	637	123	139	2368	930	140	127	22	51	1	6	5

SEROVAR	TOTAL	% OF SALMONELLA TOTAL
Enteritidis	2117	30
Heidelberg	1071	15
Typhimurium	814	12
ssp I 4,[5],12:i:-	281	4
Thompson	265	4
Infantis	184	3
Newport	153	2
Typhi	144	2
ssp I 4,[5],12:b:-	108	2
Braenderup	98	1
Top Ten Total	5235	75

The ranking among the three most commonly reported *Salmonella* serovars changed in 2012 for the first time in eight years, with *S. Enteritidis* continuing to be the most frequently reported, followed by *S. Heidelberg* then *S. Typhimurium*. Increases in *S. Thompson*, *S. ssp I 4,[5],12:b:-* and *S. Braenderup* all lead to higher ranking in this year's top 10 most commonly reported *Salmonella* serovars than previous years (Table 5).

In 2012, several multi-provincial increases in specific *Salmonella* serovars were noted in NESP. These increases were often highlighted as the topic of the week in the weekly NESP report and serve as a trigger for further follow-up which may lead to the detection of multi-jurisdictional outbreaks. For example, multi-jurisdictional increases in *S. Heidelberg*, *S. Anatum*, *S. ssp I 4,[5],12:b:-* identified in NESP contributed to further assessment with PulseNet Canada and provincial partners. In 2012, two Outbreak Investigation Co-ordinating Committee (OICC), as described in FIORP were activated to investigate multi-jurisdictional outbreaks of *S. Thompson* and *S. Braenderup*. The Outbreak Management Division of PHAC led and coordinated these investigations. There were also eight *Salmonella* outbreaks reported to NESP by provincial laboratories in 2012.

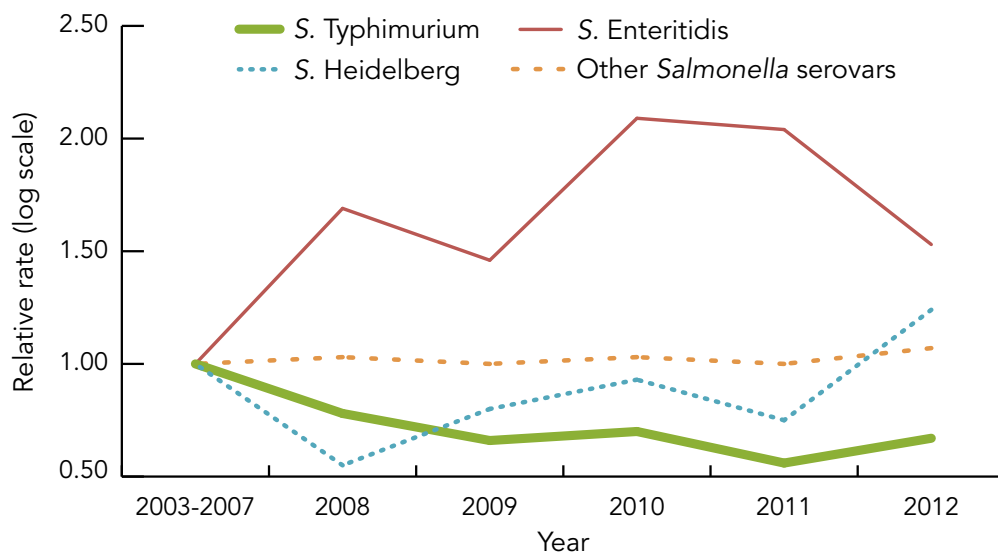
TABLE 5. NATIONAL TOTALS (OVERALL RANK) FOR THE TEN MOST COMMONLY REPORTED *SALMONELLA* SEROVARS AS REPORTED TO NESP, 2007 TO 2012

SPECIES	2007	2008	2009	2010	2011	2012
Enteritidis	1661 (1)	2239 (1)	1955 (1)	2828 (1)	2763 (1)	2117 (1)
Heidelberg	560 (3)	456 (3)	665 (3)	787 (3)	641 (3)	1071 (2)
Typhimurium	1341 (2)	914 (2)	777 (2)	827 (2)	661 (2)	814 (3)
ssp I 4,[5],12:i:-	184 (4)	180 (6)	271 (4)	278 (4)	218 (4)	281 (4)
Thompson	173 (5)	130 (7)	99	107 (7)	118 (8)	265 (5)
Infantis	131 (10)	119 (8)	110 (8)	106 (8)	185 (7)	184 (6)
Newport	142 (9)	185 (5)	133 (6)	146 (6)	195 (6)	153 (7)
Typhi	158 (6)	192 (4)	164 (5)	180 (5)	196 (5)	144 (8)
ssp I 4,[5],12:b:-	78	74	75	90	62	108 (9)
Braenderup	68	57	69	73	78	98 (10)
Saintpaul	123	92	130 (7)	88	101 (9)	94
Javiana	49	66	102 (9)	90	77	87
Paratyphi A	94	109 (10)	92	91	94 (10)	79
Hadar	144 (8)	113 (9)	100 (10)	95 (10)	75	70
Oranienburg	145 (7)	45	53	104 (9)	52	55

S. ENTERITIDIS AND S. HEIDELBERG

In 2012, 2117 *S. Enteritidis* isolates were reported to NESP, a decrease over the previous year. However, *S. Enteritidis* remained the most prevalent cause of human salmonellosis in Canada representing approximately 30% of all human *Salmonella* isolates reported in 2012 (decrease from 41% the previous year). The incidence rate for *S. Enteritidis* decreased in 2012, whereas the incidence of *S. Heidelberg* increased in 2012 above the baseline period (2003-2007) (Figure 3). *S. Heidelberg* increased to represent 15% of all *Salmonella* isolates reported in 2012 (an increase from 10% the previous year).

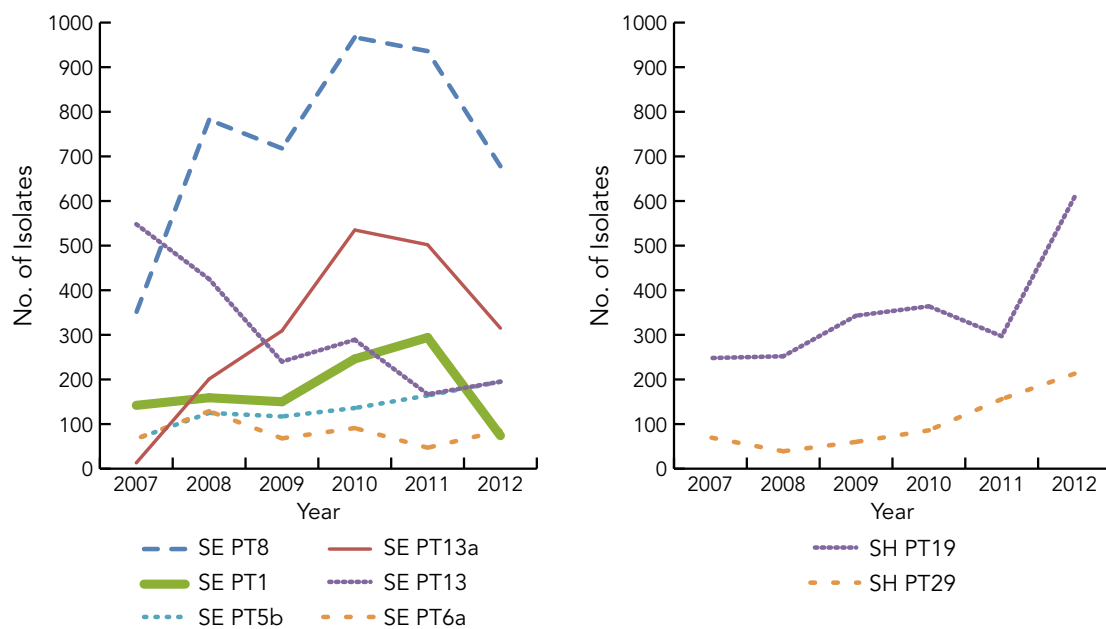
FIGURE 3. RELATIVE INCIDENCE RATES* OF *S. ENTERITIDIS*, *S. HEIDELBERG*, *S. TYPHIMURIUM* AND OTHER *SALMONELLA* SEROVARS REPORTED TO NESP BY YEAR, 2008 TO 2012



