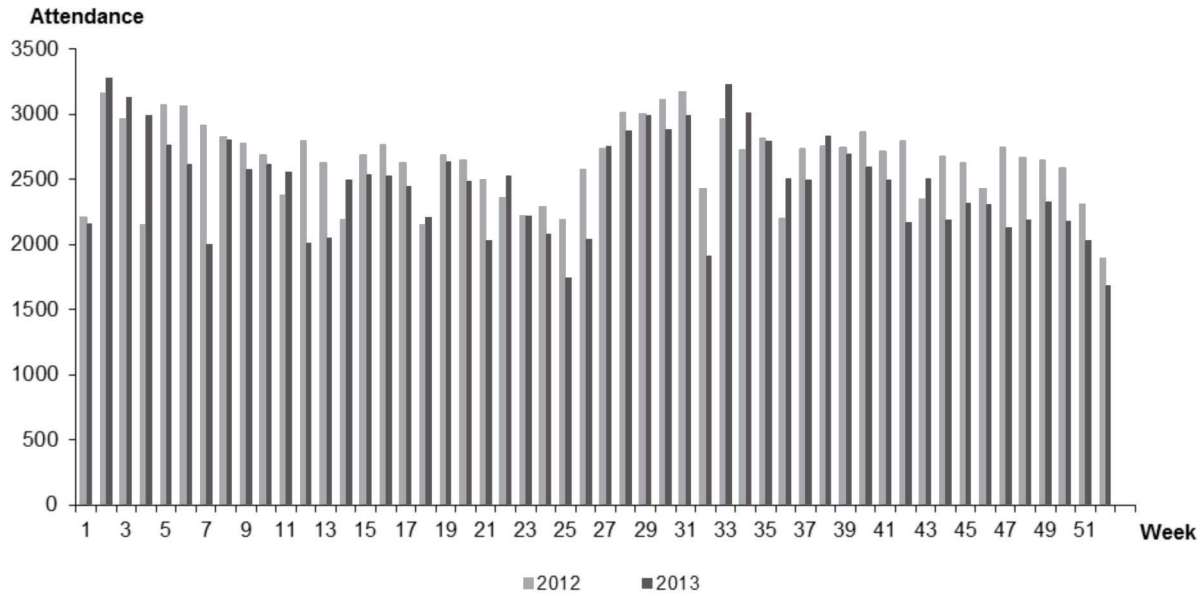
III
FOOD-/WATER-BORNE DISEASES

Food-borne diseases are caused by the ingestion of foodstuffs or water contaminated by toxins associated with bacterial growth in the food, bacterial, viral or parasitic agents, toxins produced by harmful algal species or present in specific fish species or heavy metals and other organic compounds.

ACUTE DIARRHOEAL ILLNESSES

There were a total of 137,079 attendances at polyclinics for acute diarrhoeal illnesses in 2013 – an increase of 7.6% over the 127,402 seen in 2012. The weekly surveillance of acute diarrhoeal attendances showed a similar pattern to that of the previous year (Figure 3.1).

Figure 3.1
Weekly attendances of diarrhoeal illnesses at polyclinics, 2012 – 2013



CAMPYLOBACTERIOSIS

Campylobacter enteritis is an acute bacterial enteric disease of variable severity characterised by diarrhoea, abdominal pain, malaise, fever, nausea and vomiting. *Campylobacter jejuni* and less commonly, *Campylobacter coli* are the usual causes of *Campylobacter* enteritis in humans. The mode of transmission is by ingestion of the organism in undercooked chicken and pork, contaminated food and water or unpasteurised milk.

A total of 397 cases of *Campylobacter* enteritis were reported in 2013, a decrease of 10.4% compared to 443 cases reported in 2012. *Campylobacter jejuni* was isolated in majority of the cases (Table 3.1). Of the 397 reported cases, 35 were imported cases and 356 were indigenous cases. The other 6 cases were two foreigners who came to Singapore to seek medical treatment for infections acquired overseas and four tourists.

The incidence rate among indigenous cases was highest in the 0-4 years age group, with an overall male to female ratio of 1.2:1 (Table 3.2). Among the three major ethnic groups, the Malays had the highest incidence followed by Chinese and Indians (Table 3.3).

Table 3.1
Incidence of reported *Campylobacter* enteritis, 2002 – 2013

Year	No. of cases caused by					Incidence rate per 100,000 population*
	C. jejuni	*C. coli*	*C. laridis*	Other species	Total	
2002	50	0	0	0	50	1.2
2003	140	1	0	3	144	3.4
2004	122	2	0	7	131	3.1
2005	241	0	0	0	241	5.5
2006	227	0	0	9	236	5.3
2007	161^	1^	0	9	170	3.7
2008	158	0	0	19	177	3.7
2009	240	0	0	21	261	5.2
2010	292	0	0	28	320	6.3
2011	340	2	0	30	372	7.2
2012	388#	12	1#	43	443	8.3
2013	335	14	0	48	397	7.4

^One case had a concurrent infection of both *C.jejuni* and *C.coli*
#One case had a concurrent infection of both *C. jejuni* and *C. laridis*
*Rates are based on 2013 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 3.2
Age-gender distribution and age-specific incidence rates of reported *Campylobacter* enteritis cases^, 2013

Age (Yrs)	Male	Female	Total (%)	Incidence rate per 100,000 population*
0 – 4	102	76	178 (45.5)	79.5
5 – 14	47	36	83 (21.2)	17.3
15 – 24	9	6	15 (3.8)	1.9
25 – 34	11	10	21 (5.5)	1.7
35 – 44	8	1	9 (2.3)	0.9
45 – 54	7	4	11 (2.8)	1.5
55+	32	42	74 (18.9)	13.4
Total	**216**	**175**	**391 (100)**	**7.2**

^Excluding two foreigners seeking medical treatment in Singapore and four tourists.
*Rates are based on 2013 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 3.3
Ethnic-gender distribution and ethnic-specific incidence rates of reported *Campylobacter* enteritis cases^, 2013

