

National Enteric Disease Surveillance: Shiga toxin-producing *Escherichia coli* (STEC) Annual Report, 2013

The Laboratory-based Enteric Disease Surveillance (LEDS) system contributes to the understanding of human Shiga toxin-producing *Escherichia coli* (STEC) infections in the United States by collecting reports of laboratory-confirmed infections submitted by state public health laboratories. Reporting to LEDS is voluntary; the number of states submitting reports varies somewhat from year to year, although almost all states report every year.

Data in this report are current as of February 2, 2016.

An overview of surveillance methods and systems for Shiga toxin-producing *Escherichia coli* (STEC) infections is available at <http://www.cdc.gov/ncezid/dfwed/PDFs/national-stec-surveillance-overview-508c.pdf> (1).

Summary

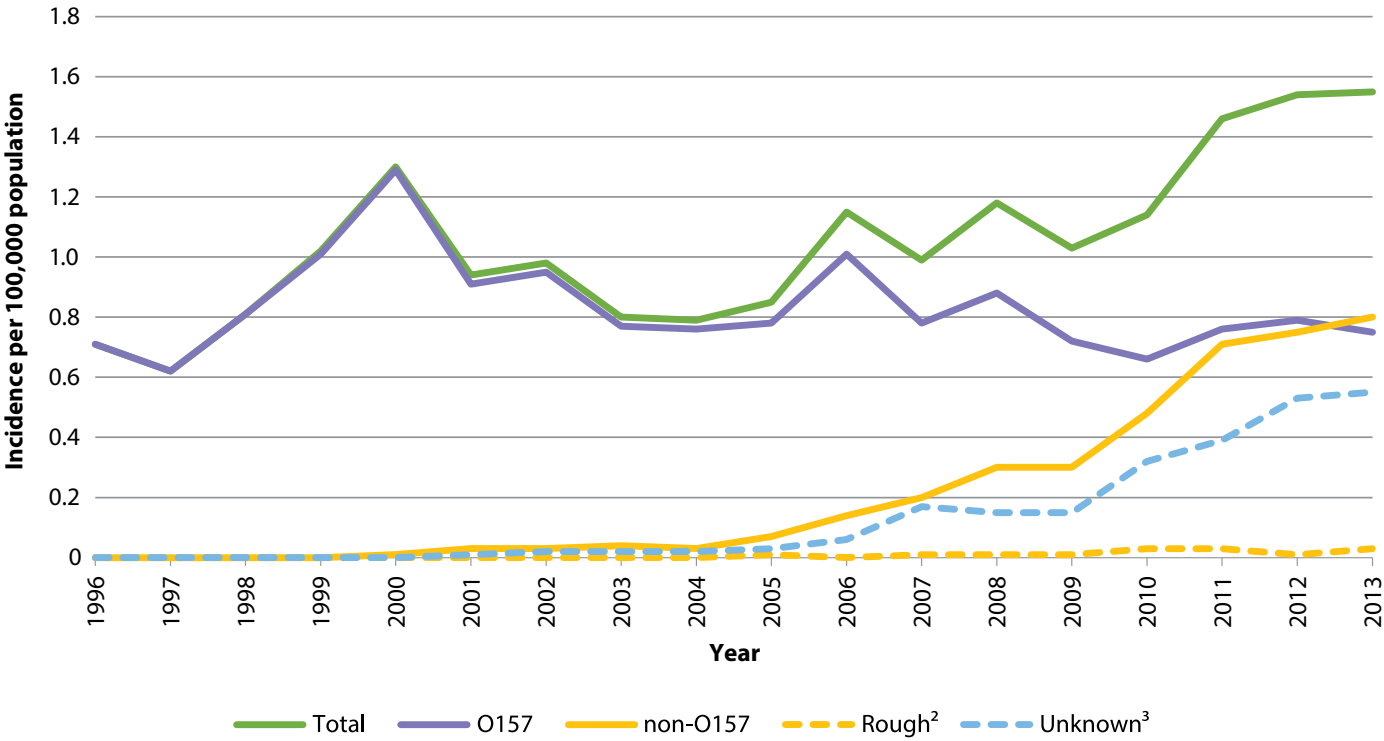
- In 2013, 51 jurisdictions (50 states plus the District of Columbia) reported 4,909 cases of culture-confirmed Shiga toxin-producing *Escherichia coli* (STEC) infections to LEDS, 2% more than in 2012.
- While incidence of serogroup O157 infection continued to decline (0.75 cases per 100,000 population in 2013), overall national incidence of culture-confirmed STEC continued to increase (1.55 cases per 100,000 population in 2013) and was 50% greater than in 2009 (1.03 cases per 100,000 population), the last year a decrease in incidence was reported. Increased overall national incidence appears to be driven by increased incidence of non-O157 serogroups (0.80 cases per 100,000 population in 2013).
- An additional 1,731 STEC infections of unknown serogroup (0.55 cases per 100,000 population) were reported.¹ This is a 4% increase since 2012, continuing the trend of increasing incidence started in 2004.
- Children aged 1–4 years had the highest incidence of infection of all age groups for both O157 and non-O157 serogroups.
- Infants (<1 year of age) had the largest difference in incidence between O157 and non-O157 serogroups of all age groups (0.78 vs. 2.29 for girls and 0.74 vs. 2.13 for boys).
- Incidence was highest in the North.
- The largest percentages of both O157 and non-O157 serogroups were reported in the summer months.