* rates are compared to the 2003-2007 baseline period

Phage typing is commonly used to detect changing trends in *S. Enteritidis* and *S. Heidelberg*. In 2012, a decrease of *S. Enteritidis* phage type 8, 13a and 1 was observed (Figure 4) and an increase in *S. Heidelberg* phage type 19 and 29. An increase in *S. Heidelberg* PT 19 was reported in many provinces in 2012 with provincial investigations occurring in some jurisdictions. These 2 phage types comprise 73% of all *S. Heidelberg* phages types reported in 2012 (Figure 4). A complete list of all *Salmonella* phage types reported by NML in 2012 is listed in Appendix 2.

FIGURE 4. NUMBER OF *S. ENTERITIDIS* ISOLATES REPORTED TO NML FOR THE SIX MOST COMMON PHAGE TYPES OF *S. ENTERITIDIS* AND TWO MOST COMMON PHAGE TYPES FOR *S. HEIDELBERG*, 2007 TO 2012

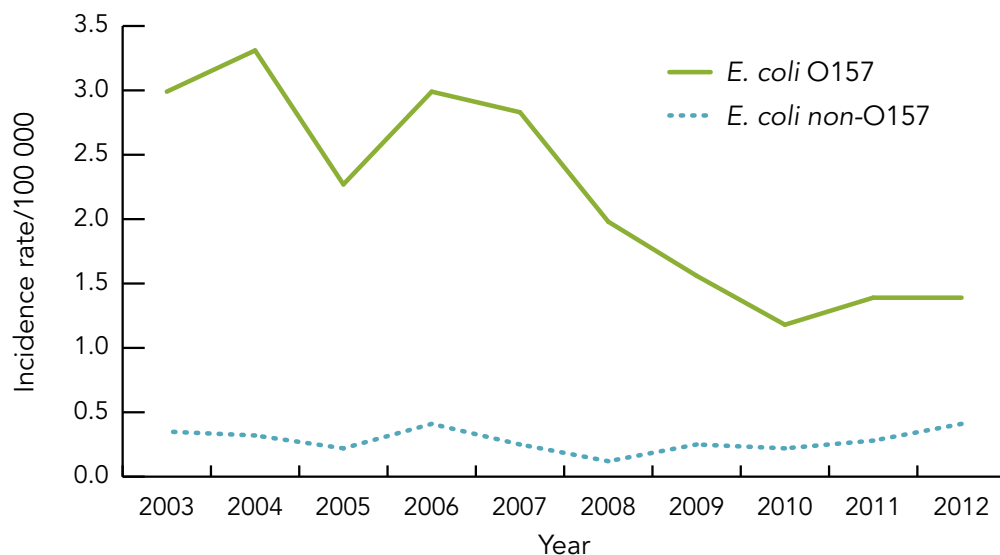


E. COLI

One significant trend observed in NESP is the decline in cases of *E. coli* O157 VTEC over the past 10 years (Figure 5). The incidence rate has decreased from 3.00 cases per 100 000 in 2006 to 1.18 cases per 100 000 in 2010; the incidence rate increased slightly to 1.39 in 2012. The incidence rate showed no change from 2011, despite the occurrence of 7 multi-jurisdictional outbreaks in 2012. These outbreaks were collaboratively investigated by federal and provincial partners through an activated OICC as described in FIORP. The Outbreak Management Division of PHAC led and coordinated these investigations. There were also four additional *E. coli* O157 outbreaks reported to NESP by provincial laboratories in 2012.

The national incidence rate of *E. coli* non-O157 reported to NESP has ranged from 0.12/100 000 to 0.41/100 000 over the past ten years. It should be noted that *E. coli* non-O157 are reported less consistently than *E. coli* O157 to NESP by the provincial laboratories (as many are not identified or sent to provincial laboratories) and that the specific serotype of *E. coli* non-O157 isolates is not often reported. The limited *E. coli* serotype data available through NESP are presented in Appendix 1. Serotype information is also available for the confirmed non-O157, Shiga toxin-producing isolates sent to the NML in 2012 (Appendix 3). *E. coli* O121:H19 and *E. coli* O26:H11 were the most commonly reported non-O157 serotypes in 2012.

FIGURE 5. INCIDENCE RATE OF *E. COLI* O157 VTEC AND *E. COLI* NON-O157 (INCLUDING UNTYPED ORGANISMS) SEROTYPES REPORTED TO NESP, 2003 TO 2012



LISTERIA MONOCYTOGENES

In July 2010, the list of organisms included in NESP was expanded to include *L. monocytogenes*. This addition was designed to provide increased national surveillance of invasive listeriosis. A total of 124 isolates were reported in 2012 with a median of 2 isolates reported nationally per week, although there may be seasonal variation in the distribution of *L. monocytogenes*. This is consistent with last year with 132 cases reported to NESP in 2011. The breakdown of the total isolates reported by each province/territory is shown in Table 1 and serotypes identified by NML in 2012 can be found in Table 6.

TABLE 6. SEROTYPE OF *L. MONOCYTOGENES* ISOLATES BY PROVINCE REPORTED TO NML IN 2012

SEROTYPE	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	TOTAL
1/2a	4	2	-	2	17	-	1	1	-	-	27
1/2b	1	-	-	1	6	-	-	-	-	-	8
1/2c	-	-	-	-	-	-	-	-	-	-	0
3a	-	-	-	-	1	-	-	-	-	-	1
4a	-	-	-	-	-	-	-	-	-	1	1
4b	7	3	-	1	20	-	3	3	-	-	37
4c	-	-	-	-	-	-	-	1	-	-	1
Untypable	-	-	-	-	-	-	-	-	-	-	0
Total <i>L. monocytogenes</i>	12	5	0	4	44	0	4	5	0	1	75

According to the case definition for invasive listeriosis, only isolates obtained from a normally sterile site or placental/fetal tissues should be reported to NESP. Therefore, unlike the other enteric organisms included in NESP, all *L. monocytogenes* isolates are from extra-intestinal sites. The isolation sites of *L. monocytogenes* reported to NESP are shown in Table 7. Blood and CSF were the most common sites reported.