	Male	Female	Total (%)	Incidence rate per 100,000 population*
Singapore Resident				
Chinese	134	96	230 (58.8)	8.1
Malay	24	26	50(12.8)	9.7
Indian	11	5	16 (4.1)	4.5
Others	15	17	32 (8.2)	25.3
Foreigner	32	31	63 (16.1)	4.1
Total	**216**	**175**	**391 (100)**	**7.2**

^Excluding two foreigners seeking medical treatment in Singapore and four tourists.
*Rates are based on 2013 estimated mid-year population.
(Source: Singapore Department of Statistics)

CHOLERA

Cholera is an acute bacterial enteric disease characterised in its severe form by sudden onset, profuse painless watery stools, nausea and vomiting. Untreated cases proceed rapidly to dehydration, acidosis, hypoglycaemia, circulatory collapse and renal failure. The usual causative agent in Singapore is *Vibrio cholerae* serogroup O1 which includes two biotypes, Classical and El Tor. Each of these biotypes can be further classified into serotypes Inaba, Ogawa and Hikojima. Other serogroups in addition to O1 are O139 and Non O. The mode of transmission is through ingestion of food or water contaminated with faeces or vomitus of infected persons.

In 2013, two imported cases of cholera were reported (Figure 3.2), one is a Singapore citizen and the other is a permanent resident. Both cases were positive for *V. cholerae* O1 El Tor biotypes. The overall incidence rate was 0.04 per 100,000 population (Table 3.4 and 3.5).

Figure 3.2
E-weekly distribution of reported cholera cases, 2012 - 2013

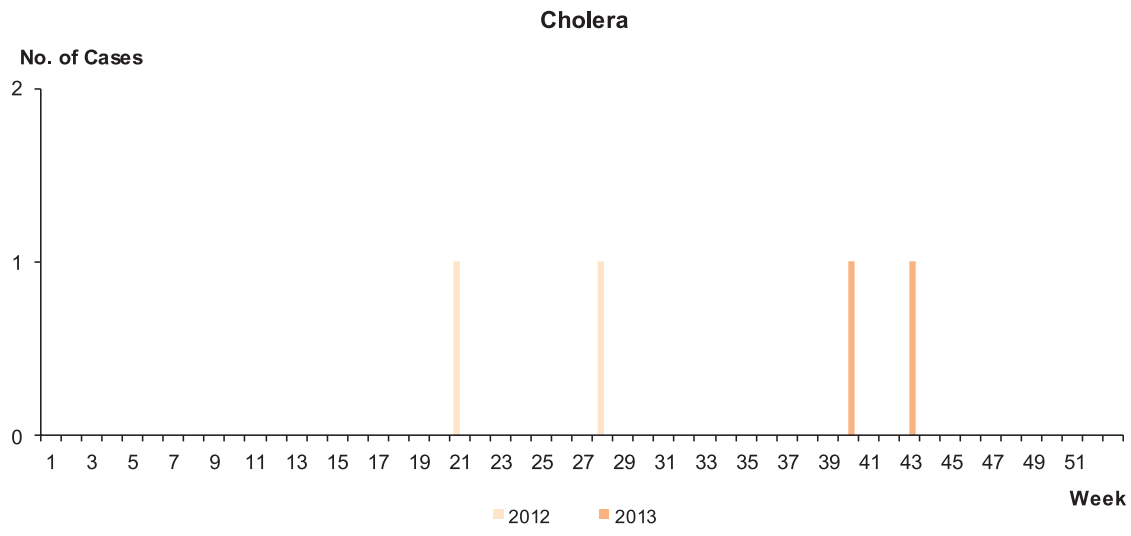


Table 3.4
Age-gender distribution and age-specific incidence rate of reported cholera cases, 2013

Age (Yrs)	Male	Female	Total (%)	Incidence rate per 100,000 population*
0 – 4	0	0	0 (0.0)	0.00
5 – 14	0	0	0 (0.0)	0.00
15 – 24	0	0	0 (0.0)	0.00
25 – 34	0	0	0 (0.0)	0.00
35 – 44	0	2	2 (100.0)	0.21
45 – 54	0	0	0 (0.0)	0.00
55 – 64	0	0	0 (0.0)	0.00
65 +	0	0	0 (0.0)	0.00
Total	**0**	**2**	**2 (100.0)**	**0.04**

*Rates are based on 2013 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 3.5
Ethnic-gender distribution and ethnic-specific incidence rate of reported cholera cases, 2013

	Male	Female	Total (%)	Incidence rate per 100,000 population*
Singapore Resident				
Chinese	0	0	0 (0.0)	0.00
Malay	0	0	0 (0.0)	0.00
Indian	1	0	1 (50.0)	0.28
Others	1	0	1 (50.0)	0.79
Foreigner	0	0	0 (0.0)	0.00
Total	**2**	**0**	**2 (100.0)**	**0.04**

*Rates are based on 2013 estimated mid-year population
(Source: Singapore Department of Statistics)

ENTERIC FEVERS

Enteric fevers are systemic, bacterial diseases characterised by insidious onset of sustained fever, severe headache, malaise, anorexia. Other features may include a relative bradycardia, splenomegaly and non-productive cough (in the early stage of the illness). Constipation is more common than diarrhoea in adults. It is important to appreciate the difference between Salmonellosis food poisoning, and typhoid or paratyphoid fever, commonly known as enteric fevers. Causative organisms for the enteric fevers are *Salmonella typhi* and *Salmonella paratyphi* (types A or B) and infections are usually associated with travel to countries where these diseases are endemic.

During the period 2009 to 2013, a total of 569 cases of enteric fever were reported, of which 390 (68.5%) cases were typhoid and 179 (31.5%) cases were paratyphoid. The majority (91.9%) were imported cases (Table 3.6).

