

**Air-/Droplet-Borne
Diseases**

**Vector-Borne/
Zoonotic Diseases**

**Food-/Water-
Borne Diseases**

**Blood-Borne
Diseases**

**Environmental-Related
Diseases**

**HIV/AIDS, STIs,
Tuberculosis & Leprosy**

**Childhood
Immunisation**

- Haemophilus Influenza Type B Disease
- Hand, Foot and Mouth Disease
- Influenza
- Measles
- Meningococcal Infection
- Mumps
- Pertussis
- Pneumococcal Disease (invasive)
- Rubella
- Viral Conjunctivitis
- Severe Illness & Death from Possibly Infectious Causes (SIDPIC)
- Chickenpox (Varicella)

I AIR-/DROPLET-BORNE DISEASES

Airborne transmission occurs by dissemination of droplet nuclei which are small particle residues 5 micrometers or smaller in diameter, which can remain suspended in the air for long periods of time. Droplets can be formed when a person coughs, sneezes or talks. Droplets can also be formed during administration of drugs via nebuliser or invasive procedures such as

suctioning and bronchoscopy. Transmission occurs when droplets containing microorganisms generated from infected persons are propelled a short distance (within a meter) through air and deposited on the host's mucous membranes (such as conjunctiva, nasal mucosa, mouth or respiratory tract).

HAEMOPHILUS INFLUENZA TYPE B DISEASE

Haemophilus influenzae type b (Hib) disease is a serious disease caused by bacteria. The most common severe types of Haemophilus influenzae disease are: pneumonia (lung infection); bacteremia (bloodstream infection); and meningitis (infection of the covering of the brain and spinal cord). The causative agent is Haemophilus Influenza type b (gram-negative coccobacillus). The mode of transmission is by inhalation of respiratory droplets or direct contact with respiratory tract secretions of infected persons. Hib disease is vaccine-preventable.

In 2014, there were six cases of Haemophilus influenzae type b disease reported compared to ten cases in 2013 (Figure 1.1). All the cases were laboratory confirmed with positive blood or cerebral spinal fluids culture. The incidence rates were highest in those aged 0 to 4 years; and 65 years and above. Among the three major ethnic groups, Malays had the highest incidence rate (Table 1.1 and 1.2). Of the six reported cases, 1 was imported case and 5 indigenous cases (Table 1.3).

Figure 1.1
E-weekly distribution of reported Hib cases, 2013 – 2014

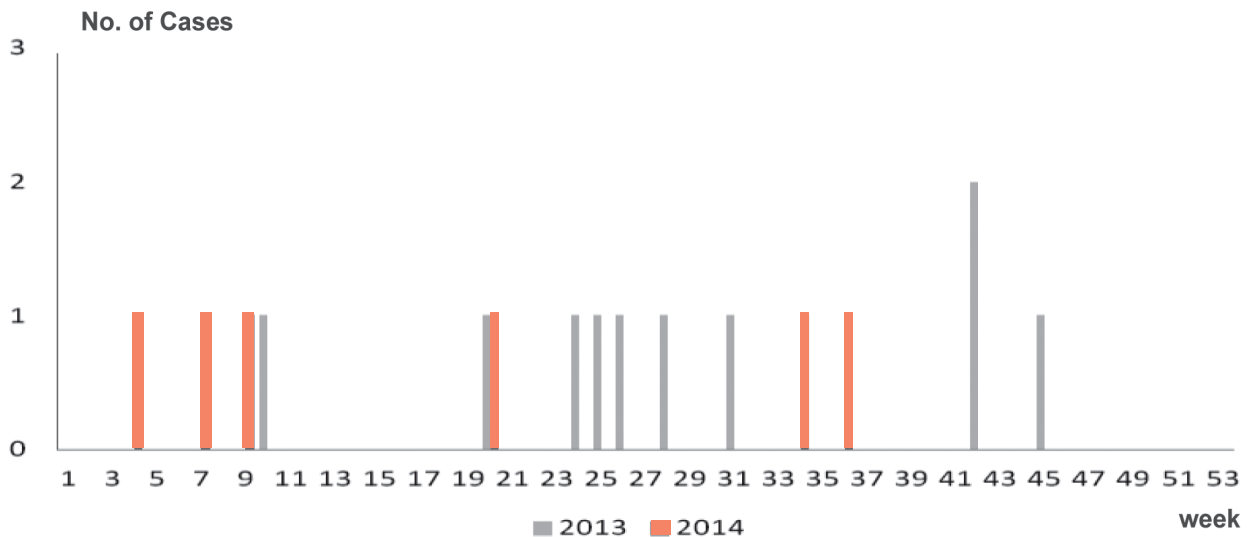


Table 1.1
Age-gender distribution and age-specific incidence rates of reported Hib cases, 2014

Age (Yrs)	Male	Female	Total (%)	Incidence rate per 100,000 population*
0 - 4	0	1	1 (16.67)	0.4
5 - 14	0	1	1 (16.67)	0.2
15 - 24	0	0	0 (0.0)	0.0
25 - 34	0	1	1 (16.67)	0.1
35 - 44	0	0	0 (0.0)	0.0
45 - 54	1	0	1 (16.67)	0.1
55 - 64	0	0	0 (0.0)	0.0
65+	1	1	2 (33.32)	0.4
Total	2	4	6 (100.0)	0.1

*Rates are based on 2014 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 1.2
Ethnic-gender distribution and ethnic-specific incidence rate of reported Hib cases, 2014

	Male	Female	Total (%)	Incidence rate per 100,000 population*
Singapore Resident				
Chinese	1	0	1 (16.67)	0.0
Malay	1	2	3 (49.99)	0.6
Indian	0	0	0 (0.0)	0.0
Others	0	1	1 (16.67)	0.8
Foreigner	0	1	1 (16.67)	0.1
Total	2	4	6 (100.0)	0.1

*Rates are based on 2014 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 1.3
Total number of notifications received for Hib, 2010 - 2014

Age Group	2010		2011		2012		2013		2014	
	Local	Imported	Local	Imported	Local	Imported	Local	Imported	Local	Imported
0 - 4	0	1	0	0	0	0	0	0	1	0
5 - 14	1	0	0	0	0	0	0	0	0	1
15 - 24	0	0	0	0	0	0	0	0	0	0
25 - 34	0	0	0	0	0	0	0	0	1	0
35 - 44	1	0	0	0	0	0	0	0	0	0
45 - 54	0	0	0	0	0	0	2	0	1	0
55 - 64	0	0	0	0	0	0	3	1	0	0
65+	2	0	2	0	1	0	4	0	2	0
Total	4	1	2	0	1	0	9	1	5	1

HAND, FOOT AND MOUTH DISEASE (HFMD)

Hand, foot and mouth disease (HFMD) is a common childhood viral disease characterised by brief prodromal fever, followed by pharyngitis, mouth ulcers and rash on the hands and feet. Children may have reduced appetite due to painful oral ulcers erupting on the tongue, gums or inside of the cheeks. A non-pruritic vesicular rash or red spots typically appears on the hands and feet, most commonly on the palms and soles. The common causative agents for HFMD are the coxsackieviruses type A (CA), echovirus (EC) and enterovirus 71 (EV71). HFMD can be transmitted from person to person through the faecal-oral or respiratory route.

A total of 22,171 cases of HFMD were reported in 2014, a decrease of 33.3% compared to 31,741 cases reported in 2013 (Figure 1.2). There were no local cases with severe complications due to HFMD reported in 2014.

The incidence rate was highest in the 0 - 4 years age group, with an overall male to female ratio of 1.3:1 (Table 1.4). Among the three major ethnic groups, Chinese had the highest incidence rate, followed by Malays and Indians (Table 1.5). No HFMD deaths were reported in 2014.

Viral isolation and PCR of enterovirus 71 (EV 71) and other enteroviruses was carried out on samples collected at the KK Women's and Children's Hospital (KKH), National University Hospital (NUH) and sentinel GP clinics. Of the isolates that were tested positive, the majority was coxsackieviruses type A (CA) (28.0%), followed by EV 71 (0.4%). Among the coxsackieviruses, CA6 (48.3%) was the predominant serotype, followed by CA16 (25.2%).