TABLE 7. COLLECTION SITE OF *L. MONOCYTOGENES* ISOLATES AS REPORTED TO NESP, 2012

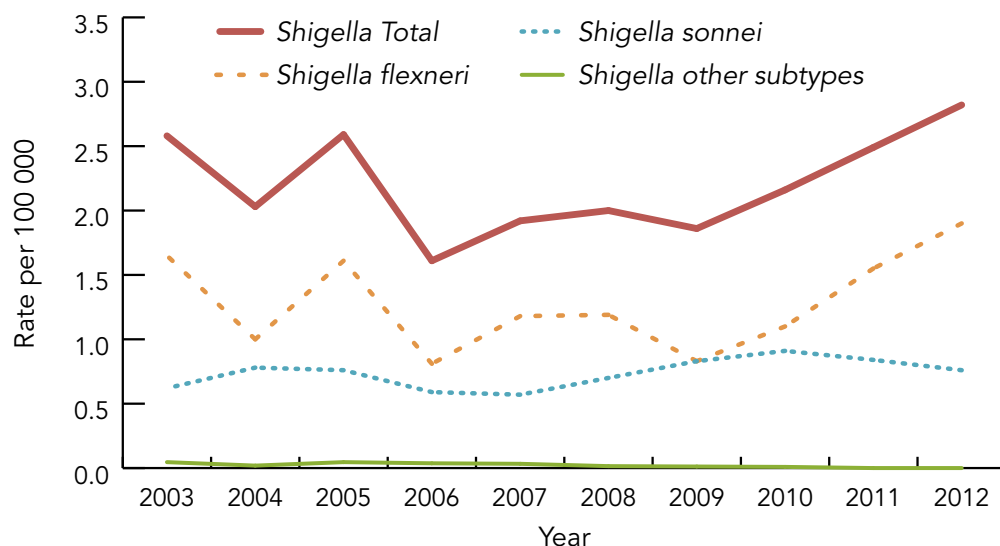
SITE	NO. ISOLATES	PERCENT (%)
Blood	91	73.4
CSF	21	16.9
Other tissue or fluid*	5	4.0
Unknown site	7	5.6
Total	124	

* placenta (2), synovial fluid, bile and transgluteal fluid

SHIGELLA

In 2012, 988 *Shigella* isolates were reported to NESP, two thirds being *Shigella sonnei* isolates (666). An increasing trend of *Shigella sonnei* isolates has been reported since 2009, driven by several outbreaks in a few provinces (Figure 6).

FIGURE 6. INCIDENCE RATE OF *SHIGELLA* SPECIES REPORTED TO NESP, 2003 TO 2012



HEPATITIS A

In July 2012, the list of organisms included in NESP was expanded to include Hepatitis A. This addition was designed to provide timely national surveillance of Hepatitis A for multi-jurisdictional outbreak detection. During the six months Hepatitis A was included in NESP (July to December 2012), 125 isolates of Hepatitis A were reported. A median of 5 isolates were reported nationally per week (range 1-9 isolates). It is important to note that the Hepatitis A counts reported to NESP may not match CNDSS based on the different reporting streams however the NESP counts reported over the 6 month time period are similar to what is expected based on a comparison to annual totals of Hepatitis A case data reported to CNDSS in recent years (between 275 and 325 cases from 2009-2011). The breakdown of the total isolates reported by each province/territory is shown in Table 8.

TABLE 8. NUMBER OF HEPATITIS A ISOLATES/CASES REPORTED TO NESP BY PROVINCE/TERRITORY, 2012

	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	YK	NT	NU	TOTAL
Hepatitis A	19	11	13	4	55	20	2	1	-	-	-	-	-	125

ISOLATES COLLECTED FROM EXTRA-INTESTINAL ISOLATION SITES

The number of isolates collected from extra-intestinal sites excluding *L. monocytogenes*, reported to NESP in 2012 is shown in Table 9. Although information regarding extra-intestinal isolation sites is collected by NESP, these data are not consistently reported to provincial or central reference labs. Isolation of an organism from a sterile site may reflect more severe illness and an increased likelihood to seek treatment and be tested.

The organisms that had the highest percentage of cases isolated from an extra-intestinal site were *S. Dublin*, *C. fetus*, *S. Paratyphi A*, *S. Typhi* and *Vibrio alginolyticus*.

TABLE 9. NUMBER OF ISOLATES COLLECTED FROM EXTRA-INTESTINAL ISOLATION SITES AS REPORTED TO NESP IN 2012

ORGANISM	BLOOD	URINE	OTHER*	TOTAL/OVERALL	PERCENT (%)
<i>Campylobacter</i>	23	0	2	25/1994	1.26
<i>fetus ssp fetus</i>	10		1	11/27	40.74
<i>jejuni</i>	11			11/1548	0.71
Other species	2		1		
<i>Shigella</i>	3	1	1	5/984	0.51
<i>flexneri</i>	3		1	4/267	1.50
<i>sonnei</i>		1		1/666	0.15
<i>Salmonella</i>	277	155	24	456/6979	6.54
Agona		3		3/69	4.35
Bareilly	2	1		3/25	12.00
Braenderup	2	2		4/96	4.17
Brandenburg	2	2		4/32	12.50
Cerro		2		2/6	33.33
Dublin	4	2	1	7/12	58.33
Enteritidis	49	28	7	84/2117	3.97
Hadar	1	6		7/70	10.00
Heidelberg	62	33	4	99/1071	9.24
Infantis	1	15	2	18/184	9.78
Javiana	1	4	1	6/87	6.90
Montevideo	1	5	1	7/41	17.07
Muenchen	1	1		2/47	4.26
Newport	1	3		4/153	2.61
Oranienburg	7	2		9/55	16.36
Panama	5		1	6/37	16.22
Paratyphi A	34			34/79	43.04

ORGANISM	BLOOD	URINE	OTHER*	TOTAL/OVERALL	PERCENT (%)
Paratyphi B	2			2/65	3.08
Poona	2	2		4/32	12.50
Saintpaul	5	3		8/94	8.51
Sandiego	3	1	1	5/27	18.52
Schwarzengrund	2	3		5/25	20.00
Senftenberg		2		2/28	7.14
ssp I 4,[5],12:b:-	2		1	3/108	2.78
ssp I 4,[5],12:i:-	3	4		7/281	2.49
Stanley	2			2/64	3.13
Thompson	5	4		9/265	3.40
Typhi	51			51/144	35.42
Typhimurium	11	5	2	18/814	2.21
Virchow	2			2/32	6.25
Other serovars	14	22	3		
Vibrio	1	0	4	5/61	8.20
<i>alginolyticus</i>			3	3/3	100.00
<i>cholerae</i>			1	1/7	14.29
<i>vulnificus</i>	1			1/3	33.33
Yersinia enterocolitica	2		2	4/293	1.37
E. coli O157		1		1/484	0.21
Total	306	157	33	496	

* Other sites include: **Abscess:** S. Enteritidis, S. Heidelberg, S. Infantis, *Yersinia enterocolitica*; **Bile:** C. coli ; **Breast:** S. ssp I 4,[5],12:b:-; **Catheter:** S. Kingabwa; **Ear:** V. alginolyticus; **Expectorate:** S. Heidelberg ; **Hip incision:** S. Enteritidis; **JP drainage:** S. Enteritidis; **Leg tissue:** V. cholera; **Pus:** C. fetus ssp fetus, S. Montevideo, S. Panama; **Pericardial fluid:** S. Enteritidis; **Peritoneal fluid:** S. Heidelberg, S. Infantis; **Pleural Fluid:** S. Dublin, S. ssp I 6,7:-, S. ssp I 4,[5],12:e,h:-; **Pilonidal:** S. Typhimurium; **Sinus jawbone:** S. Enteritidis; **Sputum:** S. Enteritidis; **Toe culture:** V. alginolyticus; **Wound:** S. Enteritidis, S. Javiana, S. Typhimurium, Sh. Flexneri, *Yersinia enterocolitica*, V. alginolyticus. **Vagina:** S.ssp IV 44:z4,z23:-.