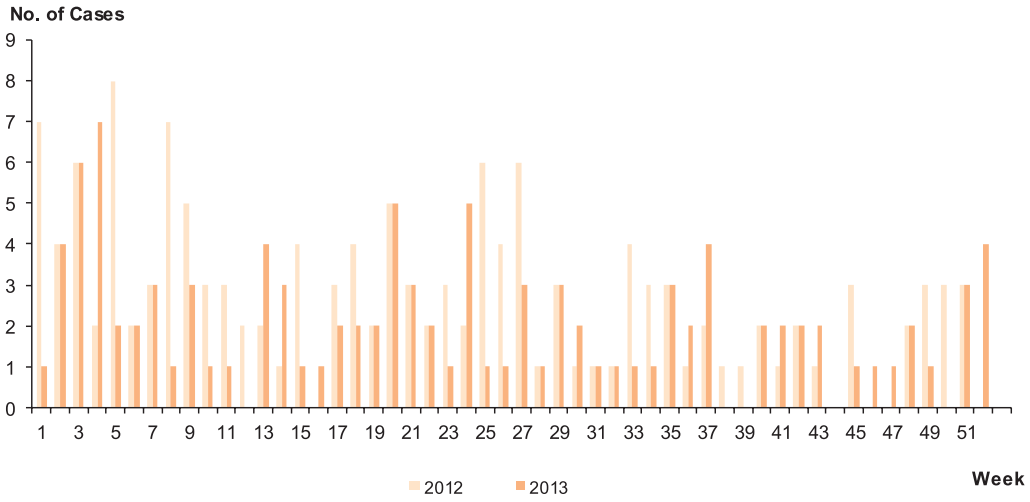
Table 3.6
Classification of reported enteric fever cases, 2009 – 2013

Year	Typhi	Paratyphi		Total
		A	B	
2009	69 (62)	21 (19)	7 (3)	97 (84)
2010	82 (77)	37 (35)	1 (1)	120 (113)
2011	71 (69)	32 (31)	1 (0)	104 (100)
2012	84 (82)	57 (46)	0 (0)	141 (128)
2013	84 (75)	23 (23)	0 (0)	107 (98)
Total	**390 (365)**	**170 (154)**	**9 (4)**	**569 (523)**

( ) imported cases

In 2013, a total of 107 cases of enteric fevers, comprising 84 cases of typhoid, and 23 cases of paratyphoid A, a decrease of 24.1% compared to 141 cases reported in 2012 (Figure 3.3).

Figure 3.3
E-weekly distribution of reported enteric fever cases, 2012 – 2013



Typhoid Fever

Of the 84 reported cases of typhoid, 75 were imported. Of the 75 imported cases, 24 were Singapore residents, 35 were work permit or employment pass holders, nine were tourists, four were foreigners seeking treatment in Singapore, two were student pass holders, and one was a dependent pass holder (Table 3.7). Of the nine local cases, five were Singapore residents, three were foreigners working in Singapore and one was a dependant pass holder.

Table 3.7
Classification of reported typhoid and paratyphoid cases, 2013

Population Group	Typhoid No. (%)	Paratyphoid No. (%)
Local residents	29 (34.5)	11 (47.8)
Foreigners seeking medical treatment in Singapore	4 (4.8)	6 (26.1)
Tourists	9 (10.7)	0 (0.0)
Other categories of foreigners	42 (50.0)	6 (26.1)
Total	**84 (100.0)**	**23 (100.0)**

The overall incidence rate of typhoid fever among local residents was 1.3 per 100,000 population and was highest in the 0 – 4 years and 15 – 24 age group (Table 3.8).

Table 3.8
Age-gender distribution and age-specific incidence rate of reported typhoid cases^, 2013

Age (Yrs)	Male	Female	Total (%)	Incidence rate per 100,000 population*
0 – 4	2	3	5 (7.0)	2.2
5 – 14	6	4	10 (14.1)	2.1
15 – 24	15	2	17 (24.0)	2.2
25 – 34	15	7	22 (31.0)	1.8
35 – 44	5	5	10 (14.1)	1.0
45 – 54	2	2	4 (5.6)	0.5
55 – 64	2	0	2 (2.8)	0.4
65+	0	1	1 (1.4)	0.2
Total	**47**	**24**	**71 (100.0)**	**1.3**

^ Excluding four foreigners seeking medical treatment in Singapore and nine tourists
*Rates are based on 2013 estimated mid-year population.
(Source: Singapore Department of Statistics)

Among the three major ethnic groups, the other ethnic group had the highest incidence rate (Table 3.9). Foreigners comprised 59.2% of the cases.

Table 3.9
Ethnic-gender distribution and ethnic-specific incidence rate of reported typhoid cases^, 2013

	Male	Female	Total (%)	Incidence rate per 100,000 population*
Singapore Resident				
Chinese	1	3	4 (5.6)	0.1
Malay	4	0	4 (5.6)	0.8
Indian	6	7	13 (18.3)	3.7
Others	2	6	8 (11.3)	6.3
Foreigner	34	8	42 (59.2)	2.7
Total	**47**	**24**	**71 (100.0)**	**1.3**

^ Excluding four foreigners seeking medical treatment in Singapore and nine tourists
*Rates are based on 2013 estimated mid-year population.
(Source: Singapore Department of Statistics)

Of the 24 Singapore residents who acquired the infection overseas, the majority contracted the disease from India (Table 3.10). Most cases were overseas on vacation (95.8%) (Table 3.11).

Table 3.10
Singapore residents who contracted typhoid overseas by country of origin, 2009 – 2013

Classification	2009 No. (%)	2010 No. (%)	2011 No. (%)	2012 No. (%)	2013 No. (%)
Country visited					
Bangladesh	0 (0.0)	1 (4.8)	0 (0.0)	1 (3.6)	1 (4.2)
Cambodia	2(18.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
China	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Germany	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (4.2)
India	3(27.3)	10 (47.5)	20 (76.9)	16 (57.1)	17 (70.8)
Indonesia	3(27.3)	5 (23.7)	6 (23.1)	4 (14.2)	2 (8.3)
Malaysia	1(9.1)	2 (9.6)	0 (0.0)	1 (3.6)	3 (12.5)
Nepal	0 (0.0)	1 (4.8)	0 (0.0)	0 (0.0)	0 (0.0)
Pakistan	0 (0.0)	1 (4.8)	0 (0.0)	1 (3.6)	0 (0.0)
Qatar	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Thailand	2 (18.2)	0 (0.0)	0 (0.0)	1 (3.6)	0 (0.0)
Myanmar	0 (0.0)	0 (0.0)	0 (0.0)	3 (10.7)	0 (0.0)
Maldives	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.6)	0 (0.0)
Vietnam	0 (0.0)	1 (4.8)	0 (0.0)	0 (0.0)	0 (0.0)
Total	**11 (100.0)**	**21 (100.0)**	**26 (100.0)**	**28 (100.0)**	**24 (100.0)**