Figure 1.2
E-weekly distribution of reported hand, foot and mouth cases, 2013 – 2014

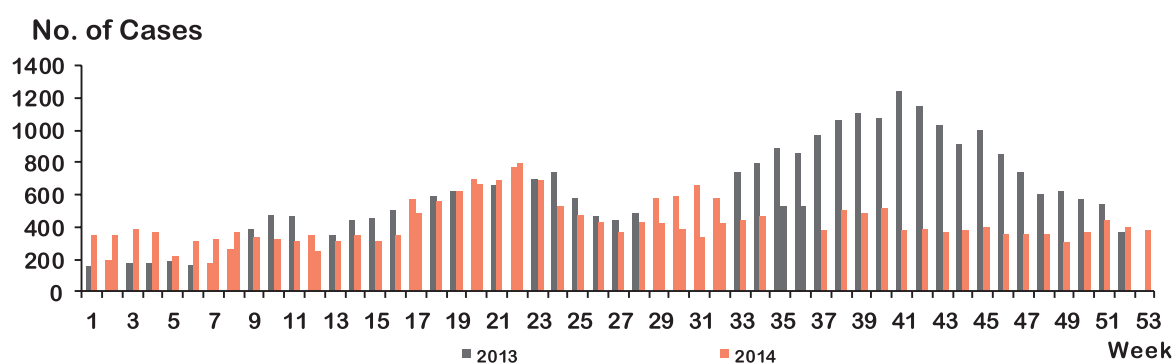


Table 1.4
Age-gender distribution and age-specific incidence rate of reported hand, foot and mouth cases[^], 2014

	Male	Female	Total (%)	Incidence rate per 100,000 population*
0 – 4	8,289	6,324	14,613 (66.0)	6,502.6
5 – 14	2,920	2,314	5,234 (23.6)	1,097.1
15 – 24	408	295	703 (3.2)	92.1
25 – 34	370	443	813 (3.7)	65.4
35 – 44	381	247	628 (2.8)	64.5
45 – 54	63	48	111 (0.5)	15.0
55+	18	26	44 (0.2)	4.2
Total	12,449	9,697	22146 (100.0)	404.9

[^]Excluding 25 tourists.

*Rates are based on 2014 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 1.5
Ethnic-gender distribution and ethnic-specific incidence rate of reported hand, foot and mouth cases[^], 2014

	Male	Female	Total (%)	Incidence rate per 100,000 population*
Singapore Resident				
Chinese	8,787	6,889	15676 (70.8)	545.4
Malay	1,426	1204	2630 (11.9)	509.0
Indian	338	272	610 (2.8)	172.8
Others	634	455	1089 (4.9)	859.6
Foreigner	1,264	877	2141 (9.7)	133.9
Total	12,449	9,697	22,146	404.9

[^]Excluding 25 tourists.

*Rates are based on 2014 estimated mid-year population.
(Source: Singapore Department of Statistics)

Institutional Outbreaks of HFMD

There were 1,648 reported outbreaks of HFMD in year 2014, each involving two or more cases. Table 1.6 gives a breakdown of HFMD outbreaks at various educational institutions by attack rate. Two HFMD clusters are discussed below.

Since 2010, additional measures were introduced to curb the HFMD transmission in educational institutions. Childcare centres or kindergartens with prolonged HFMD transmission had their names published on the MOH website and were subsequently closed for ten days if the transmission was further prolonged. These measures continued to be enforced in 2014 with public education enhanced.

Table 1.6
Outbreaks of hand, foot and mouth disease in childcare centres/kindergartens/schools, 2014

Attack rate (%)	Childcare Centres	Kindergartens	Primary Schools	Enrichment Centres	Other Institutions*
< 10	858	197	299	16	75
10 - 20	152	5	-	9	-
21 - 30	29	-	-	-	-
31 - 40	3	-	-	-	-
41 - 50	-	-	-	1	-
>50	3	-	-	1	-
Total	1,045	202	299	27	75

*44 from secondary schools, nine from international schools, 10 from special schools, four from polytechnics and eight from private schools.

Cluster 1: Childcare centre at Punggol

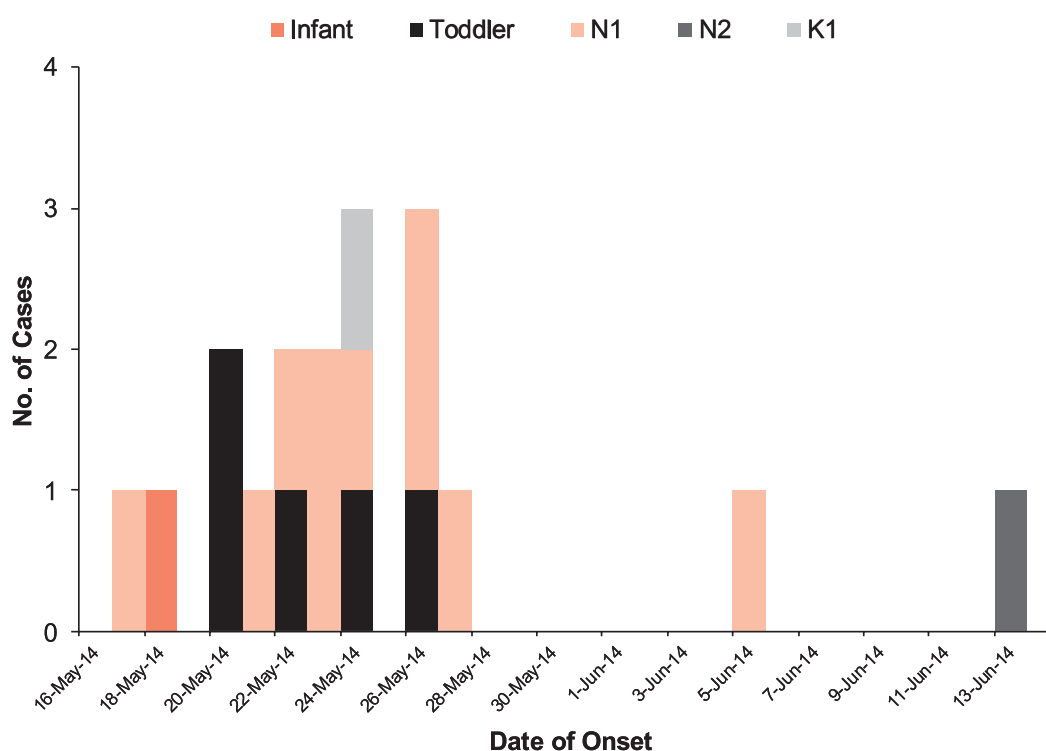
An outbreak of HFMD involving 18 children aged between 0 and 5 years occurred between 17 May and 13 Jun 2014 in a childcare centre at Punggol. At the time of the outbreak, the centre had 24 full-time staff and 132 children in six classes: Infant, Toddler (PG), Nursery 1 (N1), Nursery 2 (N2), Kindergarten 1 (K1) and Kindergarten 2 (K2).

The class-specific attack rates ranged from 3.0% to 33.3.3%, with an overall attack rate of 13.6% (Table 1.7). The index case, a nursery student, presented with symptoms on 17 May 2014. The infection subsequently spread amongst other children. The last reported case was on 13 Jun 2014 (Figure 1.3). The centre was mandatorily closed for ten days from 18 to 27 Jul 2014 due to the high number of cases and the prolonged disease transmission period.

Table 1.7
Attack rates of hand, foot and mouth disease (HFMD) in a childcare centre at Punggol, 17 May –13 Jun 2014

Class Category	No. Enrolled			No. Affected and Attack Rates					
	Male	Female	Total	Male	%	Female	%	Total	%
Infant	9	5	14	0	0	1	20.0	1	7.1
Toddler	13	9	22	2	15.4	3	33.3	5	22.7
N1	16	14	30	7	43.8	3	21.4	10	33.3
N2	12	7	19	1	8.3	0	0.0	1	5.3
K1	19	14	33	1	5.3	0	0.0	1	3.0
K2	9	5	14	0	0	0	0.0	0	0.0
Total	78	54	132	11	14.1	7	13.0	18	13.6

Fig 1.3
Time distribution of 18 cases of hand, foot and mouth disease in a childcare centre at Punggol, 17 May 2014 - 13 Jun 2014



Cluster 2: Childcare centre at Telok Blangah

An outbreak of HFMD involving 15 children aged between 2 and 5 years occurred between 25 March and 28 April 2014 in a child care centre at Telok Blangah. At the time of the outbreak, the centre had 34 full-time staff and 183 children in six classes: Infant, Toddler (PG), Nursery 1 (N1), Nursery 2 (N2), Kindergarten 1 (K1) and Kindergarten 2 (K2).

The class-specific attack rates ranged from 4.7% to 14.3%, with an overall attack rate of 8.2% (Table 1.8).

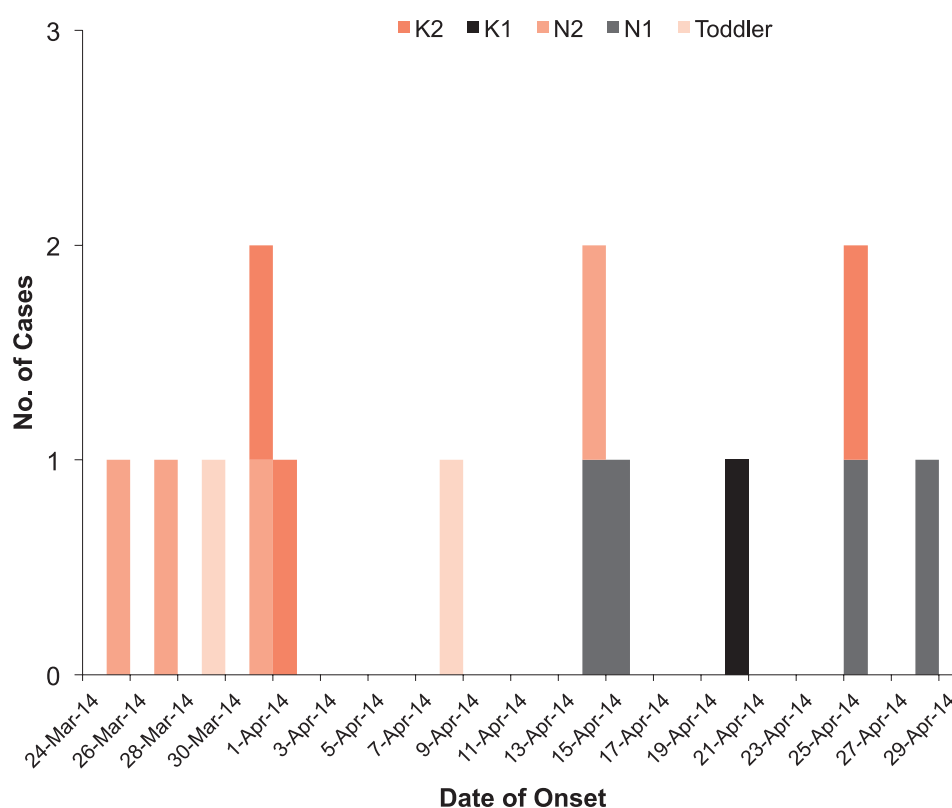
The outbreak started with a child attending the N2 class who developed symptoms on 25 March 2014. The infection subsequently spread amongst other children. The last reported case was on 28 April 2014 (Figure 1.4).