¹The practice of testing diarrheal stools for Shiga toxin without concomitant bacterial culture and serotyping has increased in recent years (2). The LEDS system is unable to differentiate reports of culture-confirmed STEC infection of unknown serogroup from reports of STEC diagnosed only by non-culture methods.

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Figure 1. Incidence rate of human Shiga toxin-producing *Escherichia coli* (STEC) infection reported to CDC, by serogroup and year, United States, 1996–2013¹



¹The “Total” category includes culture-confirmed infections of serogroup O157, non-O157 serogroups, and rough isolates.

²When isolates are rough, the O group is not expressed and cannot be determined by phenotypic methods. These isolates can be O157 or non-O157.

³The “Unknown” category includes cases diagnosed by culture-based methods where an isolate was never serogrouped and may also include cases diagnosed by culture-independent diagnostic tests (CIDTs).

Table 1a. Culture-confirmed human STEC infections reported to CDC, with the 10 most frequently reported serogroups listed individually, United States, 2013

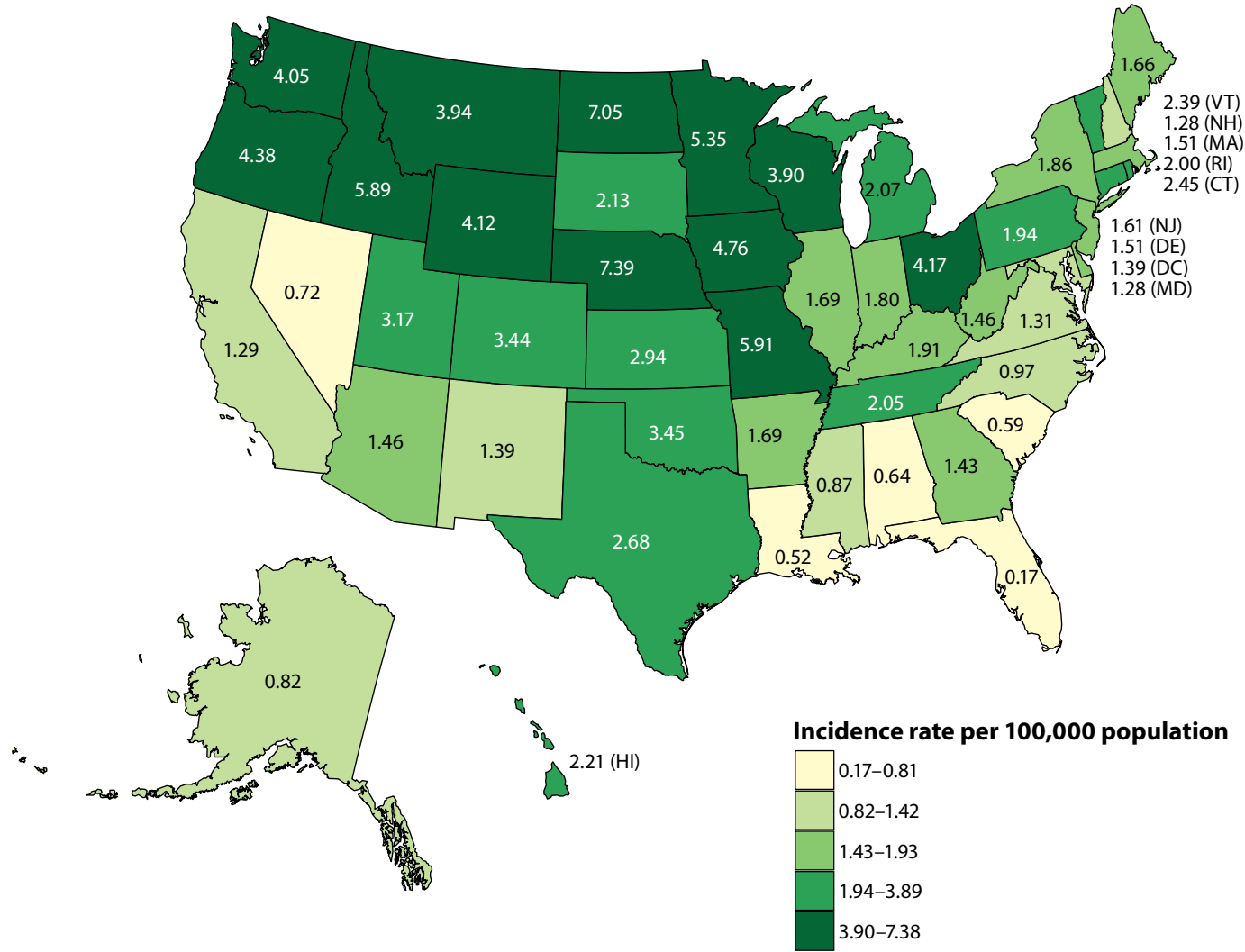
Rank	Serotype	Number reported	Percent	Incidence
1	O157	2,382	48.5	0.75
2	O26	758	15.4	0.24
3	O103	645	13.1	0.20
4	O111	416	8.5	0.13
5	O121	172	3.5	0.05
6	O45	126	2.6	0.04
7	O145	71	1.4	0.02
8	O186	31	0.6	<0.01
9	O118	21	0.4	<0.01
10	O69	20	0.4	<0.01
	Non-O157, other serogroups	182	3.7	0.06
	Subtotal, all non-O157	2,442	49.7	0.77
	Rough*	85	1.7	0.03
	All serogroups	4,909	100.0	1.55

*When isolates are rough, the O group is not expressed and cannot be determined by phenotypic methods. These isolates can be O157 or non-O157.