TRAVEL-ASSOCIATED INFECTIONS

Although foreign travel is an important risk factor for gastro-intestinal illness, this information is rarely reported to provincial laboratories and is therefore greatly under-represented in NESP.

A total of 240 cases (1.4%) of enteric infection recorded through NESP were reported in foreign travelers or new immigrants arriving in Canada (Table 10 & Table 11). Asia and the Caribbean were the most common regions identified associated with 25% (60 cases) and 24% (57 cases) respectively, of travel-acquired infections. Mexico and the Caribbean are popular winter destinations for Canadians, combined these 2 regions represent 35% of the travel-acquired infections reported.

TABLE 10. NUMBER OF INFECTIONS BY REGION/COUNTRY OF ORIGIN AS REPORTED TO NESP, 2012

GEOGRAPHIC REGION	NO. OF CASES (%)
Caribbean	60 (25.0)
Asia	57 (23.8)
Africa	45 (18.8)
Mexico	23 (9.6)
Europe	17 (7.1)
South & Central America	13 (5.4)
Other Destinations (Including multiple regions)	10 (4.2)
Unknown	15 (6.3)
Total	240

Salmonella infections were the most common travel-related infection, accounting for 38% of travel associated cases reported through NESP. Parasites were the second most common travel related infection with 20% of travel related cases. There were no cholera cases reported to NESP in 2012; compared with 9 cases reported in 2011.

TABLE 11. NUMBER OF TRAVEL-ACQUIRED INFECTIONS REPORTED TO NESP BY ORGANISM, 2012

ORGANISM	NO. OF CASES (% OF TRAVEL TOTAL)	% OF PATHOGEN TOTAL	COUNTRY OR REGION (NO. > 1)
<i>Campylobacter</i>	46 (19.2%)	2.3	
<i>coli</i>	3	1.5	Peru (2), multiple destinations (Philippines and Thailand)
<i>jejuni/coli</i>	14	17.4	Costa Rica (2), Cuba, Dominican Republic, Europe, Morocco, Peru, Spain (2), Unknown (3), multiple destinations (Spain, Italy, Croatia and Greece) and (Kampuchea and Vietnam)
<i>jejuni</i>	29	1.9	Afghanistan (2), Costa Rica Mexico (9), England, Ethiopia, Europe (2), Hong Kong, India (2), Italy, Kenya, Pakistan, Panama, Peru, Philippines, Thailand (2), multiple destinations (Thailand, Singapore and Malaysia)
<i>E. coli</i>	5 (2.1%)	<1	
O157:H7	3	<1	Pakistan, Sri Lanka, Venezuela
O157:NM	1		Mexico
O-Rough:H2	1		Mexico
Parasites	49 (20.4%)	3.7	
<i>Entamoeba histolytica/dispar</i>	16	3.4	Algeria, Africa, Asia, Bhutan, Greece, Guatemala (3), Japan, Mexico (2), Pakistan, Vietnam, Unknown
<i>Cryptosporidium</i>	3	1.7	USA, Mexico (2)
<i>Giardia</i>	30	<1	Asia, Bhutan (3), Congo (3), Cuba, Ethiopia (3), India (2), Mediterranean, Mexico (2), Nepal, Thailand, Vietnam, Unknown (8), multiple destinations (El Salvador, Nicaragua, Costa Rica) and multiple destinations (Asia and India).
<i>Salmonella</i>	92 (38.3%)	1.3	
Corvallis	2	12.5	Multiple destinations (Japan and Hong Kong) and multiple destinations (Taiwan and Indonesia)
Enteritidis	46	2.2	Caribbean, Cuba (21), Dominican Republic, Indonesia, Jamaica (5), Mexico (12), Trinidad and Tobago (3), Turkey, multiple destinations (Mexico and Russia)
Heidelberg	4	<1	Mexico (2), India (2)
Infantis	2	1.1	Kenya, Saudi Arabia
Javiana	2	2.3	Cuba, Unknown
Newport	3	1.9	Mexico (3)
Paratyphi A	4	5.1	India, Pakistan (3)

ORGANISM	NO. OF CASES (% OF TRAVEL TOTAL)	% OF PATHOGEN TOTAL	COUNTRY OR REGION (NO. > 1)
ssp I 4,[5],12:i:-	3	1.1	India, Lebanon, Mexico
Stanley	4	6.2	Philippines (3), Thailand
Typhi	6	4.2	India (4), Bangladesh, Pakistan
Typhimurium	5	<1	Cuba, Mexico, Morocco, Portugal, Trinidad and Tobago
Other serovars	11		Australia, Bangladesh, Cuba, Mexico (3), Jamaica, India, USA, multiple destinations (Europe and Asia), unknown
Shigella	26 (10.8%)	2.6	
<i>Shigella flexneri</i>	12	4.5	Africa, Ethiopia, Guatemala, Haiti, India (2), Trinidad and Tobago, Uganda, Venezuela, Multiple destinations (Laos, Kampuchea, Vietnam, and Thailand), unknown
<i>Shigella dysenteriae</i>	2	18.2	Pakistan, Sudan
<i>Shigella boydii</i>	1	2.3	Cuba
<i>Shigella sonnei</i>	11	1.7	Azerbaijan, Costa Rica, Dominican Republic (3), Guatemala, Madagascar, Mexico (2), Philippines, Vietnam
Yersinia	2 (0.8%)	<1	
<i>Y. enterocolitica</i>	2		Cuba
Viruses	20 (8.3%)	<1	
Hepatitis A	12	9.6	Africa (2), Haiti, India (2), Mexico (2), Morocco (2), Pakistan (2), Peru, Sudan
Norovirus	8	<1	Cuba
Total	240		