The centre's name was published on the Ministry of Health's website due to the prolonged disease transmission period.

Table 1.8
Attack rates of hand, foot and mouth disease in a child care centre at Telok Blangah, 25 March – 28 April 2014

Class Category	No. Enrolled			No. Affected and Attack Rates					
	Male	Female	Total	Male	%	Female	%	Total	%
Infant	3	7	10	0	0.0	0	0.0	0	0.0
Toddler	7	7	14	1	14.3	1	14.3	2	14.3
N1	18	17	35	2	11.1	2	11.8	4	11.4
N2	16	22	38	2	12.5	2	9.1	4	10.5
K1	28	15	43	1	3.6	1	6.7	2	4.7
K2	25	18	43	2	8.0	1	5.6	3	7.0
Total	97	86	183	8	8.2	7	8.1	15	8.2

Figure 1.4
Time distribution of 18 cases of hand, foot and mouth disease in a childcare centre at Telok Blangah, 25 March – 28 April 2014



INFLUENZA

Influenza is an acute viral disease of the respiratory tract characterised by fever and symptoms such as sore throat, cough, coryza, headache and myalgia. It is spread from person to person mainly through infectious respiratory secretions released during coughing and sneezing.

The causative agent is the influenza virus and three types of influenza virus (influenza A, B and C) are recognised. The Influenza type A viruses include two subtypes (H1N1 and H3N2) that infect

humans and have been associated with pandemics and widespread epidemics. Influenza type B is occasionally associated with regional epidemics, and influenza type C is usually associated with sporadic cases and minor localised outbreaks. Diagnosis is based on the clinical recognition of influenza-like illness with or without laboratory confirmation and strain characterisation.

In temperate and cold climates, influenza reaches peak incidence in winter. As the Northern and

Southern Hemispheres have winter at different times of the year, there are two flu seasons each year: December-March in the Northern Hemisphere; and June-September in the Southern Hemisphere.

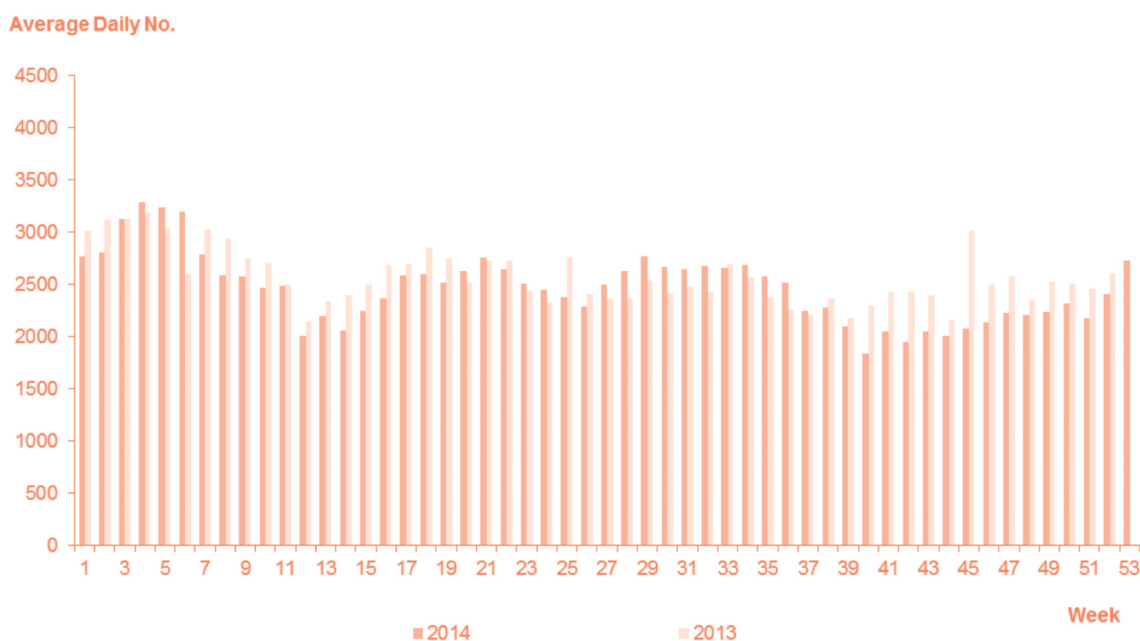
In tropical and subtropical areas, influenza epidemics can occur either twice a year or even throughout the year. In Singapore, influenza viruses circulate year round, with a bimodal increase in incidence observed in April-July and November-January.

The weekly attendance for acute respiratory infections (ARI) at polyclinics and public hospital emergency departments (ED) is routinely monitored as a proxy

indicator for influenza activity (Note: ARI represents a mixture of respiratory illnesses and the proportion of influenza cases presenting with ARI varies with the level of influenza activity.) The weekly number of admissions due to ARI at public hospitals is also monitored.

There were a total of 686,247 attendances at polyclinics for ARI in 2014, a decrease of 2.5% compared to 703,527 seen in 2013. No clear seasonal pattern for ARI was observed. The average daily number of polyclinics attendances for ARI peaked at 3,288 in E-week 4 (Figure 1.5).

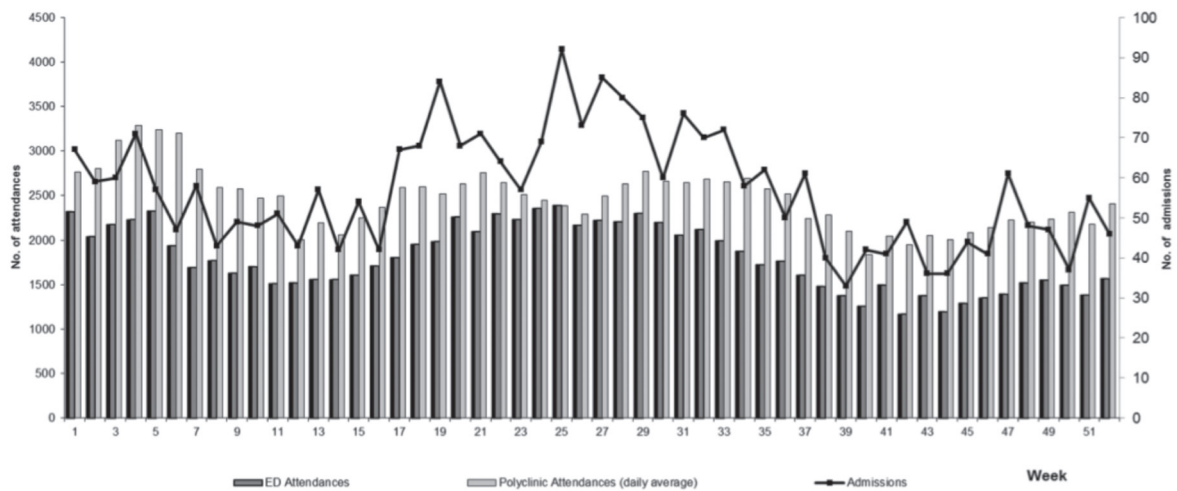
Figure 1.5
E-weekly distribution of acute respiratory infection attendance at polyclinics 2013 – 2014



An annual total of 95,661 ARI cases were seen at the emergency departments (ED) of public hospitals in 2014, a decrease of 9.8% compared to 106,086 cases reported in 2013. The highest average weekly

ARI attendance at ED was observed in E-week 25 at 2,393. In addition, ARI admissions peaked at 92 cases in E-week 25 (Figure 1.6).