Table 1b. Incidence rates of culture-confirmed human STEC O157 and non-O157 infections reported to CDC by age group and sex, United States, 2013 (n = 4,762 with age and sex reported)

Age group, years	O157 (n = 2,316)		Non-O157 (n = 2,363)	
	Female	Male	Female	Male
<1	0.78	0.74	2.13	2.03
1-4	4.15	3.82	3.7	3.76
5-9	1.69	1.74	0.8	0.85
10-19	0.99	1.00	1.18	1.33
20-29	0.74	0.48	1.06	0.61
30-39	0.50	0.23	0.61	0.24
40-49	0.26	0.21	0.34	0.13
50-59	0.35	0.17	0.39	0.15
60-69	0.43	0.31	0.41	0.22
70-79	0.62	0.37	0.52	0.23
≥80	0.34	0.27	0.46	0.52
Overall	0.79	0.67	0.82	0.67

Figure 2a. Incidence rate of human Shiga toxin-producing *Escherichia coli* (STEC) infection reported to CDC (all serogroups), by reporting jurisdiction, United States, 2013 (n = 6,640)*



* Includes infections of rough serotype and of unknown serogroup.

Figure 2b. Incidence rate of culture-confirmed human Shiga toxin-producing *Escherichia coli* (STEC) O157 infection reported to CDC, by reporting jurisdiction, United States, 2013 (n = 2,382)

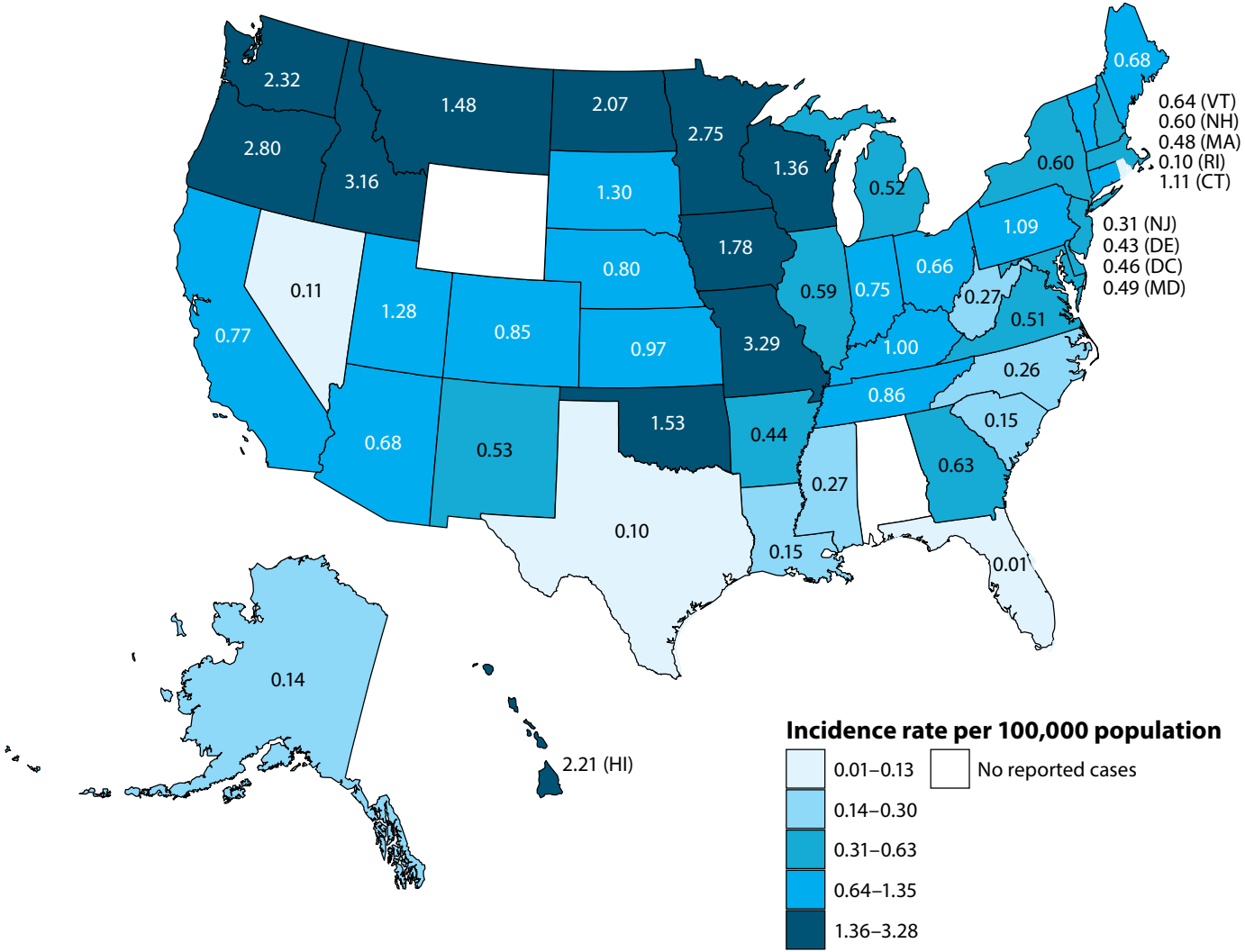


Figure 2c. Incidence rate of culture-confirmed human Shiga toxin-producing *Escherichia coli* (STEC) non-O157 infection reported to CDC, by reporting jurisdiction, United States, 2013 (n = 2,442)