Table 3.11
Singapore residents who contracted typhoid overseas by purpose of travel, 2009 – 2013

	2009 No. (%)	2010 No. (%)	2011 No. (%)	2012 No. (%)	2013 No. (%)
Purpose of travel					
Vacation	9 (81.2)	19 (90.5)	25 (96.2)	26 (92.9)	23 (95.8)
Business/employment	2 (18.2)	2 (9.5)	1 (3.8)	2 (7.1)	1 (4.2)
Others	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Total	**11 (100.0)**	**21 (100.0)**	**26 (100.0)**	**28 (100.0)**	**24 (100.0)**

Paratyphoid Fever

Of the 23 reported cases of paratyphoid, all were imported cases. Of the 23 imported cases, 11 were Singapore residents, six were foreigners seeking treatment in Singapore, three were work permit or employment pass holders, two were student pass holders and a dependant pass holder. The overall incidence rate of paratyphoid fever among local residents was 0.3 per 100,000 population (Table 3.12) and was highest in the 5 – 14 years age group.

Table 3.12
Age-gender distribution and age-specific incidence rate of reported paratyphoid cases^, 2013

Age (Yrs)	Male	Female	Total (%)	Incidence rate per 100,000 population*
0 – 4	0	0	0 (0.0)	0.0
5 – 14	3	0	3 (17.7)	0.6
15 – 24	1	1	2 (11.8)	0.3
25 – 34	4	2	6 (35.2)	0.5
35 – 44	0	2	2 (11.8)	0.2
45 – 54	3	0	3 (17.7))	0.4
55 - 64	1	0	1 (5.8)	0.2
65 +	0	0	0 (0.0)	0.0
Total	**12**	**5**	**17 (100.0)**	**0.3**

^ Excluding six foreigners seeking medical treatment in Singapore.
*Rates are based on 2013 estimated mid-year population.
(Source: Singapore Department of Statistics)

Among the three major ethnic groups, other ethnic groups had the highest incidence rate (Table 3.13). Foreigners comprised 35.3% of the cases.

Table 3.13
Ethnic-gender distribution and ethnic-specific incidence rate of reported paratyphoid cases^, 2013

	Male	Female	Total (%)	Incidence rate per 100,000 population*
Singapore Resident				
Chinese	3	3	6 (35.3)	0.2
Malay	0	0	0 (0.0)	0.0
Indian	1	0	1 (5.9)	0.3
Others	3	1	4 (23.5)	3.2
Foreigner	5	1	6 (35.3)	0.4
Total	**12**	**5**	**17 (100.0)**	**0.3**

^ Excluding six foreigners seeking medical treatment in Singapore.
*Rates are based on 2013 estimated mid-year population.
(Source: Singapore Department of Statistics)

Of the 11 Singapore residents who acquired the infection overseas, 8 (53.3%) acquired the infection from India, Indonesia and Cambodia (Table 3.14). Most cases were overseas on vacation (54.6%) (Table 3.15).

Table 3.14
Singapore residents who contracted paratyphoid overseas by country of origin, 2009 – 2013

	2009 No. (%)	2010 No. (%)	2011 No. (%)	2012 No. (%)	2013 No. (%)
Country visited					
Bangladesh	0 (0.0)	1 (6.7)	1 (7.7)	0 (0.0)	0 (0.0)
Cambodia	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (18.1)
China	1 (9.1)	0 (0.0)	0 (0.0)	2 (7.1)	1 (9.1)
India	4 (36.4)	8 (53.3)	4 (30.8)	3 (10.7)	3 (27.3)
Indonesia	3 (27.3)	3 (20.0)	4 (30.8)	7 (25.0)	3 (27.3)
Malaysia	1 (9.1)	0 (0.0)	2 (15.4)	2 (7.1)	1 (9.1)
Myanmar	1 (9.1)	0 (0.0)	1 (7.7)	5 (17.9)	1 (9.1)
Nepal	0 (0.0)	3 (20.0)	1 (7.7)	1 (3.6)	0 (0.0)
Hong Kong SAR	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.6)	0 (0.0)
South Korea	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.6)	0 (0.0)
Switzerland	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.6)	0 (0.0)
Pakistan	1 (9.1)	0 (0.0)	0 (0.0)	2 (7.1)	0 (0.0)
Vietnam	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.6)	0 (0.0)
Thailand	0 (0.0)	0 (0.0)	0 (0.0)	2 (7.1)	0 (0.0)
Total	**11 (100.0)**	**15 (100.0)**	**13 (100.0)**	**28 (100.0)**	**11 (100.0)**

Table 3.15
Singapore residents who contracted paratyphoid overseas by purposes of travel, 2009 – 2013

Classification	2009 No. (%)	2010 No. (%)	2011 No. (%)	2012 No. (%)	2013 No. (%)
Purpose of travel					
Vacation	9 (81.8)	14 (93.3)	11 (84.6)	18 (64.3)	6 (54.6)
Business/employment	2(18.2)	1(6.7)	2 (15.4)	10 (35.7)	5 (45.4)
Seminar	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0 (0.0)
Total	**11 (100.0)**	**15 (100.0)**	**13 (100.0)**	**28 (100.0)**	**11 (100.0)**

HEPATITIS A

Hepatitis A is a viral infection spread from person to person by the faecal-oral route. Foods that are eaten raw or partially cooked, prepared with contaminated water or by an infected food handler are common sources of infection. Clinical features include jaundice, fever, nausea and vomiting, loss of appetite, abdominal pain and tenderness, dark urine and pale stools.

There were 88 cases of serologically confirmed acute hepatitis A as compared to 108 cases in 2012 (Figures 3.4). 11 of the 88 cases involved 9 foreigners seeking medical treatment in Singapore and 2 tourists (Table 3.16).