Figure 1.6
Weekly polyclinic attendance, emergency department (ED) attendances and admissions for ARI, 2014

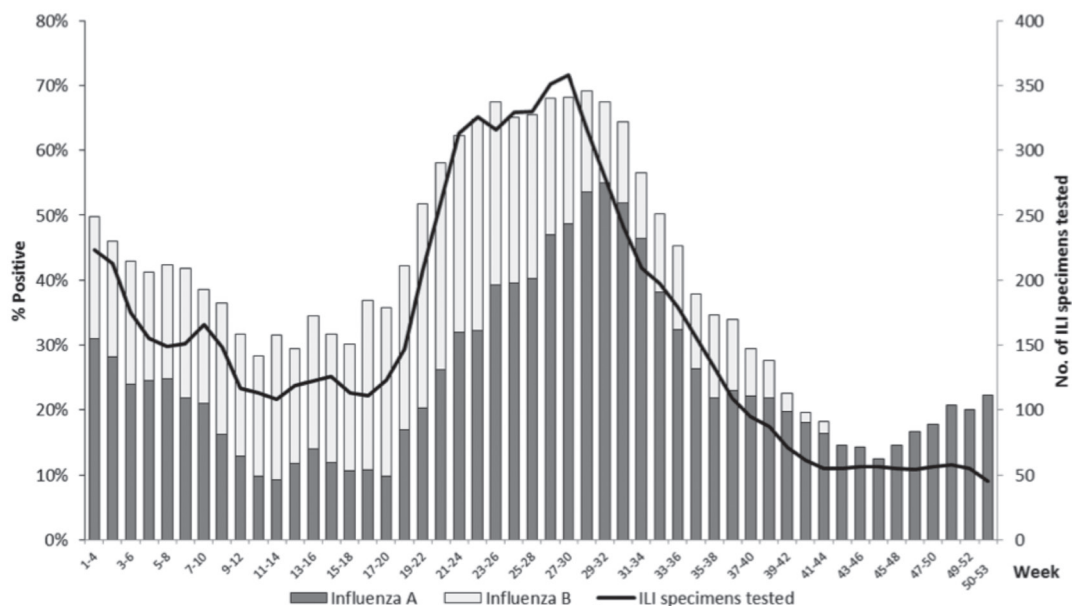


Virological surveillance of influenza viruses was carried out on throat and/or nasopharyngeal specimens obtained from polyclinics, hospitals and sentinel private clinics throughout the year. The typing, subtyping and isolation of influenza viruses was carried out at the National Public Health Laboratory (NPHL) and at designated hospital laboratories. Further genetic analysis and antigenic characterisation of selected samples was also done by NPHL and the WHO Collaborating Centre for Reference and Research on Influenza, Melbourne, Australia.

The 4-weekly moving average of the proportion of samples from patients in polyclinics and sentinel

private clinics with influenza-like illness (ILI) which were positive for influenza viruses is shown in Figure 1.7. Higher levels of influenza activity were observed for the 4-weekly moving average between E-weeks 21-24 and 30-33, with a range of 62.3% to 69.1%. Influenza activity peaked in E-weeks 28-31 with 69.1% of ILI samples testing positive for influenza viruses. 77.6% of the positive samples in E-weeks 28-31 were influenza A viruses. Of these, 84.1% were of the H3N2 subtype. In 2014, 49.4% of all ILI samples tested positive for influenza viruses. Of the positive samples, 62.2% tested positive for influenza A viruses, of which 65.8% were of the influenza A(H3N2) subtype.

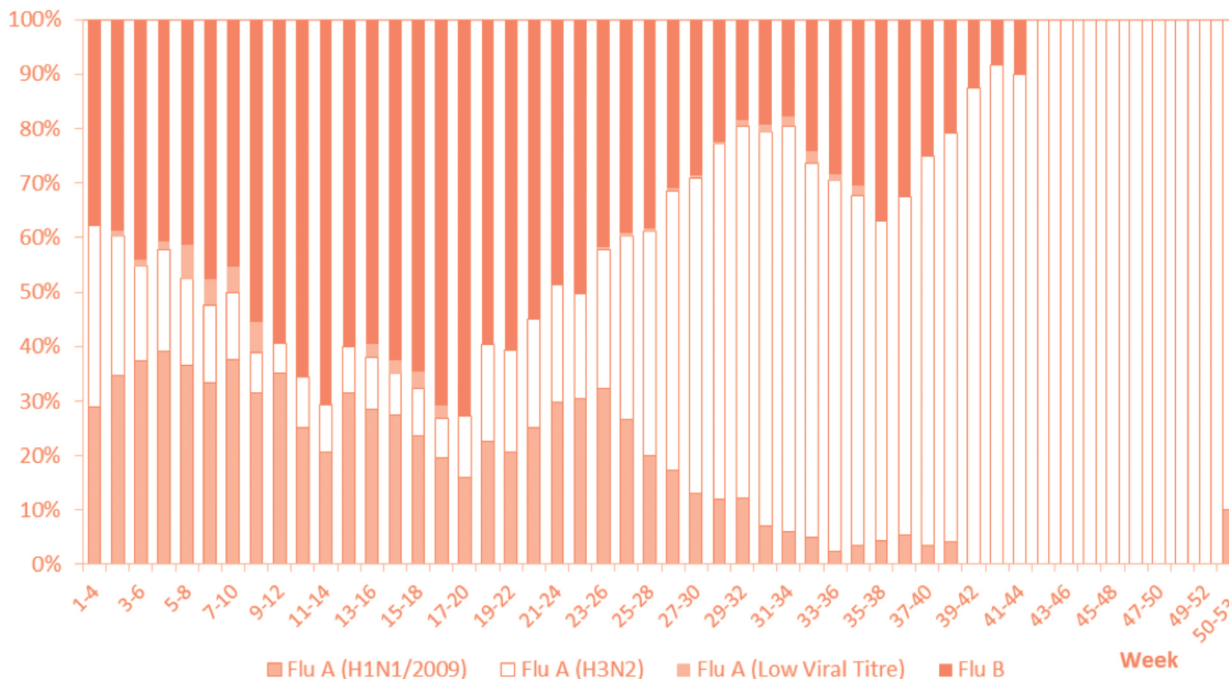
Figure 1.7
4-Week Moving Virological Surveillance of Influenza A & B, 2014



Between E-week 1-4 and 24-27, influenza B predominated among the influenza viruses, co-circulating with lower levels of influenza A(H1N1)

pdm09 and influenza A(H3N2). This was followed by influenza A(H3N2) virus gaining strong predominance in Singapore for the remainder of 2014 (Figure 1.8).

Figure 1.8
4-Week moving influenza typing results, 2014



Majority of influenza A(H1N1)pdm09 viruses of 2014 were antigenically similar to current vaccine strain, A/California/07/2009. The haemagglutinin genes of A(H3N2) viruses belonged to phylogenetic clades 3C.3 and 3C.2, and the viruses were antigenically similar to either A/Victoria/361/2011 or A/Switzerland/9715293/2013, which were the viruses in the vaccines for use in the 2014-2015 influenza seasons as recommended by WHO. Approximately 95% of influenza B viruses were of the B/Yamagata lineage and the rest belonged to B/Victoria lineage. Under B/Yamagata lineage, both B/

Massachusetts/2/2012-like viruses (~27%) and its low reactors (~73%) were detected during Jan-Jun 2014, while B/Phuket/3073/2013-like viruses were detected during Jul-Dec 2014. All the viruses of B/Victoria lineage were typed as B/Brisbane/60/2008-like viruses. Over 280 isolates, including influenza A(H1N1)pdm09, A(H3N2) and B viruses, were analysed for the resistance to neuraminidase inhibitors oseltamivir, peramivir, laninamivir and zanamivir. No antiviral resistance was detected except that reduced inhibition to peramivir was detected in one influenza B isolate.

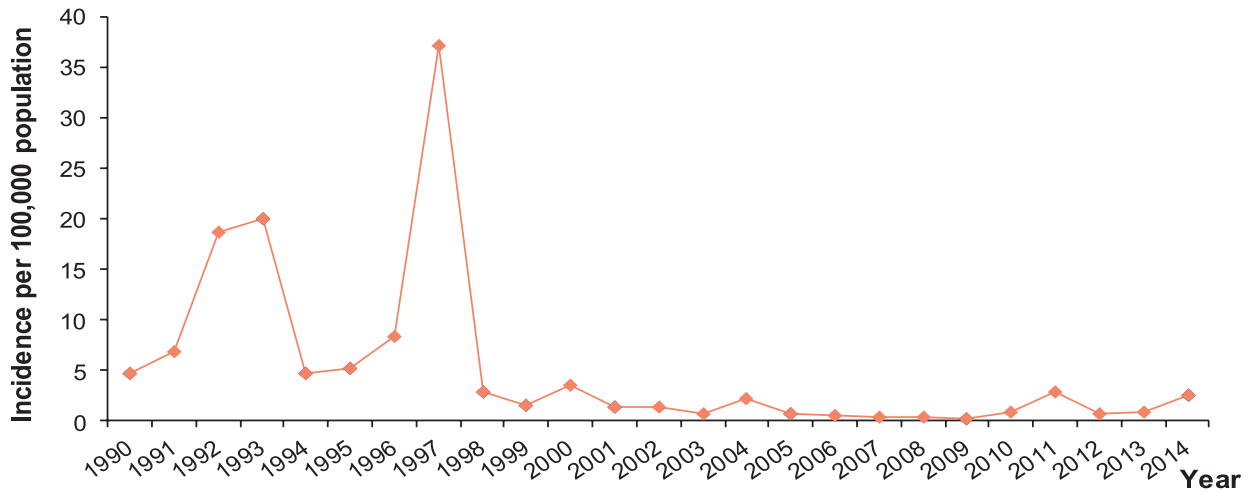
MEASLES

Measles is an acute, highly communicable viral disease caused by the measles virus, a member of the genus *Morbillivirus* of the family *Paramyxoviridae*. The mode of transmission is airborne by droplet spread, or direct contact with the nasal or throat secretions of an infected person.