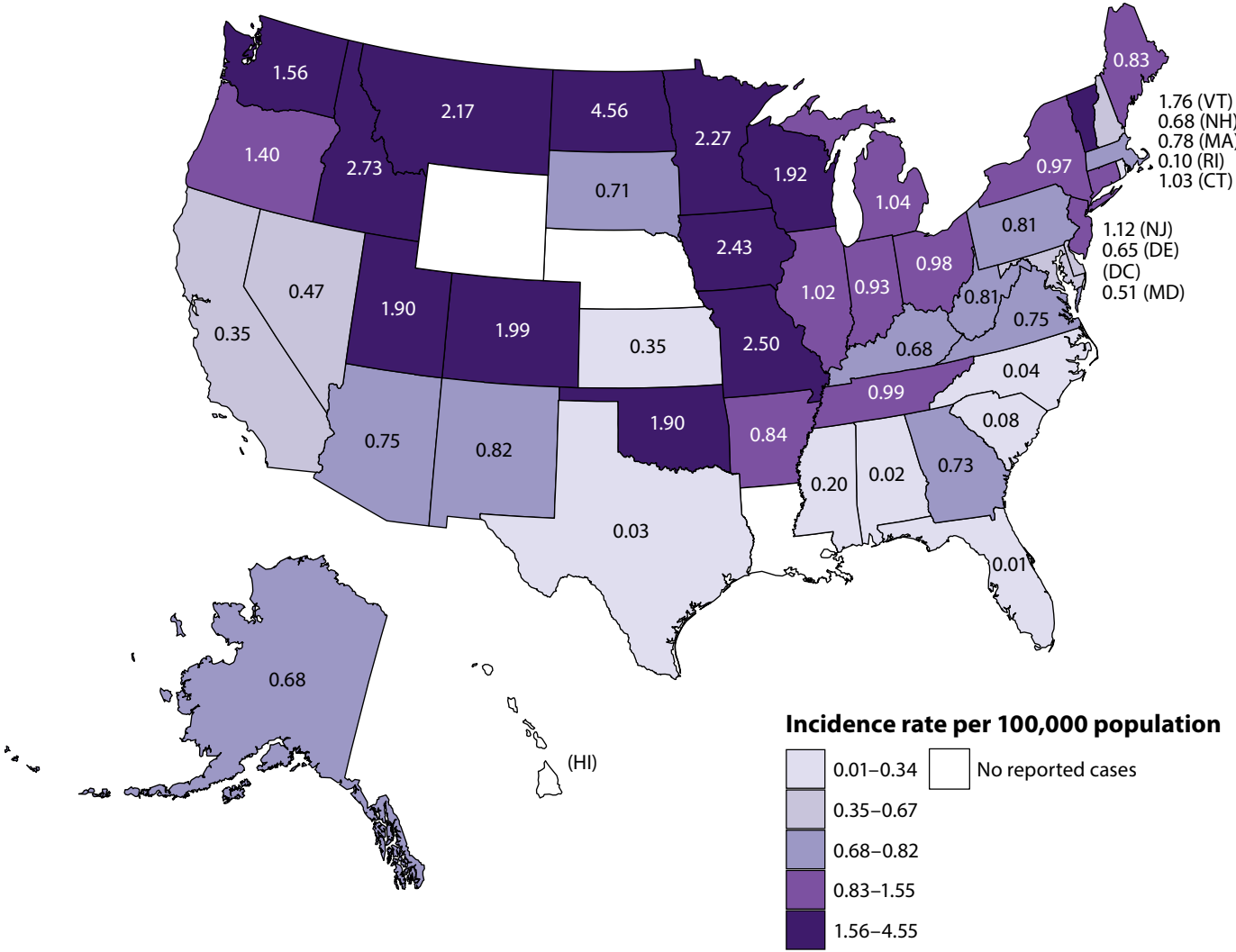


Figure 2d. Incidence rate of culture-confirmed human Shiga toxin-producing *Escherichia coli* (STEC) non-O157 infection, top 5 non-O157 serogroups reported to CDC, by reporting jurisdiction, United States, 2013 (n = 2,117)