Figure 3.4
E-weekly distribution of reported acute hepatitis A cases, 2012 – 2013

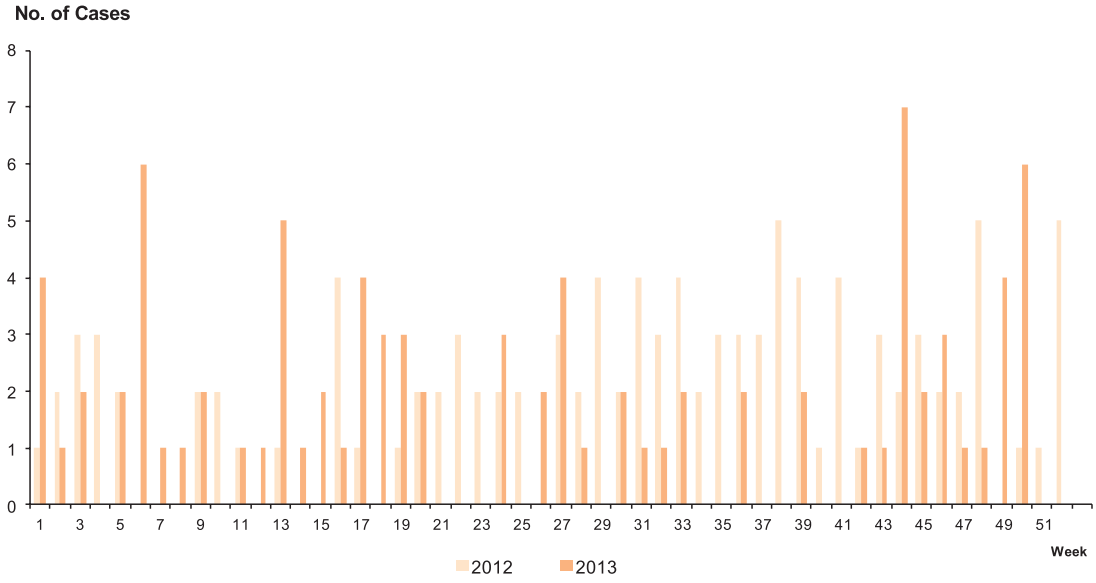


Table 3.16
Classification of reported acute hepatitis A cases, 2013

Population Group	No. of cases (%)
Singapore residents	54 (61.4)
Work permit holders/other foreigners	23 (26.1)
Foreigners seeking medical treatment in Singapore and tourists	11 (12.5)
Total	**88 (100.0)**

Among local residents, the age-specific incidence rate of acute hepatitis A (2.2 per 100,000 population) was highest in the 45 - 54 years age group. The overall male to female ratio was 3:1 (Table 3.17).

Table 3.17
Age-gender distribution and age-specific incidence rate of acute hepatitis A cases^, 2013

Age (Yrs)	Male	Female	Total (%)	Incidence rate per 100,000 population*
0 – 4	0	0	0 (0)	0.0
5 – 14	3	4	7 (9.1)	1.5
15 – 24	6	3	9 (11.7)	1.2
25 – 34	14	5	19 (24.6)	1.6
35 – 44	14	1	15 (19.5)	1.6
45 – 54	13	3	16 (20.8)	2.2
55 – 64	5	2	7 (9.1)	1.3
65+	3	1	4 (5.2)	0.9
Total	**58**	**19**	**77 (100.0)**	**1.4**

^Excluding 9 foreigners seeking medical treatment in Singapore and 2 tourists
*Rates are based on 2013 estimated mid-year population.
(Source: Singapore Department of Statistics)

Among the three major ethnic groups, Malay and Indian had similar incidence rate while Chinese had lower incidence rate. (Table 3.18).

Table 3.18
Ethnic-gender distribution and ethnic-specific incidence rate of acute hepatitis A cases^, 2013

	Male	Female	Total (%)	Incidence rate per 100,000 population*
Singapore Resident				
Chinese	29	9	38 (49.3)	1.3
Malay	4	3	7 (9.1)	1.4
Indian	4	1	5 (6.5)	1.4
Others	1	3	4 (5.2)	3.2
Foreigner	20	3	23 (29.9)	1.5
Total	**58**	**19**	**77(100.0)**	**1.4**

^Excluding 9 foreigners seeking medical treatment in Singapore and 2 tourists
*Rates are based on 2013 estimated mid-year population.
(Source: Singapore Department of Statistics)

Imported acute hepatitis A

Of the 88 cases of acute hepatitis A, 57 (64.8%) cases were acquired overseas (Table 3.19). The majority of the cases acquired the infection from Southeast Asia (65%) and the Indian subcontinent (24.6%) (Table 3.20).

Table 3.19
Imported acute hepatitis A by population group, 2013

Population Group	No. of cases (%)
Local Residents	
Residents who contracted the disease overseas	27 (47.4)
Workpermit/employment/dependent pass holders	19 (33.3)
Foreigners seeking medical treatment and tourist	11 (19.3)
Total	**57 (100.0)**

Table 3.20
Imported acute hepatitis A by country of origin, 2013

Country visited	No. of cases (%)
Southeast Asia	
Indonesia	12 (21.2)
Malaysia	14 (24.6)
Myanmar	2 (3.5)
Philippines	7 (12.3)
Thailand	1 (1.7)
Vietnam	1 (1.7)
Indian Subcontinent	
India	12 (21.2)
Nepal	1 (1.7)
Pakistan	1 (1.7)
Other Countries	
China	3 (5.3)
Russia	1(1.7)
Taiwan	1(1.7)
Vanuata	1(1.7)
Total	**57 (100.0)**

HEPATITIS E

Similar to hepatitis A, hepatitis E is also a viral infection spread from person to person by the faecal-oral route. The most common documented mechanism of transmission is via faecal-contaminated drinking water. Clinical features include jaundice, fever, nausea and vomiting, loss of appetite, abdominal pain and tenderness, dark urine and pale stools.

There were 55 reported cases of serologically confirmed acute hepatitis E compared to 104 cases in 2012 (Figure 3.5). 2 of the 55 cases involved foreigners seeking medical treatment in Singapore (Table 3.21).