In Singapore, the number of reported measles cases has rapidly declined with the introduction of

compulsory measles vaccination in August 1985. In 1992 and 1997, there was an increase in the number of reported cases (Figure 1.9). All age groups were affected and as a result, the “catch-up” immunisation initiative was implemented in July – November 1997 and the two-dose MMR vaccination regime was implemented in January 1998. The incidence of measles has remained at a low level since then.

Figure 1.9
Incidence of reported measles cases, 1990 – 2014



A total of 142 laboratory confirmed cases of measles were reported in 2014 compared to 46 cases reported in 2013 (Figure 1.10). The highest incidence rate was observed in children under the age of 1 year (Table 1.9). Among the three major ethnic groups, Malays

had the highest incidence rate, followed by Chinese and Indian (Table 1.10). Six cases had at least one dose of MMR vaccination prior to onset of illness (Source: National Immunisation Registry).

Figure 1.10
E-weekly distribution of reported measles cases, 2013 – 2014

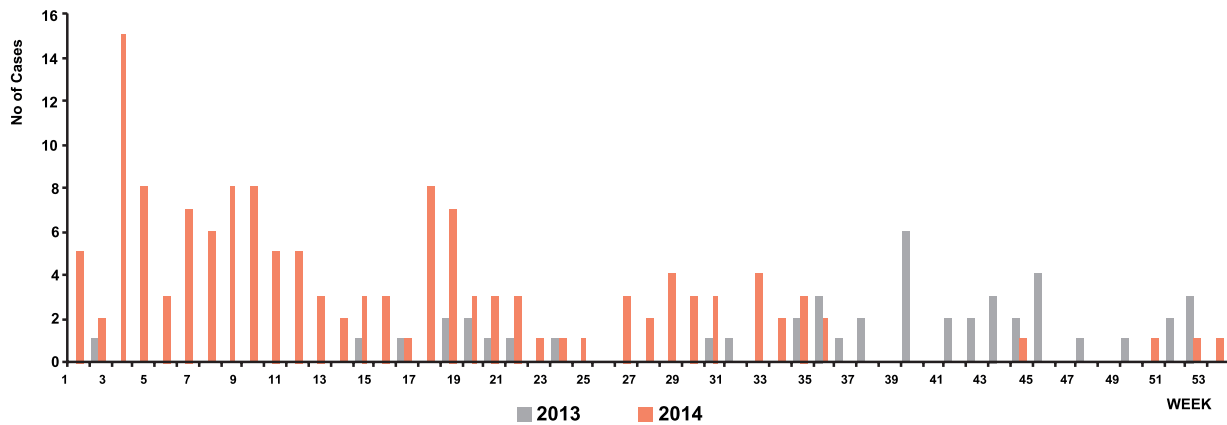


Table 1.9
Total number of notifications received for Measles, 2010 – 2014*

Age	2010		2011		2012		2013		2014	
	Local	Imported	Local	Imported	Local	Imported	Local	Imported	Local	Imported
< 6 mths	1	0	6	0	1	0	2	1	4	0
6 mths – <1yr	5	1	20	3	2	0	12	3	21	7
1 – 4 yrs	14	5	51	8	9	0	9	5	31	9
5 – 9 yrs	2	3	6	1	3	0	0	4	2	0
10 – 14 yrs	0	0	1	0	1	0	1	0	0	0
15 – 24 yrs	3	3	6	0	3	0	1	0	4	2
25 – 34 yrs	6	1	14	6	7	4	2	0	20	8
35 – 44 yrs	3	1	9	2	4	2	4	0	14	1
45 – 54 yrs	1	0	0	0	0	0	0	0	3	2
55+	0	0	0	0	1	0	0	0	0	0
Total	35	15	113	20	31	6	31	13	99	29

*Exclude tourists and foreigners seeking medical treatment in Singapore

Table 1.10
Age-gender distribution and age-specific incidence rate of reported measles cases[^], 2014

Age	Male	Female	Total (%)	Incidence rate per 100,000 population*
< 6 mths	3	1	4 (3.1)	97.6
6 mths – < 1yr	17	11	28 (21.8)	
1 – 4 yrs	24	16	40 (31.3)	21.5
5 – 9 yrs	2	0	2 (1.6)	0.9
10 – 14 yrs	0	0	0 (0.0)	0.0
15 – 24 yrs	3	3	6 (4.7)	0.8
25 – 34 yrs	14	14	28 (21.9)	2.3
35 – 44 yrs	6	9	15 (11.7)	1.5
45 – 54 yrs	2	3	5 (3.9)	0.7
55+	0	0	0(0.0)	0.0
Total	71	57	128 (100.0)	2.3

[^]Excluding three tourists and eleven foreigners seeking medical treatment in Singapore

*Rates are based on 2014 estimated mid-year population.

(Source: Singapore Department of Statistics)

Table 1.11
Ethnic-gender distribution and ethnic-specific incidence rate of reported measles cases[^], 2014

	Male	Female	Total (%)	Incidence rate per 100,000 population*
Singapore Resident				
Chinese	23	17	40 (31.3)	1.4
Malay	14	7	21 (16.4)	4.1
Indian	2	3	5 (3.9)	1.4
Others	9	10	19 (14.8)	15.0
Foreigner	23	20	43 (33.6)	2.7
Total	71	57	128 (100.0)	2.3

[^]Excluding three tourists and eleven foreigners seeking medical treatment in Singapore

*Rates are based on 2014 estimated mid-year population.

(Source: Singapore Department of Statistics)

MENINGOCOCCAL INFECTION

Meningococcal meningitis is an acute bacterial disease, characterised by sudden onset of fever, intense headache, nausea and often vomiting and stiff neck. Frequently there is a petechial rash with pink macules or very rarely, vesicles. The causative agent is *Neisseria meningitidis* with serotype groups, namely, A, B, C, Y, W-135, X and Z. The mode of transmission is via direct contact, including respiratory droplets from nose and throat of infected persons.

In 2014, there were nine cases of meningococcal infection reported compared to three cases in 2013. (Tables 1.12 and 1.13). All the cases were laboratory confirmed with positive blood/ cerebral spinal fluids culture or virginal swab PCR (Table 1.14).

Table 1.12
Total number of notifications received for meningococcal infection, 2010 – 2014

Age	2010		2011		2012		2013		2014	
	Local	Imported	Local	Imported	Local	Imported	Local	Imported	Local	Imported
0 – 4	3	1	0	0	0	0	1	0	3	0
5 – 14	0	0	1	0	0	0	0	0	0	0
15 – 24	0	0	0	0	0	0	0	0	0	0
25 – 34	2	0	0	0	0	0	0	0	1	0
35 – 44	0	0	1	0	0	0	0	1	1	0
45 – 54	0	0	0	0	0	0	0	0	2	0
55 - 64	1	0	1	0	0	0	1	0	2	0
65+	0	0	3	0	0	0	0	0	0	0
Total	6	1	6	0	0	0	2	1	9	0

Table 1.13
Age-gender distribution and age-specific incidence rates of reported meningococcal infection cases, 2014

Age	Male	Female	Total (%)	Incidence rate per 100,000 population*
0 - 4	2	1	3	1.3
5 – 14	0	0	0	0
15 – 24	0	0	0	0
25 – 34	0	1	1	0.1
35 – 44	1	0	1	0.1
45 – 54	2	0	2	0.3
55 - 64	1	1	2	0.4
65+	0	0	0	0
Total	6	3	9 (100.0)	0.2

*Rates are based on 2014 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 1.14
Epidemiological data of nine reported meningococcal infection cases, 2014

Case particulars				
Gender	Age	Ethnic group	Causative agent	Status
M	2 months	Indian	Neisseria meningitides Grp B	Recovered
M	42 years	Indian	Neisseria meningitides Grp C	Died
M	3 months	Chinese	Neisseria meningitides Grp B	Recovered
M	50 years	Chinese	Neisseria meningitides Grp W-135	Recovered
M	53 years	Chinese	Neisseria meningitides Grp C	Died
M	63 years	Chinese	Neisseria meningitides Grp W-135	Recovered
F	4 months	Malay	Neisseria meningitides Grp B	Recovered
F	26 years	Malay	Neisseria meningitides (non-groupable)	Recovered
F	58 years	Malay	Neisseria meningitides Grp B	Died

MUMPS

Mumps or infectious parotitis is an acute viral disease characterised by fever, swelling and tenderness of one or more salivary glands. The mumps virus, a member of the genus Paramyxovirus, is antigenically related to the parainfluenza viruses. The mode of transmission is airborne spread via infected respiratory droplets or by direct contact with the saliva of an infected person.

The incidence of mumps in Singapore increased five-fold between 1998 and 1999, from 1,183 cases

(30.2 per 100,000 population) to 6,384 cases (161.6 per 100,000 population). Children below age 15 were the most affected age group. This increase was due to the low protective efficacy of vaccines containing the Rubini strain, which had been used between the years 1993 – 1995. Following this resurgence, a more efficacious vaccine replaced the Rubini strain-containing vaccine. Since then, the annual incidence of mumps has declined rapidly (Figure 1.11).