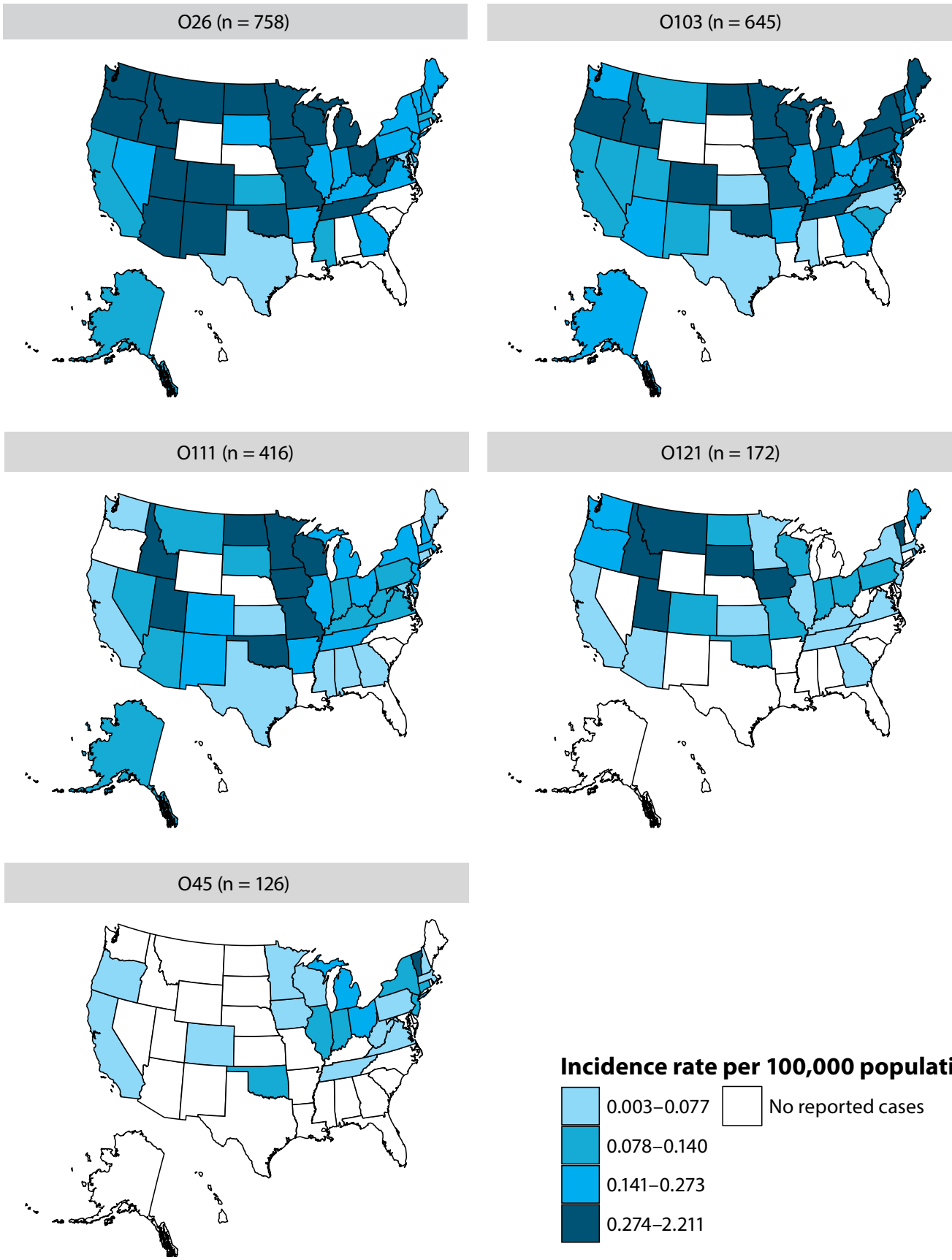


Figure 4. Percentage of culture-confirmed STEC O157 infections reported to CDC, by month of specimen collection, United States, 2013 and mean annual percentage during 2003–2012