APPENDIX 1. SPECIES AND SEROTYPE DATA REPORTED TO NESP BY PROVINCE AND TERRITORY, 2012

NESP 2012	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	YK	NT	NU	TOTAL
CAMPYLOBACTER														
<i>C. coli</i>	62	14	9	6	61	41	1		3					197
<i>C. concisus</i>		1												1
<i>C. fetus ssp fetus</i>	1	1			4	20			1					27
<i>C. hyointestinalis</i>					1	2								3
<i>C. jejuni</i>	441	329	150	122	191	135	108		43	29		1	1	1550
<i>C. jejuni/coli</i>								84		2				86
<i>C. lanienae</i>	1													1
<i>C. lari</i>	5	4	4		5	11	1					1	1	32
<i>C. peloridis</i>		1												1
<i>C. upsaliensis</i>	10	8	4		9	9	2					1		43
<i>Campylobacter</i> sp.							43			10				53
Total Campylobacter	520	358	167	128	271	218	155	84	47	41	0	3	2	1992
E. COLI														
<i>E. coli</i> O21	1													1
<i>E. coli</i> O26				1										1
<i>E. coli</i> O26:H11	5	1												6
<i>E. coli</i> O26:NM	1													1
<i>E. coli</i> O43:-:-	2													2
<i>E. coli</i> O49:NM					1									1
<i>E. coli</i> O52:H45					1									1
<i>E. coli</i> O69:H11	1													1
<i>E. coli</i> O78:-:-	1													1
<i>E. coli</i> O84:NM					1									1
<i>E. coli</i> O103:H2	1				1					1				3
<i>E. coli</i> O103:H6						1								1
<i>E. coli</i> O111				2										2
<i>E. coli</i> O111 VT-				1										1
<i>E. coli</i> O111:NM	1				1									2
<i>E. coli</i> O117:H7	1													1
<i>E. coli</i> O121:H19	7	1												8
<i>E. coli</i> O121:H9	1													1
<i>E. coli</i> O121:NM	1													1
<i>E. coli</i> O128				2										2
<i>E. coli</i> O157	64	89	28	11	174	70	22	12	12	1	1	0	0	484
<i>E. coli</i> O-Rough:H2					1									1
<i>E. coli</i> O-Rough:NM	2				2									4
<i>E. coli</i> Non-O157 VTEC	6			13		20				1				40

NESP 2012	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	YK	NT	NU	TOTAL
<i>E. coli</i> Non-Typed VTEC	53			7										60
<i>E. coli</i> <BLANK>				1										1
Total <i>E. coli</i>	148	91	28	38	182	91	22	12	12	4	1	0	0	629

LISTERIA

<i>Listeria monocytogenes</i>	8	5		4	44	53	4	5		1				124
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PARASITES

<i>Cryptosporidium</i>	14	12	26	41	30	5	23	16	9	7				183
<i>Cyclospora</i>	1				5									6
<i>Entamoeba histolytica/dispar</i>	97	6	12	30	132	175	2	3			1			458
<i>Giardia</i>	63	18	81	88	106	67	106	86	17	34	7			673
Total Parasites	175	36	120	159	273	247	131	105	26	41	8	0	0	1320

SALMONELLA

<i>S. Aba</i>					1									1
<i>S. Abaetetuba</i>	1													1
<i>S. Aberdeen</i>	1				2									3
<i>S. Adabraka</i>					1									1
<i>S. Adelaide</i>					3									3
<i>S. Agbeni</i>					1									1
<i>S. Ago</i>						1	1							2
<i>S. Agona</i>	14	16		4	28	3	1	1	1	1				69
<i>S. Alachua</i>	3	1			1									5
<i>S. Albany</i>	2	1			3				1					7
<i>S. Altona</i>					1									1
<i>S. Amager</i>	1	1												2
<i>S. Amersfoort</i>					1									1
<i>S. Amsterdam</i>				1	1									2
<i>S. Anatum</i>	8	2		1	10	6		1						28
<i>S. Anecho</i>	1													1
<i>S. Apapa</i>				1	1									2
<i>S. Aqua</i>									1					1
<i>S. Arechavaleta</i>					3									3
<i>S. Augustenborg</i>					1									1
<i>S. Baildon</i>					2									2
<i>S. Bardo</i>					1									1
<i>S. Bareilly</i>	10		1		9	5								25
<i>S. Bargny</i>					1									1
<i>S. Berta</i>	1	1			16	2								20
<i>S. Blockley</i>	1		1	1	5	2		2						12

NESP 2012	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	YK	NT	NU	TOTAL
S. Bochum	1													1
S. Bonariensis		1			3									4
S. Bovismorbificans	2	2		2	20	4	1			1				32
S. Braenderup	28	14	1	4	33	14	3	1						98
S. Brandenburg	9	2	2		9	7	1	2						32
S. Bredeney	1			1	2	4								8
S. Cannstatt					1									1
S. Carrau	2													2
S. Cerro					2	1	2	1						6
S. Chandans					1									1
S. Chester		1			7	2								10
S. Chicago					1									1
S. Choleraesuis		1												1
S. Colindale					1									1
S. Concord			1	1										2
S. Corvallis		4			10	1			1					16
S. Cotham			1		1									2
S. Cubana	1	1			1									3
S. Daytona	1													1
S. Derby	4	3		2	13	4	1							27
S. Dublin		2			2	8								12
S. Durban				1	2	1			1					5
S. Ealing	1				1									2
S. Eastbourne				1	2	3								6
S. Ebrie	1		1											2
S. Ekpoui				1										1
S. Emek					2	1								3
S. Enteritidis	384	343	64	71	788	282	62	73	13	28		5	4	2117
S. Epalinges					1									1
S. Fluntern		1												1
S. Gaminara					1									1
S. Gatuni					5	1								6
S. Give	1	1			4	2	1							9
S. Glostrup	1				3	1								5
S. Goettingen						2								2
S. Goverdhan	1													1
S. Hadar	11	10	1	4	29	13		2						70
S. Haifa		1	1			1								3
S. Hartford		1		1	29	1	1							33
S. Havana					6	1								7

[illegible]

NESP 2012	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	YK	NT	NU	TOTAL
S. Typhi	33	18	5	7	74	6	1							144
S. Typhimurium	71	61	14	18	479	152	7	7	3	2				814
S. Uganda	6	1			6	2								15
S. Urbana					1	1								2
S. Virchow	5	2		3	18	2	2							32
S. Wandsworth	2													2
S. Weltevreden	6	3		1	11	4								25
S. Worthington					4	2								6
S. Zanzibar	1													1
S. ssp I 13,23:-:-					1									1
S. ssp I 13,23:b:-					1									1
S. ssp I 16:l,v:-					2									2
S. ssp I 3,10:r:-		1												1
S. ssp I 4,12:-:-							1							1
S. ssp I 4,[5],12,27:-:-					1									1
S. ssp I 4,[5],12,27:r:-					2									2
S. ssp I 4,[5],12:-:-		1				1								2
S. ssp I 4,[5],12:-:1,2					1	1								2
S. ssp I 4,[5],12:b:-		7			85	16								108
S. ssp I 4,[5],12:d:-		1												1
S. ssp I 4,[5],12:e,h:-		1												1
S. ssp I 4,[5],12:i:-	23	40	7	4	130	69	6			1	1			281
S. ssp I 4,[5],12:r:-						2								2
S. ssp I 45:b:-						2								2
S. ssp I 47:z4,z23:-			1											1
S. ssp I 6,7,[14]:r:-	1		1											2
S. ssp I 6,7:-:-		1		1	5	1								8
S. ssp I 6,7:c:-					2	2								4
S. ssp I 6,7:k:-						1								1
S. ssp I 6,7:r:-					4									4
S. ssp I 6,8:-:-					1									1
S. ssp I 6,8:d:-		1												1
S. ssp I 6,8:e,h:-					1									1
S. ssp I 8,20:-:-					1	1								2
S. ssp I 8:e,h:2										1				1
S. ssp I 9,12:-:-	1	1			3	3								8
S. ssp I 9,12:-:1,5	2	2				4		1		1				10
S. ssp I O11:-:1,2					1									1
S. ssp I Rough-O:-:-	1	2			7	1	1							12
S. ssp I Rough-O:-:1,6							1							1