Figure 1.11
Incidence of reported mumps cases, 1990 – 2014

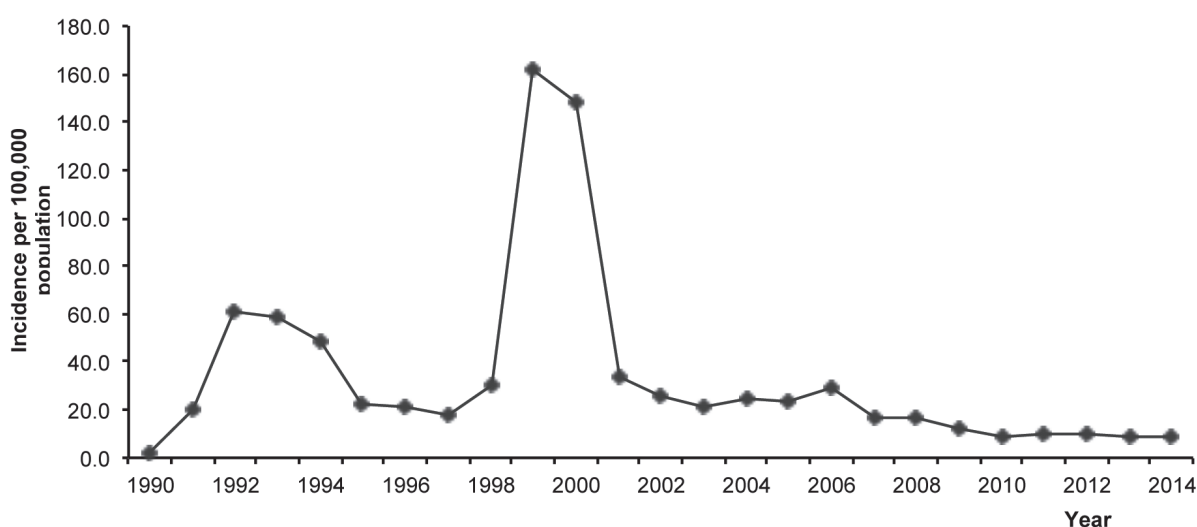
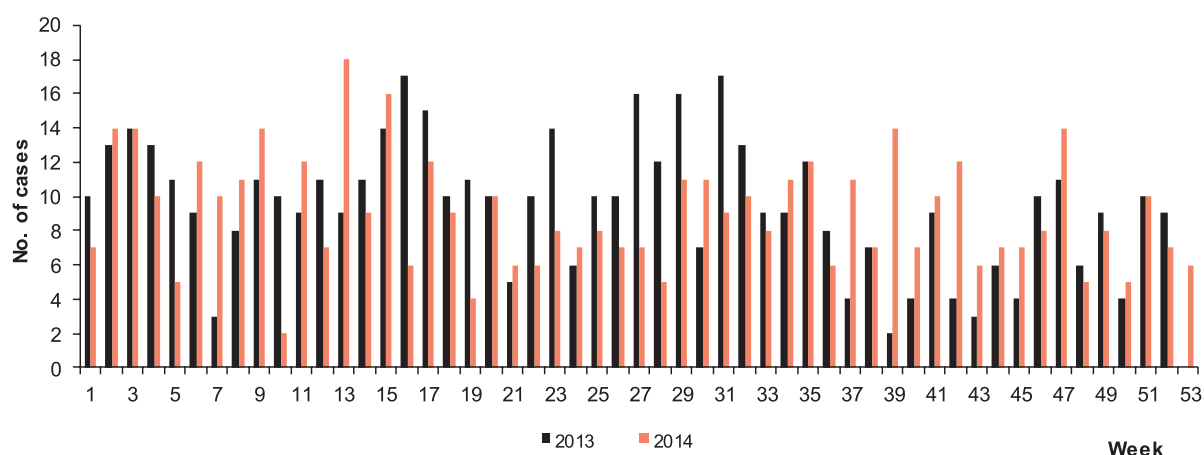


Figure 1.12
E-weekly distribution of reported mumps cases, 2013 – 2014



A total of 478 cases (8.7 per 100,000 population) were reported in 2014 as compared to 495 cases in 2013 (Figure 1.12). The incidence rate was highest in the 0 – 4 years age group (Table 1.15). Among the

three major ethnic groups, Malays had the highest incidence rate, followed by Chinese. Foreigners comprised 25.5% of cases (Table 1.16).

Table 1.15
Age-gender distribution and age-specific incidence rate of reported mumps cases, 2014

Age	Male	Female	Total (%)	Incidence rate per 100,000 population*
0 – 4	47	23	70 (14.6)	31.1
5 – 14	88	40	128 (26.8)	26.8
15 – 24	27	20	47 (9.8)	6.2
25 – 34	48	37	85 (17.8)	6.8
35 – 44	41	41	82 (17.2)	8.4
45 – 54	16	26	42 (8.8)	5.7
55+	13	11	19 (4.0)	2.3
Total	280	198	478 (100.0)	8.7

*Rates are based on 2014 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 1.16
Ethnic-gender distribution and ethnic-specific incidence rate of reported mumps cases, 2014

	Male	Female	Total (%)	Incidence rate per 100,000 population*
Singapore Resident				
Chinese	150	108	258 (54.0)	9.0
Malay	27	32	59 (12.3)	11.4
Indian	10	3	13 (2.8)	3.7
Others	11	15	26 (5.4)	20.5
Foreigner	82	40	122 (25.5)	7.6
Total	280	198	478 (100.0)	8.7

PERTUSSIS

Pertussis is an acute bacterial infection of the respiratory tract caused by *Bordetella pertussis*. The mode of transmission is via respiratory droplets or direct contact with the nasal or throat secretions of an infected person.

A total of 21 laboratory confirmed cases of pertussis were reported in 2014 compared to 17 in 2013 (Figure 1.13). Of the 21 reported cases, two were imported

cases and 19 indigenous cases (Table 1.17). Of the cases, 10 were aged below 1 year, 2 were aged between 1 and 9 years and the rest were young adults aged 15-24 years. Among the three major ethnic groups, Malays had the highest incidence rate, followed by Indians (Table 1.18 and 1.19). None of the cases received DPT vaccination prior to onset of illness (Source: National Immunisation Registry).

Figure 1.13
E-weekly distribution of reported pertussis cases, 2013 – 2014

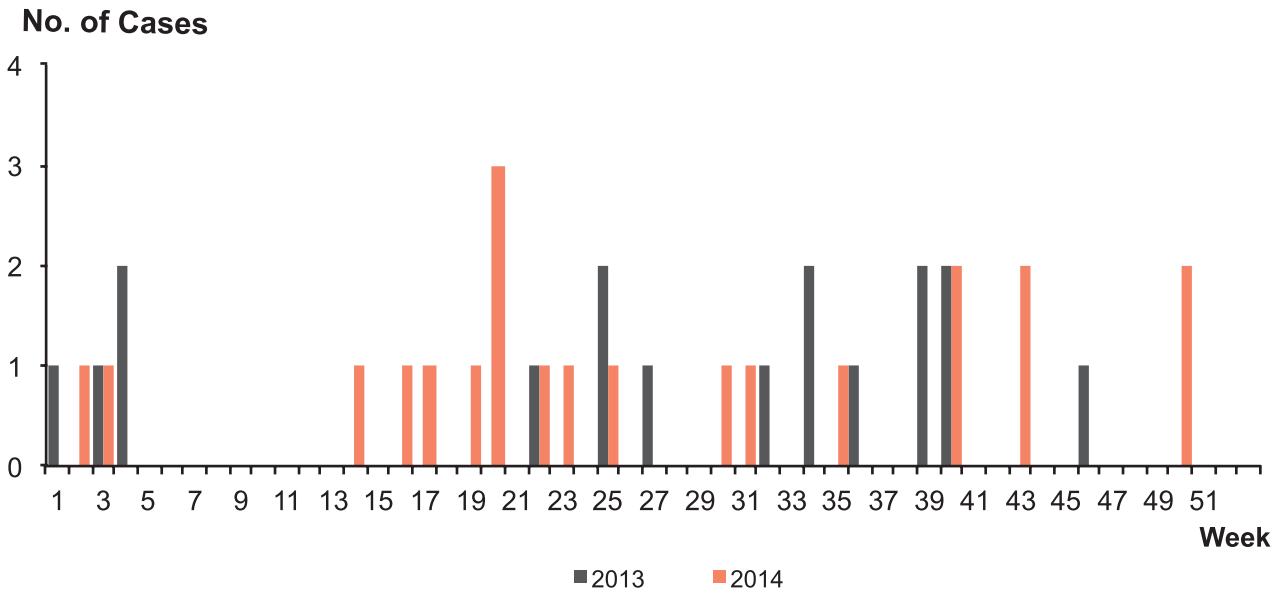


Table 1.17
Total number of notifications received for pertussis, 2010 – 2014

Age	2010		2011		2012		2013		2014	
	Local	Imported	Local	Imported	Local	Imported	Local	Imported	Local	Imported
0 – 4	7	1	19	1	9	4	14	1	9	2
5 – 14	0	0	1	0	0	0	0	0	1	0
15 – 24	0	0	8	0	11	0	0	1	9	0
25 – 34	0	0	0	0	0	0	1	0	0	0
35 – 44	0	0	0	0	0	0	0	0	0	0
45 – 54	0	0	0	0	0	0	0	0	0	0
55 – 64	0	0	0	0	0	0	0	0	0	0
65+	0	0	0	0	0	0	0	0	0	0
Total	7	1	28	1	20	4	15	2	19	2