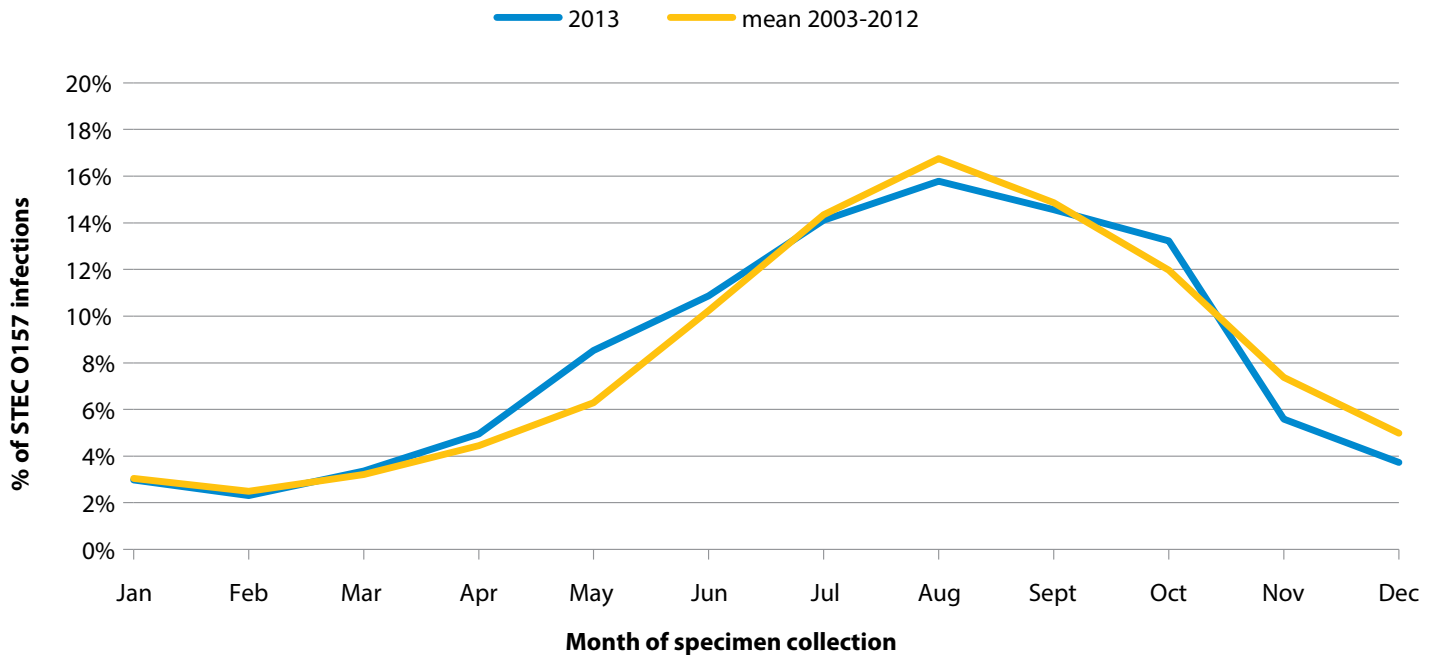
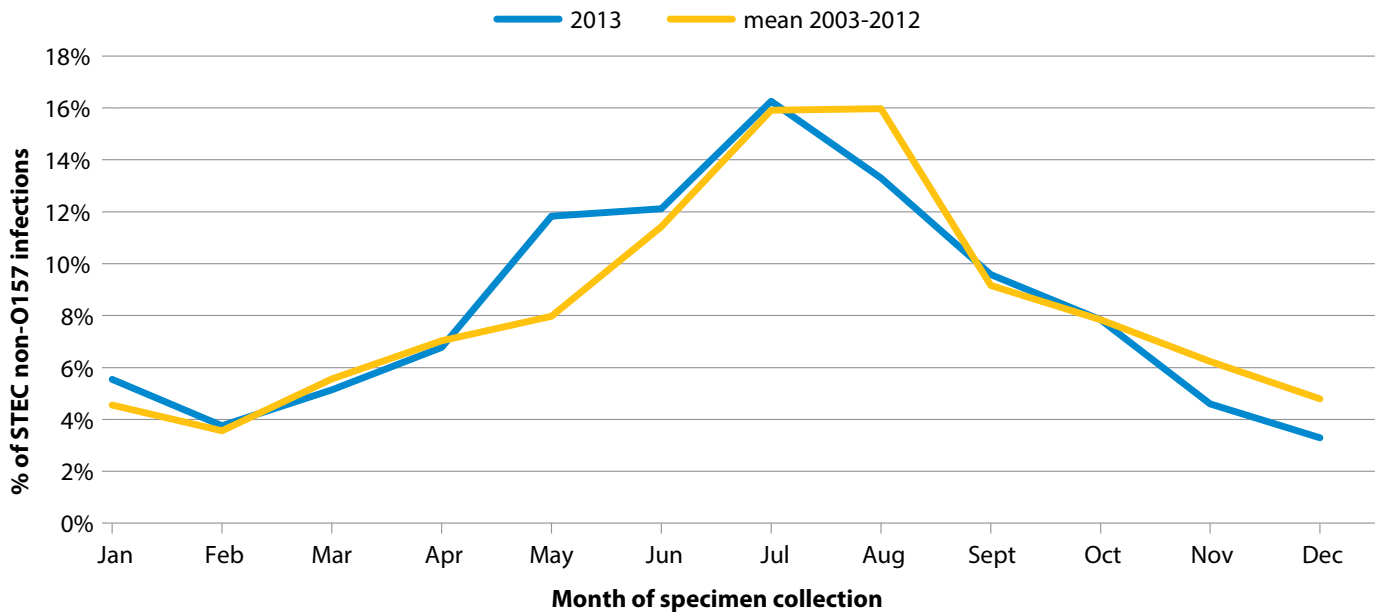


Figure 5. Percentage of culture-confirmed non-O157 STEC infections reported to CDC, by month of specimen collection, United States, 2013 and mean annual percentage during 2003–2012



National Enteric Disease Surveillance: Shiga toxin-producing *Escherichia coli* (STEC) Annual Report, 2013—Appendices

Appendices

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Appendix 1. Culture-confirmed Shiga toxin-producing *Escherichia coli* (STEC) infections reported to CDC by serogroup, age group, and sex, 2013

Serogroup	Age Group (years)	Sex			Total
		Female	Male	Unknown	
All	< 1	59	58	1	118
	1–4	615	626	21	1262
	5–9	251	275	9	535
	10–19	452	503	22	977
	20–29	400	248	14	662
	30–39	229	99	7	335
	40–49	133	75	4	212
	50–59	170	72	3	245
	60–69	146	85	5	236
	70–79	116	52	2	170
	≥ 80	61	37	2	100
	Unknown	10	13	34	57
	Total		2642	2143	124

Serogroup	Age Group (years)	Sex			Total
		Female	Male	Unknown	
Non-O157	< 1	41	41	0	82
	1–4	288	306	9	603
	5–9	80	89	6	175
	10–19	241	285	10	536
	20–29	230	137	9	376
	30–39	124	49	4	177
	40–49	72	27	3	102
	50–59	88	33	2	123
	60–69	70	34	3	107
	70–79	52	19	1	72
	≥ 80	34	23	1	58
	Unknown	7	8	16	31
	Total		1327	1051	64

Serogroup	Age Group (years)	Sex			Total
		Female	Male	Unknown	
O157	< 1	15	15	1	31
	1–4	323	311	12	646
	5–9	170	183	3	356
	10–19	203	213	12	428
	20–29	160	108	5	273
	30–39	102	47	3	152
	40–49	56	44	1	101
	50–59	79	36	1	116
	60–69	73	48	2	123
	70–79	62	31	1	94
	≥ 80	25	12	1	38
	Unknown	3	5	16	24
Total		1271	1053	58	2382

Appendix 2a. Culture-confirmed Shiga toxin-producing *Escherichia coli* (STEC) infections reported to CDC by serogroup and reporting jurisdiction, 2013 (Alaska to Kansas¹)