Figure 3.5
E-weekly distribution of reported acute hepatitis E cases, 2012 – 2013

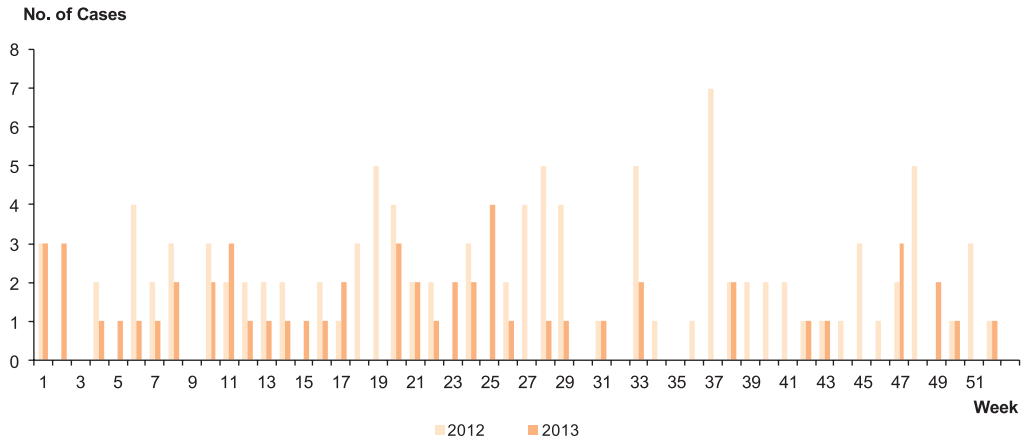


Table 3.21
Classification of reported acute hepatitis E cases, 2013

Population Group	No. of cases (%)
Singapore residents	34 (61.8)
Work permit holders/other foreigners	19 (34.6)
Foreigners seeking medical treatment in Singapore	2 (3.6)
Total	**55 (100.0)**

Among local residents, the age-specific incidence rate of acute hepatitis E was highest in the 65+ years age group (2.7 per 100,000 population). The overall male to female ratio was 3.1:1 (Table 3.22).

Table 3.22
Age-gender distribution and age-specific incidence rate of acute hepatitis E cases^, 2013

Age (Yrs)	Male	Female	Total (%)	Incidence rate per 100,000 population*
0 – 4	0	0	0 (0.0)	0.0
5 – 14	0	0	0 (0.0)	0.0
15 – 24	7	1	8 (15.1)	1.0
25 – 34	9	2	11 (20.8)	0.9
35 – 44	6	2	8 (15.1)	0.8
45 – 54	4	0	4 (7.5)	0.5
55 – 64	5	5	10 (18.9)	1.8
65+	9	3	12 (22.6)	2.7
Total	**40**	**13**	**53 (100.0)**	**1.0**

^ Excluding 2 foreigners seeking medical treatment in Singapore
*Rates are based on 2013 estimated mid-year population.
(Source: Singapore Department of Statistics)

Of the three main ethnic groups, Chinese and Indian had similar incidence rate (Table 3.23).

Table 3.23
Ethnic-gender distribution and ethnic-specific incidence rate of acute hepatitis E cases^, 2013

	Male	Female	Total (%)	Incidence rate per 100,000 population*
Singapore Resident				
Chinese	19	11	30 (56.6)	1.1
Malay	0	0	0 (0.0)	0.0
Indian	3	1	4 (7.5)	1.1
Others	0	0	0 (0.0)	0.0
Foreigner	18	1	19 (35.9)	1.2
Total	**40**	**13**	**53 (100.0)**	**1.0**

^ Excluding 2 foreigners seeking medical treatment in Singapore
*Rates are based on 2013 estimated mid-year population.
(Source: Singapore Department of Statistics)

Imported acute hepatitis E

Of the 55 cases of hepatitis E, 36 (65.5%) cases were acquired overseas (Table 3.24). The majority of the cases acquired the infection from the Indian subcontinent (78.9%) and Southeast Asia (15.8%) (Table 3.25).

Table 3.24
Imported acute hepatitis E by population group, 2013

Population Group	No. of cases (%)
Local Residents	
Residents who contracted the disease overseas	19 (52.8)
Work permit/employment/dependent pass holders	15 (41.7)
Foreigners seeking medical treatment	2 (5.5)
Total	**36 (100.0)**

Table 3.25
Imported acute hepatitis E by country of origin, 2013

Country visited	No. of cases (%)
Southeast Asia	
Cambodia	1 (2.8)
Indonesia	1 (2.8)
Malaysia	8 (22.1)
Philippines	2 (5.6)
Thailand	3 (8.3)
Indian Subcontinent	
Bangladesh	9 (25.0)
India	5 (13.9)
Other Countries	
China	3 (8.3)
Hong Kong SAR	1 (2.8)
Taiwan	2 (5.6)
Vanuatu	1 (2.8)
Total	**36 (100.0)**

SALMONELLOSIS

Salmonellosis is a bacterial disease commonly presenting as acute enterocolitis, with sudden onset of fever, headache, abdominal pain, diarrhoea, nausea and sometimes vomiting. Dehydration, especially among infants or in the elderly, may be severe. The causative pathogen, *Salmonella* is a genus of gram-negative, facultative anaerobic motile rod-shape bacteria. It is divided into two species, *Salmonella enterica* and *Salmonella bongori*. *Salmonella enterica* is further subdivided into subspecies and serotypes based on biochemical and antigenic reactions. The majority (59%) of *Salmonella* serotypes belong to *S. enterica* subsp. *enterica*. Within *S. enterica* subsp. enterica, the most common O-antigen serogroups identified are from A to E. Numerous serotypes of *Salmonella* are pathogenic for both animals and human; that includes the most commonly reported *Salmonella enterica* serovar Typhimurium *(S. Typhimurium)* and *Salmonella enterica* serovar Enteritidis *(S. Enteritidis)*.

Poultry is the commonest source of human salmonellosis. Consumption of contaminated meat and eggs is also a frequent cause. A wide range of domestic and wild animals including poultry, swine, cattle, rodents and pets may act as reservoirs for salmonellosis.

A total of 1,735 laboratory-confirmed cases of non-typhoidal salmonellosis were reported in 2013, an increase of 15.7% compared to 1,499 cases reported in 2012 (Figure 3.6). Of these, 540 cases were caused by S. Enteritidis (Table 3.26).