Table 1.18
Age-gender distribution and age-specific incidence rate of reported pertussis cases, 2014

Age	Male	Female	Total (%)	Incidence rate per 100,000 population*
0 – < 1yr	4	6	10 (47.62)	25.57
1 – 4 yrs	0	1	1 (4.76)	0.54
5 – 9 yrs	1	0	1 (4.76)	0.43
10 – 14 yrs	0	0	0 (0.0)	0.0
15 – 24 yrs	9	0	9 (42.86)	1.2
25 – 34 yrs	0	0	0 (0.0)	0.1
35 – 44 yrs	0	0	0 (0.0)	0.0
45 – 54 yrs	0	0	0 (0.0)	0.0
55 – 64 yrs	0	0	0 (0.0)	0.0
65 yrs+	0	0	0 (0.0)	0.0
Total	14	7	21 (100.0)	0.4

*Rates are based on 2014 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 1.19
Ethnic-gender distribution and ethnic-specific incidence rate of reported pertussis cases, 2014

	Male	Female	Total (%)	Incidence rate per 100,000 population*
Singapore Resident				
Chinese	7	1	8 (38.10)	0.3
Malay	3	4	7 (33.33)	1.4
Indian	2	0	2 (9.52)	0.6
Others	0	0	0 (0.0)	0.0
Foreigner	2	2	4 (19.05)	0.3
Total	14	7	21 (100.0)	0.4

*Rates are based on 2014 estimated mid-year population.
(Source: Singapore Department of Statistics)

PNEUMOCOCCAL DISEASE (INVASIVE)

Invasive pneumococcal disease (IPD) is an acute bacterial infection of the respiratory tract, brain or blood stream caused by *Streptococcus pneumoniae*. The mode of transmission is by droplets or close contact with the nasopharyngeal secretions of an infected person.

A total of 147 laboratory confirmed cases of invasive pneumococcal infection were reported in 2014, a decrease of 12% compared to 167 cases reported in 2013 (Figure 1.14). Of the 147 reported cases, seven were imported cases and 140 indigenous cases (Table 1.20). The incidence rate was highest in those

aged 65 years and above. Among the three major ethnic groups, Malays had the highest incidence rate, followed by Chinese and Indians (Tables 1.21 and 1.22). Of these 147 laboratory confirmed IPD cases, the number of serotyped cases was 117, which correspond to 79.6% of laboratory confirmed IPD cases. The predominant pneumococcal type for children cases was 19A and for adult cases was 3. (Tables 1.23 and 1.24). Ten cases had received at least one dose of pneumococcal vaccines prior to onset of illness (Source: National Immunisation Registry).

Figure 1.14
E-weekly distribution of reported invasive pneumococcal cases, 2013 – 2014

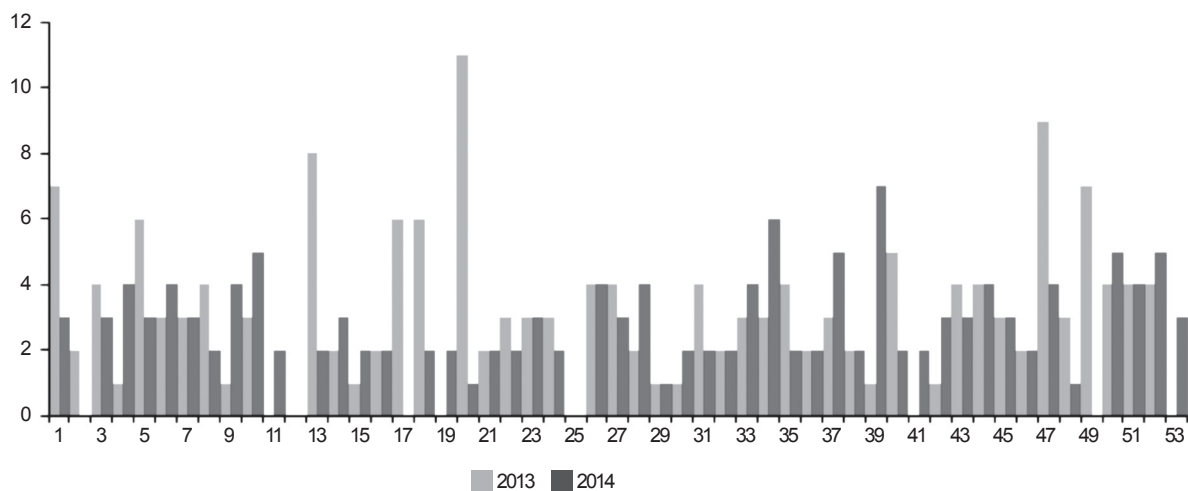


Table 1.20
Total number of notifications received for invasive pneumococcal disease, 2010 – 2014

Age	2010		2011		2012		2013		2014	
	Local	Imported	Local	Imported	Local	Imported	Local	Imported	Local	Imported
0 – 4	19	0	15	0	16	1	9	1	14	0
5 – 14	9	0	11	0	9	0	8	1	7	1
15 – 24	10	0	8	0	10	0	1	1	2	1
25 – 34	9	0	7	0	19	0	13	3	11	0
35 – 44	8	0	14	0	8	0	11	0	9	1
45 – 54	17	0	19	0	16	0	17	1	11	1
55 – 64	32	0	21	0	31	0	36	0	24	3
65+	62	0	53	0	52	1	64	1	62	0
Total	166	0	148	0	161	2	159	8	140	7

*Rates are based on 2014 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 1.21
Age-gender distribution and age-specific incidence rate of reported
invasive pneumococcal cases, 2014

Age (Yrs)	Male	Female	Total (%)	Incidence rate per 100,000 population*
0 – 4	7	7	14 (9.52)	6.2
5 – 14	2	6	8 (5.44)	1.7
15 – 24	3	0	3 (2.04)	0.4
25 – 34	8	3	11 (7.48)	0.9
35 – 44	9	1	10 (6.8)	1.0
45 – 54	7	5	12 (8.16)	1.6
55 - 64	17	10	27 (18.37)	4.7
65+	39	23	62 (42.19)	13.0
Total	92	55	147 (100.0)	2.7

*Rates are based on 2014 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 1.22
Ethnic-gender distribution and ethnic-specific incidence rate of reported
invasive pneumococcal cases, 2014

	Male	Female	Total (%)	Incidence rate per 100,000 population*
Singapore Resident				
Chinese	54	35	89 (60.54)	3.1
Malay	16	13	29 (19.73)	5.6
Indian	3	2	5 (3.40)	1.4
Others	1	1	2 (1.36)	1.6
Foreigner	18	4	22 (14.97)	1.4
Total	92	55	147 (100.0)	2.7

*Rates are based on 2014 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 1.23
Distribution of pneumococcal serotypes among children cases, 2014

Pneumococcal Type/ Group	Number of isolates (n = 16) (%)
Type 3 *§	1 (6.25)
Group 10	1 (6.25)
Group 11	1 (6.25)
Group 15	1 (6.25)
Type 19A §	10 (62.5)
Type 6B *§	1 (6.25)
Non-groupable	1 (6.25)

* Serotype included in PCV7, § serotype included in PCV13

Table 1.24
Distribution of pneumococcal serotypes among adult cases, 2014

Pneumococcal Type/ Group	Number of isolates (n = 101) (%)
Type 1 *§	2 (1.98)
Type 2	1 (0.99)
Type 3 *§	15 (14.85)
Type 4 *§	5 (4.95)
Type 5 §	1 (0.99)
Type 8	5 (4.95)
Group 11	6 (5.94)
Group 12	1 (0.99)
Type 14 *§	8 (7.92)
Group 17	1 (0.99)
Type 20	4 (3.96)
Group 33	1 (0.99)
Type 15A	2 (1.98)
Type 15B	2 (1.98)
Type 15C	1 (0.99)
Type 15F	1 (0.99)
Type 18C *§	1 (0.99)
Type 19A §	7 (6.93)
Type 19F *§	2 (1.98)
Type 22F	1 (0.99)
Type 23A	4 (3.96)
Type 23F *§	6 (5.94)
Type 6A §	4 (3.96)
Type 6B *§	4 (3.96)
Type 6C	2 (1.98)
Type 7F §	1 (0.99)
Type 9V *§	3 (2.97)
Group 18	1 (0.99)
Non-groupable	9 (8.92)

* Serotype included in PCV7, § serotype included in PCV13

RUBELLA

Rubella is a generally mild febrile viral disease with a diffuse punctate and maculopapular rash sometimes resembling that of measles or scarlet fever. It is also commonly known as German measles. The causative agent is the rubella virus (genus *Rubivirus*) from the *Togaviridae* family and it is spread through droplets or by close contact with the nasopharyngeal secretions of an infected person.