NESP 2012	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	YK	NT	NU	TOTAL
S. ssp I Rough-O:H r:-					1									1
S. ssp I Rough-O:a:1,5	1													1
S. ssp I Rough-O:b:-					2									2
S. ssp I Rough-O:e,h:1,6	2													2
S. ssp I Rough-O:e,h:e,n,z15	1													1
S. ssp I Rough-O:f,g:-	1													1
S. ssp I Rough-O:g,m:-		1			1									2
S. ssp I Rough-O:i:-					2									2
S. ssp I Rough-O:r:1,2					1									1
S. ssp I Rough-O:z38:-					1									1
S. ssp I Rough-O:z4,z23:-							1							1
S. ssp I	7			6		1		1	1	1				17
S. ssp II 9,46:l,w:e,n,x		1												1
S. ssp II 42:r:-					1	1								2
S. ssp II 58:l,z13,z28:z6					1									1
S. ssp II				1										1
S. ssp IIIa				1										1
S. ssp IIIa 13,23:g,z51:-		1			1									2
S. ssp IIIa 41:z4,z23:-					1									1
S. ssp IIIa 53:z4,z23:-		1												1
S. ssp IIIb	3													3
S. ssp IIIb 47:k:z35					1									1
S. ssp IIIb 48:z4,z24:-		1												1
S. ssp IIIb 50:k:z					2									2
S. ssp IIIb 50:z52:z53					1									1
S. ssp IIIb 61:l,v,z13:1,5,7		1												1
S. ssp IIIb 61:l,v:1,5,7		2			1									3
S. ssp IIIb 61:l,v:z35	1													1
S. ssp IIIb OR:-:-		1												1
S. ssp IIIb Rough-O:z10:e,n,x,z								1						1
S. ssp IV 21:g,z51:-		1												1
S. ssp IV 44:z4,z23:-						1								1
S. ssp IV 48:g,z51:-			1		1	1								3
S. ssp IV	2													2
Salmonella sp.				3			3	1		4				11
Total Salmonella	1001	846	148	207	3148	1190	173	151	30	69	1	7	8	6979

NESP 2012	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	YK	NT	NU	TOTAL
SHIGELLA														
<i>Sh. boydii</i>				2			2							4
<i>Sh. boydii</i> 1	2				2									4
<i>Sh. boydii</i> 2		1			8	1								10
<i>Sh. boydii</i> 4	4	1			8	3								16
<i>Sh. boydii</i> 8					2									2
<i>Sh. boydii</i> 9	1													1
<i>Sh. boydii</i> 12						1								1
<i>Sh. boydii</i> 14						1								1
<i>Sh. boydii</i> 15		1												1
<i>Sh. boydii</i> 19						1								1
<i>Sh. boydii</i> 20					1	2								3
<i>Sh. dysenteriae</i> 2						1								1
<i>Sh. dysenteriae</i> 3	1	1												2
<i>Sh. dysenteriae</i> 4	1				1									2
<i>Sh. dysenteriae</i> 6	1													1
<i>Sh. dysenteriae</i> 9		2												2
<i>Sh. dysenteriae</i> 12					1									1
<i>Sh. dysenteriae</i> 14					1									1
<i>Sh. dysenteriae</i> Prov SH-103					1									1
<i>Sh. flexneri</i>	1		8	2			1	7						19
<i>Sh. flexneri</i> 1	22	12												34
<i>Sh. flexneri</i> 1a					1	1								2
<i>Sh. flexneri</i> 1b					14	10								24
<i>Sh. flexneri</i> 2	15	5												20
<i>Sh. flexneri</i> 2a	1				33	8								42
<i>Sh. flexneri</i> 2b					3									3
<i>Sh. flexneri</i> 3	26	6												32
<i>Sh. flexneri</i> 3a					12	29								41
<i>Sh. flexneri</i> 3b					1	2								3
<i>Sh. flexneri</i> 4	5	4				1								10
<i>Sh. flexneri</i> 4a					2	1								3
<i>Sh. flexneri</i> 4c					2	1								3
<i>Sh. flexneri</i> 6	5	3			7	2								17
<i>Sh. flexneri</i> Prov SH-104	1	1			4	4								10
<i>Sh. flexneri</i> var X					1									1
<i>Sh. flexneri</i> var Y					3									3
<i>Sh. sonnei</i>	65	131	156	72	160	75	1	5	1					666
Total Shigella	151	168	164	76	268	144	4	12	1	0	0	0	0	988

NESP 2012	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	YK	NT	NU	TOTAL
VIBRIO														
<i>V. alginolyticus</i>		1							2					3
<i>V. cholerae</i>				1										1
<i>V. cholerae</i> non-O1	1					1								2
<i>V. cholerae</i> non-O1/ O139		3				1	1							5
<i>V. fluvialis</i>		2					1		2					5
<i>V. parahaemolyticus</i>	21	12	1	1	3		1		3					42
<i>V. vulnificus</i>					2		1							3
Total Vibrio	22	18	1	2	5	2	4	0	7	0	0	0	0	61
VIRUSES														
Adenovirus	23			47	74			3						147
Astrovirus					6									6
Enterovirus				26										26
Hepatitis A	19	11	13	4	55	20	2	1						125
Norovirus	357	331	342	75	854	759	155	333	91	104	8			3409
Rotavirus	101	72	265	45	129		106	23	13	49				803
Total Viruses	500	414	620	197	1118	779	263	360	104	153	8	0	0	4516
YERSINIA														
<i>Y. bercovieri</i>	2													2
<i>Y. enterocolitica</i>	44	24	37	8	146	28	3	2		1	1			294
<i>Y. frederiksenii</i>	5	2	7											14
<i>Y. intermedia</i>			2											2
<i>Y. kristensenii</i>	3	1												4
<i>Y. mollaretii</i>		2												2
<i>Y. pseudotuberculosis</i>	1													1
<i>Yersinia sp.</i>				1		1	1							3
Total Yersinia	55	29	46	9	146	29	4	2	0	1	1	0	0	322

APPENDIX 2. PHAGE TYPES OF ISOLATES SUBMITTED TO NML*, 2012

ORGANISM	PHAGE TYPE	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	TOTAL
<i>ESCHERICHIA COLI</i>												
<i>E. coli</i> O157:H NM	8					11				1		12
	14					1						1
	14a					1						1
	31	2										2
	34						2					2
	54					2						2
	91		1									1
	Subtotal	2	1	0	0	15	2	0	0	1	0	21
<i>E. coli</i> O157:H7	2	6	3	2	2	12	2					27
	4	1	4	3	1	17	2	4	1			33
	8	1	1	13		13	6					34
	14	5	7	1		18	4		3			38
	14a	13	77	7	3	134	31	2	6	10	1	284
	14c	1	2			3	2					8
	14d					3	1		1			5
	19					2						2
	21		1			2						3
	23		1									1
	31	2	1			4	12	20	8	1		48
	32a					1	1					2
	33		1									1
	34	1				5			2			8
	38					3				1		4
	45					1						1
	49						1					1
	54	2	1			3	1					7
	70					1						1
	87		2									2
	89		1			2						3
	91					1						1
	93					3						3
	94		1			1						2
	95								1			1
	Atypical	1	4	1	3	17	4			1		31
	Subtotal	33	107	27	9	246	67	26	22	13	1	551

* These values include isolates submitted to the NML for research purposes and may also include a small number of strains that represent multiple isolates from the same patient.