Figure 3.6
E-weekly distribution of reported Salmonellosis cases, 2012 – 2013

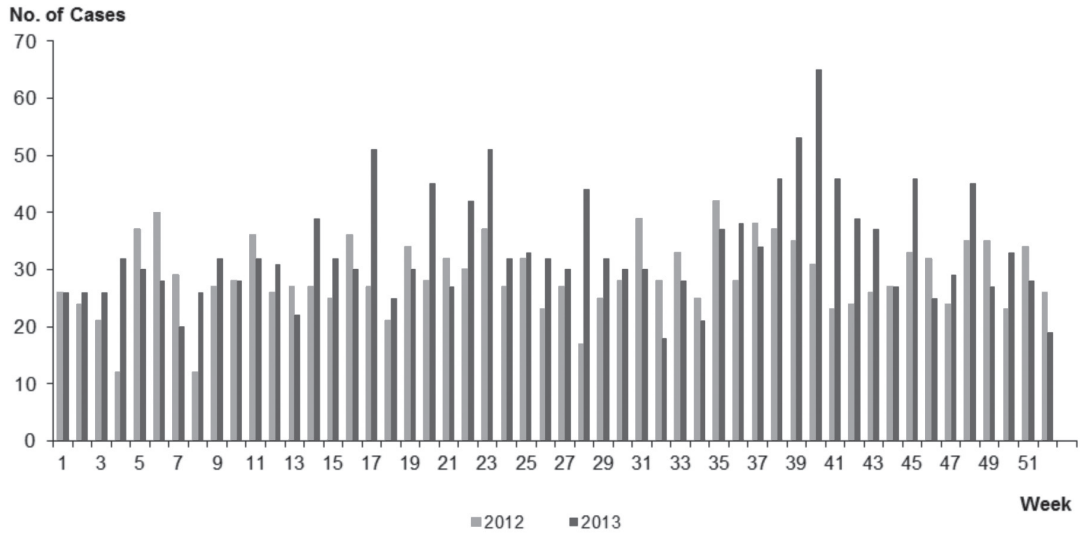


Table 3.26
Incidence of reported non-typhoidal salmonellosis, 2013

Salmonella serotypes	No. of cases (%)	Incidence rate per 100,000 population*
Group A		
Paratyphi A	2 (0.1)	0.04
Untyped	1 (0.1)	0.02
Group B		
Stanley	101 (5.8)	1.87
Agona	3 (0.2)	0.06
Brandenburg	1 (0.1)	0.02
Chester	2 (0.1)	0.04
Serovar 4,5,12:b: - (dT+)	43 (2.5)	0.8
Serovar 4,5,12:b: -	1 (0.1)	0.02
Serovar 4,5,12:d: -	1 (0.1)	0.02

Salmonella serotypes	No. of cases (%)	Incidence rate per 100,000 population*
Serovar 4,12:i: -	1 (0.1)	0.02
Serovar 4,5,12:i: -	10 (0.6)	0.18
Serovar 4,5,12 : - : 1,2	1 (0.1)	0.02
Stanleyville	1 (0.1)	0.02
Saintpaul	5 (0.3)	0.09
Indiana	1 (0.1)	0.02
Reading	1 (0.1)	0.02
Schwarzengrund	1 (0.1)	0.02
Paratyphi B dT+ (var Java)	18 (1.0)	0.33
Typhimurium	47 (2.7)	0.87
Non-Typhimurium	9 (0.5)	0.17
Untyped	183 (10.5)	3.39
Group B / C	1 (0.1)	0.02
Group C		
Albany	14 (0.8)	0.26
Augustenborg	1 (0.1)	0.02
Bardo	1 (0.1)	0.02
Bareilly	21 (0.8)	0.39
Bovismorbificans	13 (0.7)	0.24
Braenderup	15 (0.9)	0.28
Corvallis	10 (0.6)	0.18
Newport	4 (0.2)	0.07
Potsdam	3 (0.2)	0.06
Livingstone	2 (0.1)	0.04
Hadar	1 (0.1)	0.02
Hindmarsh	2 (0.1)	0.04
Infantis	1 (0.1)	0.02
Mbandaka	6 (0.3)	0.11
Molade	2 (0.1)	0.04
Montevideo	1 (0.1)	0.02
Muenchen	1 (0.1)	0.02
Ohio	1 (0.1)	0.02
Oslo	1 (0.1)	0.02
Richmond	1 (0.1)	0.02
Rissen	3 (0.2)	0.06
Serovar 6,7 : - : -	1 (0.1)	0.02
Serovar 6,7 : y : -	1 (0.1)	0.02
Serovar 8 : - : -	1 (0.1)	0.02
Serovar 8,20 : - : -	1 (0.1)	0.02
Singapore	3 (0.2)	0.06
Untyped	116 (6.7)	2.15
Group C / D	4 (0.2)	0.07
Group D		
Enteritidis	540 (31.1)	10
Javiana	21 (1.21)	0.39
Serovar 9,12:-:15	1 (0.1)	0.02
Panama	1 (0.1)	0.02
Eastbourne	1 (0.1)	0.02

Salmonella serotypes	No. of cases (%)	Incidence rate per 100,000 population*
Non-Enteritidis	30 (1.73)	0.55
Untyped	313 (18.0)	5.8
Group E		
Weltevreden	66 (3.8)	1.22
Senftenberg	4 (0.2)	0.07
Orion	1 (0.1)	0.02
Give	2 (0.1)	0.04
Untyped	28 (1.6)	0.52
Group F		
Rubislaw	1 (0.1)	0.02
Group E / G	19 (1.1)	0.35
Group G		
Okatie	4 (0.2)	0.07
Untyped	4 (0.2)	0.07
Group I		
Hvittingfoss	6 (0.3)	0.11
Group M		
Pomona	1 (0.1)	0.02
Group O		
Alachua	1 (0.1)	0.02
Group P		
Mgulani	1 (0.1)	0.02
Serovar 38 : i : -	1 (0.1)	0.02
Untyped	24 (1.4)	0.44
Total	**1,735 (100.0)**	**32.1**

*Rates are based on 2013 estimated mid-year population.
(Source: Singapore Department of Statistics)

S. Enteritidis

Of the 540 cases reported in 2013, 530 were local residents comprising 8 imported and 522 indigenous cases. Two cases of S. Enteritidis were seamen who went through medical screening and eight cases were foreigners seeking medical treatment in Singapore.