Serogroup	AK	AL	AR	AZ	CA	CO	CT	DC	DE	FL	GA	HI	IA	ID	IL	IN	KS
O1					1												
O103	2		8	11	40	17	10		3		16		17	6	25	17	
O104																	
O109																	
O110																	
O111	1		7	8	25	14	2		2		8		24	9	24	7	
O113							1				1					1	
O116																	
O117						1											
O118				1		2	1				7						
O119					1												
O121				4	6	7					3		9	11	5	7	
O124				1													
O125																	
O126						1											
O128					1	2											
O130															1		
O143																	
O145	1		1		2		3				1		11		2	2	
O146															1		
O152				1													
O153															1		
O156																	
O157	1		13	45	298	45	38	2	4		63	35	55	53	70	46	21
O163																	
O165			1								1						
O168																	
O172							2								2		
O174			1												2		
O175															1		
O177							1										
O178				1			1										
O181					1												
O186				1	2						7				4		
O26	1		8	23	51	56	7		1		20		12	17	30	17	
O28											1					1	
O32															1		
O36																	
O38															1		
O39																	

¹The key to state name abbreviations can be found at http://www.census.gov/geo/reference/ansi_statetables.html.

Serogroup	AK	AL	AR	AZ	CA	CO	CT	DC	DE	FL	GA	HI	IA	ID	IL	IN	KS
O45					1	1	5						1		11	7	
O5					1	1					1				1		
O50						1											
O69							1				3				1		1
O7											1						
O70																	
O71					2		1				1				2		
O74															1		
O75															1		
O76											1				2	1	
O77					1												
O79											1				2		
O8																1	
O80							2										
O84															2		
O85															2		
O91															2		
O98																	
Rough				1		19	3			1	6				3		
Total	6	0	39	97	433	167	78	2	10	1	142	35	129	96	200	107	22

Appendix 2b. Culture-confirmed Shiga toxin-producing *Escherichia coli* (STEC) infections reported to CDC by serogroup and reporting jurisdiction, 2013 (Kentucky to Nevada¹)

Serogroup	KY	LA	MA	MD	ME	MI	MN	MO	MS	MT	NC	ND	NE	NH	NJ	NM	NV
O1			1	1			1					1					
O103	9		14	10	4	30	34	59	1	1	4	4		2	22	2	3
O104				1													
O109															1		
O110																	
O111	6		10	1	1	14	20	33	2	1		8		2	16	4	3
O113				1											2		
O116										2							
O117																	
O118	1						1								4		
O119																	
O121	3		4		3		4	9		7		1			6		
O124							5										
O125																	
O126			1												1		
O128			1														
O130															1		
O143																	
O145	1		2	3	1	2	5	9							2		
O146			1														
O152																	
O153																	
O156																	
O157	45	7	32	28	9	49	147	211	8	15	25	15	13	6	26	11	3
O163																	
O165																1	
O168																	
O172																	
O174																	
O175																	
O177							1										
O178																	
O181							1								1		
O186			3	1			2								3		
O26	10		9	3	2	29	37	54	4	12		16		3	22	7	6
O28							1										
O32																	
O36							1										
O38																	
O39																	

¹The key to state name abbreviations can be found at http://www.census.gov/geo/reference/ansi_statetables.html.

Serogroup	KY	LA	MA	MD	ME	MI	MN	MO	MS	MT	NC	ND	NE	NH	NJ	NM	NV
O45			1			26	4							1	9		
O5			2				3									1	
O50							1										
O69				6						1					3		
O7																	
O70															1		
O71			1									1			3		
O74																	
O75																	
O76			1														
O77															1		
O79																	
O8												1					
O80																	
O84												1				1	
O85																	
O91			1	1												1	
O98							1								1		
Rough			2	15	2		17			1					2	1	
Total	75	7	86	71	22	150	286	375	15	40	29	48	13	14	127	29	15

Appendix 2c. Culture-confirmed Shiga toxin-producing *Escherichia coli* (STEC) infections reported to CDC by serogroup and reporting jurisdiction, 2013 (New York to Wyoming¹)

Serogroup	NY	OH	OK	OR	PA	RI	SC	SD	TN	TX	UT	VA	VT	WA	WI	WV	WY
O1	1											1		1			
O103	59	29	18	13	38		4		18	1	5	22	5	18	40	4	
O104												1					
O109				1													
O110	1																
O111	35	24	11		15			1	14		11	9		5	37	2	
O113																	
O116																	
O117																	
O118									2			1		1			
O119																	
O121	13	9	4	7	9			3	2		13	2	2	14	5		
O124																	
O125														7			
O126	2																
O128																	
O130	2													1			
O143	1											1					
O145	7	2	4		3				1		1				5		
O146																	
O152																	
O153														1			
O156			2											1			
O157	124	79	59	105	137	1	7	12	56	24	41	44	5	163	81	5	
O163			1														
O165	2		1	1					1								
O168									1								
O172																	
O174			1	1								1					
O175																	
O177			1	1										1			
O178	1		1									1					
O181									1						1		
O186	2			2					1					3			
O26	44	33	19	24	25			2	19	4	30	22	1	51	21	6	
O28																	
O32																	
O36																	
O38	1																
O39			1														

¹The key to state name abbreviations can be found at http://www.census.gov/geo/reference/ansi_statetables.html.