ORGANISM	PHAGE TYPE	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	TOTAL
SALMONELLA												
<i>S. enterica</i> ssp <i>enterica</i> (I) 4,[5],12:b:-	3b var 2					1						1
	Battersea	1	2			23						26
	Dundee var 1					8						8
	Dundee var. 2					3						3
	Atypical					26	1					27
	Untypable	1	5			8	2					16
	Subtotal	2	7	0	0	69	3	0	0	0	0	81
<i>S. enterica</i> ssp <i>enterica</i> (I) 4,[5],12:i:-	12					1						1
	20a	1										1
	22							1				1
	35					6	19			1		26
	36		1									1
	40						1					1
	99					1						1
	104		1									1
	110b						1					1
	120		1				2					3
	179 var					2	5					7
	191		2		6	9	8					25
	191a	1	7		1	1	1					11
	193	4	12	6	1	13	14	1	1			52
	195						1					1
	UT1		1									1
	UT5		3			2	1					6
	UT6		1									1
	U284		1					1				2
	U287	1	1									2
	U291		5			22	16					43
	U292										1	1
	U311	2				1						3
	Atypical		14		1	14	12	3			1	45
	Untypable					3						3
	Subtotal	9	50	6	9	75	81	6	1	1	2	240

ORGANISM	PHAGE TYPE	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	TOTAL
<i>S. enterica</i> ssp <i>enterica</i> (I) 4,[5],12:i:- O 4,5,12:Hi:H-	193						1					
<i>S. Enteritidis</i>	1	11	8	1	2	30	18	1	3			74
	1a					1						1
	1b	4	3	1	1	11	1					21
	2	2	1			11	2				1	17
	3						1					1
	3a		1			2						3
	4	3	5	3		8	8				1	28
	4b	2				3	1					6
	5a	1										1
	5b	15	15	5	2	97	41	2	14		4	195
	6		1			1						2
	6a	41	20	2	4	14	2		1		1	85
	7a	1	3	1		6	3					14
	8	133	109	20	26	243	80	23	28	3	13	678
	8a					1						1
	9a						1					1
	9b		4			2						6
	9c		1									1
	10					1						1
	11b	1	3		1		2					7
	13	55	42	1	7	64	14	6	4	1	1	195
	13a	38	60	17	7	129	34	10	9	6	5	315
	14b	3				4						7
	14c	1	1			2			3			7
	15a					2						2
	18	1		1								2
	19	3				3	4		1			11
	20		1			1						2
	21	5	2			7	3		1			18
	21c	2	1			2			1			6
	22	4	2	4	2	29	3					44
	23	4	2	1								7
	24		1									1
	25	2	3	1	2	4	2		1			15
	26				1							1
	29					1						1

ORGANISM	PHAGE TYPE	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	TOTAL
	22		3			2						5
	24					2	2					4
	25					1	2					3
	26					4	4		5			13
	26a		1	1			1		1			4
	29	21	45	8	7	71	40	10	7		4	213
	29a	5	2			1	1					9
	32		1			3	3	2			1	10
	32a					1						1
	32b	1										1
	36		1			2	1	1			1	6
	39		1			1						2
	41	1	2	1	3	2	7				1	17
	43					1						1
	44	1		1		2						4
	47					3	1				1	5
	52	1	1									2
	53	1					2					3
	54					9	3					12
	55					1	2					3
	56					2						2
	58	1				3	3	1				8
	Atypical	5	7		2	12	14		1			41
	Subtotal	80	145	16	24	500	267	39	32	2	17	1,122
<i>S. Infantis</i>	1					1						1
	3		1			1	2				1	5
	4	1	24	1		17	7	2	2	2		56
	6					1						1
	7	8	15	2	2	19	4	4				54
	8	1				1						2
	9		7		1	1	2		1			12
	11					1	2					3
	12					1						1
	13					6						6
	16			1								1
	17		1									1
	24	1										1
	26					2		1				3
	27		1			2						3
	Atypical		2					1				3
	Subtotal	11	51	4	3	53	17	8	3	2	1	153

ORGANISM	PHAGE TYPE	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	TOTAL
S. Newport	1		3	2		2	3					10
	1a					2	1					3
	2	5	5	2		7	1	1	1	1		23
	3			1		5	2		1			9
	4					2	1					3
	6		1				2					3
	9	2	3	1	1	16	1	2				26
	10					1						1
	11				1	1						2
	13					2	1				1	4
	14	2				1	1					4
	14a	1	1			5	1	1				9
	14b	1	7	2		8	1					19
	14c	1										1
	15	4				4						8
	16					1						1
	17a						1	1				2
	17c		1									1
	17e					1						1
	Atypical	3	2	2		7	8	1	1			24
	Subtotal	19	23	10	2	65	24	6	3	1	1	154
S. Oranienburg	1					1	1					2
	6	2	3			5	4		1			15
	8	2	1									3
	9		1									1
	11	2	2			1	2					7
	12	1	1			2	2					6
	Atypical	1	2			2	3					8
	Subtotal	8	10	0	0	11	12	0	1	0	0	42
S. Panama	A		1			5	2					8
	G	2	1			1						4
	H						1					1
	Atypical		1			3	2					6
	Untypeable	3	1			1						5
	Subtotal	5	4	0	0	10	5	0	0	0	0	24
S. Paratyphi B	Dundee						1					1
	Dundee var 2						1	1				2
	Workshop	1			4							5
	Subtotal	1	0	0	4	0	2	1	0	0	0	8

ORGANISM	PHAGE TYPE	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	TOTAL
S. Paratyphi B var. Java												
	Battersea		1	1		1	4					7
	Dundee		1			1						2
	Dundee var1		2									2
	Dundee var. 2	1	1									2
	Worksop	1	1			2					1	5
	Atypical		3			10	12					25
	Untypable	1	3			1	1					6
	Subtotal	3	12	1	0	15	19	0	0	0	1	49
S. Thompson	1	1	5	1	4	107	28	4	7	1		158
	2					5						5
	3					1						1
	5				1							1
	14	1	1			1						3
	25					1	1				3	5
	26						1					1
	108					1						1
	Atypical		6			16	3					25
	Subtotal	2	12	1	5	132	33	4	7	1	3	200
S. Typhi	28				3	3						6
	35	2										2
	40					1						1
	A					3	1					4
	D1	1				2						3
	D2					1						1
	DVS	2	2			6	3					13
	E 9var					1						1
	E1	5	7	2		17						31
	E9				2	2						4
	E9 var	4	1	2		13						20
	E9 var.		1									1
	E14	1			1							2
	J1	2				1						3
	O	1										1
	UVS	1	1		1	1		1				5
	UVS I + IV		1									1
	UVS I+IV	13	3	1		16						33
	Untypable	2				11	1					14
	Subtotal	34	16	5	7	78	5	1	0	0	0	146