The notifications of S. Enteritidis among local residents had increased by 52.7% as compared to 347 cases in 2012. The incidence rate was highest in the 65 + years age group (Table 3.27).

Table 3.27
Age-gender distribution and age-specific incidence rate of reported S. Enteritidis cases^, 2013

Age (Yrs)	Male	Female	Total (%)	Incidence rate per 100,000 population*
0 – 4	76	51	127 (24.0)	56.7
5 – 14	17	19	36 (6.8)	7.5
15 – 24	18	4	22 (4.2)	2.8
25 – 34	61	20	81 (15.3)	6.6
35 – 44	20	11	31 (5.8)	3.2
45 – 54	18	15	33 (6.2)	4.5
55 - 64	31	28	59 (11.1)	10.7
65 +	76	65	141 (26.6)	31.5
Total	**317**	**213**	**530 (100.0)**	**9.8**

Among the three major ethnic groups, Malays had the highest incidence rate, followed by Chinese and Indians (Table 3.28).

Table 3.28
Ethnic-gender distribution and ethnic-specific incidence rate of reported S. Enteritidis cases^, 2013

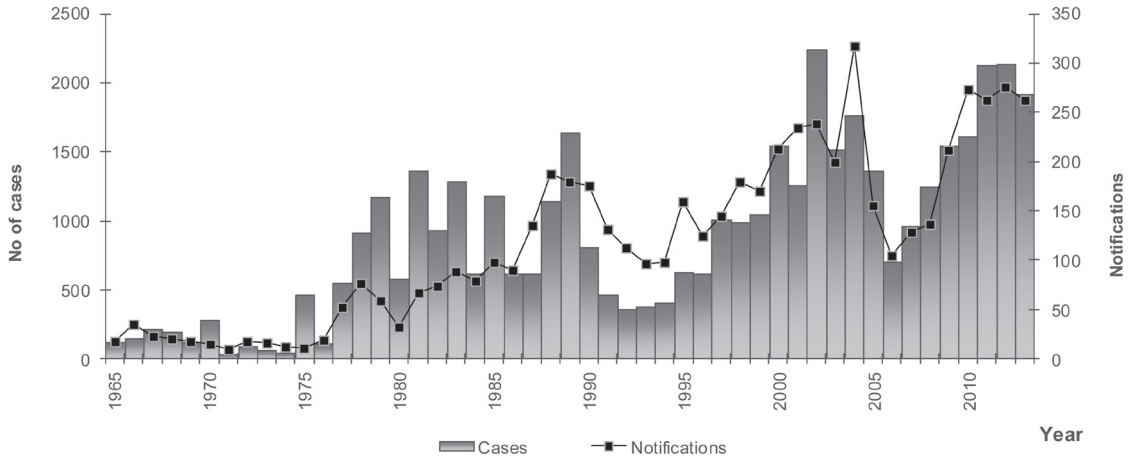
	Male	Female	Total (%)	Incidence rate per 100,000 population*
Singapore Resident				
Chinese	170	131	301 (56.8)	10.5
Malay	46	33	79 (14.9)	15.4
Indian	11	16	27 (5.1)	7.7
Others	7	9	16 (3.0)	12.6
Foreigner	83	24	107 (20.2)	6.9
Total	**317**	**213**	**530 (100.0)**	**9.8**

^ Excluding two seamen who went through medical screening and eight foreigners who sought medical treatment in Singapore
*Rates are based on 2013 estimated mid-year population.
(Source: Singapore Department of Statistics)

FOOD POISONING

There were 262 notifications of food poisoning involving 1,922 cases in 2013, compared with 276 notifications involving 2,137 cases in 2012 (Figure 3.7). Of these, 249 notifications were classified as outbreaks involving two or more cases epidemiologically linked to a common source, as compared to 270 notifications in 2012.

Figure 3.7
Notifications of food poisoning in Singapore, 1965 – 2013



The majority (64.7%) of the outbreaks occurred in restaurants and eating houses (Table 3.29).

Table 3.29
Food poisoning notifications by type of food establishment, 2013

Type of food establishments	No. of notifications	Notification classified as outbreak*	No. of food establishments involved	No. of cases
General outlets				
Bakery	7	7	7	44
Canteens				
School	4	4	4	107
Others	6	6	6	141
Caterer (licensed)	10	10	10	323
Eating house	28	25	25	80
Fair(food fair)	0	0	0	0
Fair (Others)	2	2	2	4
Food court	13	12	12	30
Food Factory	1	1	1	2
Foodshop (takeaway)	3	3	3	6
Hawker centre	16	16	16	44
Other licensed premises	2	2	2	16
Restaurants				
In Hotel	13	12	12	147
Fast Food	6	6	6	13
Others	125	118	108	489
Supermarket	2	2	2	5
Snackbar	14	13	13	38
Unapproved catering by licensed premises	0	0	0	0
Sub-total (General outlets)	**252**	**239**	**229**	**1,489**
In house kitchen				
Army	1	1	1	250
Childcare centre	1	1	1	26
Nursing home	0	0	0	0
Workers dormitory	1	1	1	7
Others	4	4	4	108
Unlicensed premises	3	3	3	42
Sub-total (Others)	**10**	**10**	**10**	**433**
Total	**262**	**249**	**239**	**1,922**

*two or more epidemiologically linked cases involved

Microbiological investigations of 201 food samples and 55 environmental swabs were conducted. Of the food samples, seven were positive for *Bacillus cereus*, five were positive for *Staphylococcus aureus*, two were positive for *Salmonella* Enteritidis, one was positive for *Escherichia coli*, and one was positive for Norovirus. Two environmental samples were positive for *Staphylococcus aureus*.

Of 449 food handlers sent for screening, 36 were positive for Norovirus, 12 were positive for *Aeromonas*, 8 were positive for *Salmonella*, three were positive for *Salmonella* Enteritidis, three were positive for Rotavirus, two were positive for *Campylobacter,* three were positive for *Vibrio parahaemolyticus*, one was positive for *Vibrio furnissii* and one was positive for *Vibrio cholerae*.