Serogroup	NY	OH	OK	OR	PA	RI	SC	SD	TN	TX	UT	VA	VT	WA	WI	WV	WY
O45	16	18	4	1	11				1			2	2		4		
O5	5		1	1								1					
O50									1								
O69	2		2														
O7																	
O70																	
O71			1						1								
O74																	
O75																	
O76				2										1			
O77														1			
O79																	
O8			1									1					
O80														2			
O84												1					
O85																	
O91	2			1													
O98													1				
Rough	3		1	2					2			1		3			
Total	323	194	133	162	238	1	11	18	121	29	101	111	16	274	194	17	0

Appendix 3. Human Shiga toxin-producing *Escherichia coli* (STEC) infections reported to CDC by serogroup and year, 2003–2013

Serogroup	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
O1	1			1	1			1	1	3	8	16
O10	1			1								2
O100						2		1				3
O101						1				3		4
O103	12	15	43	89	105	181	235	358	548	569	645	2800
O104					1				7	3	2	13
O107								1				1
O108								2				2
O109					2	1					2	5
O11				1	1	1			1			4
O110		1	1		1	1	1	3	1		1	10
O111	20	17	34	71	112	241	153	236	322	367	416	1989
O112								1	1	3		5
O113	1				1	3	1	2	6	5	6	25
O114								1				1
O116			1				1		1		2	5
O117			1			1	1				1	4
O118	5	1	1	8	4	9	19	22	47	38	21	175
O119	1				3	1	1	2	2	1	1	12
O12				1								1
O121	12	8	16	23	61	55	62	74	176	167	172	826
O123					1	1	4	3	4	1		14
O124	1				1		5	2	3	2	6	20
O125					1	3	1	1	4	1	7	18
O126	1	1	2		2	1	3	3	1	2	5	21
O127								2				2
O128				4	3	4	1	2	3	5	4	26
O13								1		1		2
O130	1			1	1	1	1	4	2	3	5	19
O132		1										1
O134					1							1
O135					1							1
O136	1							1				2
O137					1				1	1		3
O14						2						2
O140								1	1			2
O141						1				5		6
O143					1			1	1		2	5
O145	9	5	8	17	19	35	24	74	74	111	71	447
O146					2	4	2	6	5	13	2	34
O149						1						1

Serogroup	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
O15				1	1			1				3
O151					1	1	2	1				5
O152					1				2	1	1	5
O153			2		5	1	2	4	8	1	2	25
O154					1					1		2
O156			1	4	2		4	2	2	4	3	22
O157	2222	2234	2314	3014	2360	2669	2215	2046	2366	2474	2382	26296
O158		1						2	1	1		5
O159									1			1
O160						1						1
O162			1		2							3
O163						1	2	2	2	1	1	9
O164									1			1
O165	2	1		8	5	5	4	6	6	11	8	56
O166				1				3				4
O168					1						1	2
O169					1							1
O17										2		2
O171				1					1			2
O172					1	1	2	3	1	2	4	14
O174	1	2			3	2	2	1	6	4	6	27
O175				1			1		2	2	1	7
O177			3	5	1		2	2	4	4	5	26
O178					2	4	1	3	2	4	5	21
O179				4		1				2		7
O18	1			1		2						4
O181			2					4	2	10	5	23
O182										2		2
O185									1			1
O186									4	28	31	63
O19		1										1
O2					1			1	1			3
O20					1							1
O21					1					2		3
O22	1	1			1	1	1		3			8
O23									1			1
O24								1				1
O25							1			1		2
O26	24	25	53	120	158	222	248	434	611	655	758	3308
O28			4	5	3	1	3	1		1	3	21
O3				3	1							4
O32											1	1

Serogroup	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
O33	1									1		2
O36											1	1
O38	1					1			1	3	2	8
O39									1	2	1	4
O4				1						1		2
O42						2		1	1			4
O43				2				1	1			4
O44					1							1
O45	8	9	13	27	34	65	65	70	135	122	126	674
O46	1											1
O49				1				4	2	1		8
O5								3	9	25	18	55
O50					1	3				2	3	9
O51	1									1		2
O52									2			2
O54									1			1
O55	3								2	3		8
O6					1		1	1	1	1		5
O60							1		1			2
O63			1									1
O68										2		2
O69				4	7	6	15	12	22	26	20	112
O7									2		1	3
O70						1					1	2
O71				1			1	3	6	25	13	49
O73										1		1
O74						1	1	2	3		1	8
O75								1			1	2
O76	2		1	4	4	3	3	9	14	9	8	57
O77									1	3	3	7
O78										1		1
O79				2					1	1	3	7
O8			1	1	2		5	3	2	4	4	22
O80				1					5	3	4	13
O82					2	1	1		1			5
O84	1		1	1	2	1	2	2	5	7	5	27
O85											2	2
O86					1			1				2
O87										2		2
O88					3			1	1	1		6
O9				1								1
O90										1		1

Serogroup	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
O91	2		4	3	5	6	8	13	14	18	8	81
O93										1		1
O96					1				1			2
O98					1			1	1	2	3	8
Rough		1	15	9	31	41	43	81	79	38	85	423
Undetermined ¹								4	8	8		20
Unknown	53	49	75	174	499	466	462	1000	1200	1676	1731	7385
Total	2390	2373	2598	3617	3474	4059	3613	4535	5763	6508	6640	45570

¹ STEC infections reported as "undetermined" are categorized as non-O157 STEC infections.

References

1. Centers for Disease Control and Prevention (CDC). National STEC Surveillance Overview. Atlanta, Georgia: US Department of Health and Human Services, CDC, 2012.
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