ORGANISM	PHAGE TYPE	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	TOTAL
S. Typhi 9,12:d:-	UVS I+IV		1									1
	Untypable		1									1
	Subtotal	0	2	0	0	0	0	0	0	0	0	2
S. Typhimurium	1	3	2		1	7	11	1				25
	2		3	1		15	7					26
	3 aerogenic					1	1					2
	8					1						1
	9		1									1
	10					38	4			1		43
	12				1	6	7					14
	15a	1		1		1		1				4
	18					2						2
	20					1						1
	22					6	3					9
	32					2						2
	35					3	1					4
	36											0
	37					2						2
	40		1			2						3
	41	1				4	2			1		8
	43	3										3
	46						3					3
	66		1	1		3	2					7
	66a											0
	69					7						7
	75 var					21	1					22
	80					1	3					4
	81					1						1
	94					1						1
	96						1					1
	99		2			6						8
	104	9	23	4	4	17	12		2	1		72
	104a					51	7	4				62
	104b		5	1	5	31	12					54
	106		1									1
	107		2		1	4	1					8
	108	3	5		1	114	15		6			144
	120		2			4	2				1	9
	136					1						1
	160					3	1					4

ORGANISM	PHAGE TYPE	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	TOTAL
	161 var						1					1
	164		3									3
	179 var					2	1					3
	191					1	1					2
	193	7	3	1	1	104	6					122
	195	1		1		1	1					4
	208		5		1	2	1					9
	UT1				2		2					4
	UT2		1									1
	UT3					2						2
	UT5		4			1						5
	UT6					1						1
	U274					1						1
	U291					1						1
	U302		2	1		12	5					20
	U310		1									1
	U311			1								1
	Atypical	7	31	4	2	62	22	1	1		2	132
	Untypable	1					2					3
	Subtotal	36	98	16	19	546	138	7	9	3	3	875

SHIGELLA

<i>Sh. boydii</i> 1	9				1	1						2
<i>Sh. boydii</i> 2	13		1				1					2
<i>Sh. boydii</i> 4	13		1			8	1	1				11
<i>Sh. boydii</i> 15	Atypical		1									1
<i>Sh. boydii</i> 19	3						1					1
<i>Sh. boydii</i> 20	3					2	2	1				5
	Subtotal	0	3	0	1	11	5	2	0	0	0	22
<i>Sh. sonnei</i>	1		97	161		53		1	3	1		316
	1a		17									17
	4							1				1
	7		2									2
	9					1						1
	10		4						1			5
	14		3			2						5
	17		1									1
	18		1			1						2
	19		1									1
	Atypical		6			38			1			45
	Subtotal	0	132	161	0	95	0	2	5	1	0	396
Total		646	1,080	315	155	2,749	967	166	157	39	61	6,335

APPENDIX 3. NON-O157 SEROTYPES OF SHIGA TOXIN-PRODUCING *E. COLI* TESTED BY THE NML*, 2012

[illegible]

NESP 2012	BC	AB	SK	MB	ON	QC	NB	PE	NS	NL	TOTAL
<i>E. coli</i> O111:H Nonmotile	2			1	1	3					7
<i>E. coli</i> O111:H Undetermined				1							1
<i>E. coli</i> O117:H7	4										4
<i>E. coli</i> O119:H4						1					1
<i>E. coli</i> O121:H1	1			1							2
<i>E. coli</i> O121:H19	20	2									22
<i>E. coli</i> O121:H Nonmotile	1										1
<i>E. coli</i> O128ab:H2				1							1
<i>E. coli</i> O145:H Nonmotile	2										2
<i>E. coli</i> O146:H Undetermined					1						1
<i>E. coli</i> O153:H2					1						1
<i>E. coli</i> O165:H25	1										1
<i>E. coli</i> O165:H Nonmotile		1									1
<i>E. coli</i> O174:H21						1					1
<i>E. coli</i> O181:H49	1										1
<i>E. coli</i> O185:H7	2										2
<i>E. coli</i> O186:H2				1							1
<i>E. coli</i> O Rough:H2					1						1
<i>E. coli</i> O Rough:H4					2						2
<i>E. coli</i> O Rough:H7	6										6
<i>E. coli</i> O Rough:H45						1					1
<i>E. coli</i> O Rough:H Nonmotile	3	2	1		1			1			8
<i>E. coli</i> O Rough:H Undetermined	2				1	2					5
Total	69	9	1	9	17	16	0	1	0	4	126

* Inclusive of only those isolates where both serotype and toxin testing data were available. These data are not representative of national incidence, as not all human-clinical Shiga toxin-producing *E. coli* are sent to the NML for these reference service tests.

APPENDIX 4: COMPARISON OF 2011 NATIONAL TOTALS, INCIDENCE PER 100 000 AND PROPORTION CAPTURED BETWEEN CANADIAN NOTIFIABLE DISEASE SURVEILLANCE SYSTEM (CNDSS) AND NESP FOR ENTERIC, FOOD AND WATERBORNE DISEASES

ENTERIC, FOOD AND WATERBORNE DISEASES	CANADIAN NOTIFIABLE DISEASE SURVEILLANCE SYSTEM (CNDSS)		NATIONAL ENTERIC SURVEILLANCE PROGRAM (NESP)		% OF CNDSS CAPTURED IN NESP
	N	RATE PER 100 000	N	RATE PER 100 000	
2011					
Botulism	6	0.02	-	-	-
Campylobacteriosis	9478	27.51	1938	-	20.4
Cholera	12	0.03	9	-	75.0
Cryptosporidiosis	590	1.71	113	-	19.2
Cyclosporiasis*	141	0.42	11	-	7.8
Giardiasis	3816	11.08	632	-	16.6
Hepatitis A	324	0.94	-	-	-
Invasive Listeriosis**	141	0.41	132	0.38	93.6
Paralytic Shellfish Poisoning***	0	0.00	-	-	-
Salmonellosis	6596	19.15	6613	19.11	100.3
Shigellosis	1062	3.08	860	2.49	81.0
Typhoid	183	0.53	196	0.56	107.1
Verotoxigenic <i>Escherichia coli</i> Infection	639	1.85	580	1.67	90.8

CNDSS data notes:

* NB and PE did not report on Cyclosporiasis in 2011. The population of the Provinces/Territories have been removed for rate calculation.

** NT did not report on Invasive Listeriosis in 2011. The population of the Territory have been removed for rate calculation.

*** NB, ON, PE and SK did not report on Paralytic Shellfish Poisoning in 2011. The population of the Provinces/Territories have been removed for rate calculation.