Rubella incidence fluctuated during 1991 – 1999. This was followed by a steady decline from 1999 (10.9 per 100,000 population) to 2014 (0.3 per 100,000 population) (Figure 1.15).

Figure 1.15
Incidence of reported rubella cases, 1991 – 2014



A total of 17 cases of rubella were reported in 2014, a decrease of 64.6% compared to 48 cases reported in 2013 (Figure 1.16). The incidence rate was highest in the 0 - 4 year age group (Table 1.25). All the 5 female cases (0.4 per 100,000 female population) were in the reproductive age group of 15 – 44 years. Among

the three major ethnic groups, Indian and Malay had the highest incidence rate, followed by Chinese. Foreigners comprised 20.0% of cases (Table 1.26).

There were no cases of congenital rubella.

Figure 1.16
E-weekly distribution of reported rubella cases, 2013 – 2014

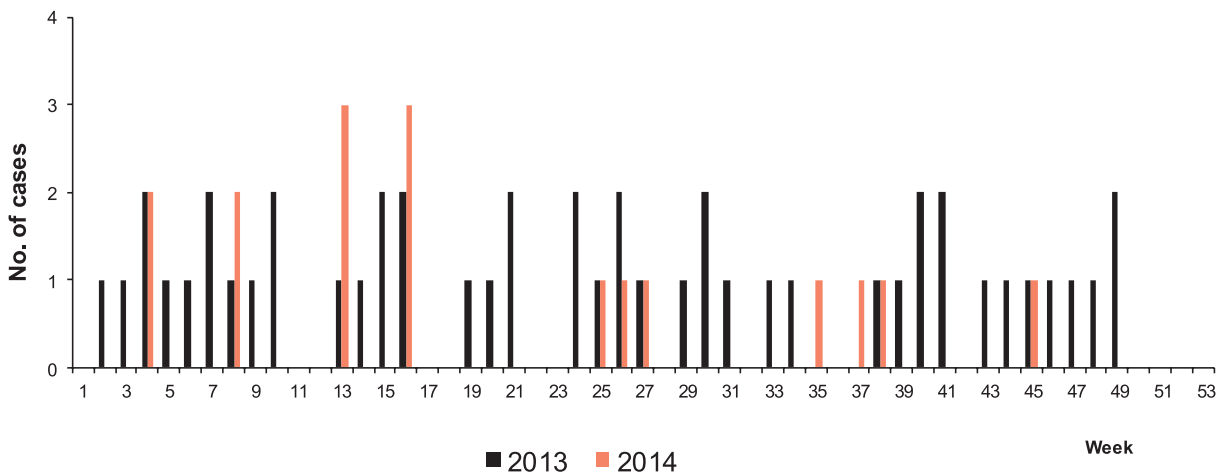


Table 1.25**Age-gender distribution and age-specific incidence rate of reported rubella cases[^], 2014**

Age (Yrs)	Male	Female	Total (%)	Incidence rate per 100,000 population*
0 – 4	5	0	5 (33.3)	2.2
5 – 14	2	0	2 (13.3)	0.4
15 – 24	0	0	0	0.0
25 – 34	2	2	4 (26.7)	0.3
35 – 44	1	3	4 (26.7)	0.4
45 – 54	0	0	0	0.0
55+	0	0	0	0.0
Total	10	5	15 (100.0)	0.3

[^]Excluding two foreigners seeking medical treatment in Singapore

*Rates are based on 2014 estimated mid-year population.

(Source: Singapore Department of Statistics)

Table 1.26**Ethnic-gender distribution and ethnic-specific incidence rate of reported rubella cases[^], 2014**

	Male	Female	Total (%)	Incidence rate per 100,000 population*
Singapore Resident				
Chinese	5	1	6 (40.0)	0.2
Malay	1	2	3 (20.0)	0.6
Indian	2	0	2 (13.3)	0.6
Others	1	0	1 (6.7)	0.8
Foreigner	1	2	3 (20.0)	0.2
Total	10	5	15 (100.0)	0.3

[^]Excluding two foreigners seeking medical treatment in Singapore

*Rates are based on 2014 estimated mid-year population.

(Source: Singapore Department of Statistics)

Table 1.27**Total number of notifications received for Rubella, 2010 – 2014 [^]**

Age	2010		2011		2012		2013		2014	
	Local	Imported	Local	Imported	Local	Imported	Local	Imported	Local	Imported
< 6 mths	9	0	9	0	3	0	2	0	0	0
6 mths – < 1yr										
1 – 4 yrs	7	0	10	0	9	0	3	0	5	0
5 – 9 yrs	2	0	5	0	3	0	0	0	1	0
10 – 14 yrs	0	0	2	0	1	0	0	0	1	0
15 – 24 yrs	26	1	18	0	10	0	2	0	0	0
25 – 34 yrs	54	1	28	1	21	1	10	1	3	1
35 – 44 yrs	44	0	15	1	4	0	12	2	2	2
45 – 54 yrs	4	1	8	0	5	0	7	0	0	0
55+	6	0	7	0	1	0	5	0	0	0
Total	152	3	102	2	57	1	41	3	12	3

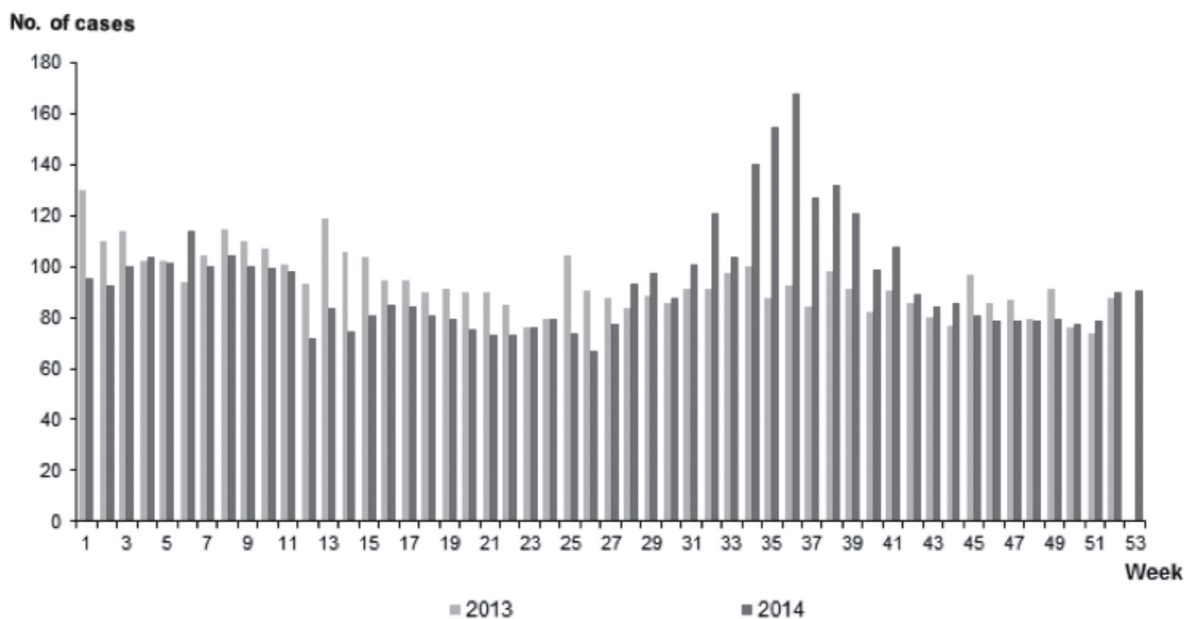
[^]excludes tourists and foreigners seeking medical treatment in Singapore

VIRAL CONJUNCTIVITIS

Viral conjunctivitis is a clinical syndrome characterised by inflammation of the conjunctiva of the eyes beginning with lacrimation, irritation and hyperemia of the palpebral and bulbar conjunctivae. The common causative agents are the adenoviruses and the enteroviruses.

In 2014, the polyclinics reported 26,227 attendances for conjunctivitis, an increase of 2.6% compared to 25,563 attendances reported in 2013 (Figure 1.17). There were no institutional outbreaks of viral conjunctivitis reported in 2014.

Figure 1.17
E-weekly distribution of reported conjunctivitis cases, 2013 – 2014



SEVERE ILLNESS AND DEATH FROM POSSIBLY INFECTIOUS CAUSES (SIDPIC) PROGRAMME

The SIDPIC programme is a hospital-based sentinel surveillance programme which reviews cases of unexplained deaths and critical illness to identify possible emerging infections caused by novel pathogens. It aims to reduce delays in recognising emerging infections of public health importance. The project is presently operational in four public hospitals (TTSH, NUH, SGH and KKH). In year 2014, a total of 10,039 hospital patients were screened by SIDPIC project coordinators in participating hospitals (Table 1.28). Of these, 171 SIDPIC cases that fulfilled the inclusion criteria were identified. The majority of SIDPIC cases (35.09%) had illnesses with respiratory

syndromes (Table 1.29). Of the 171 cases identified in 2013, 96 were found to have alternate aetiologies. 40 of these 96 cases had causative pathogens found. The top two causative pathogens were respiratory viruses (20%), and *Streptococcus pneumoniae* (20%). The remaining cases had clinical presentations that were consistent with the clinical diagnosis, e.g. autoimmune disorders. Despite extensive laboratory testing, the aetiology in 75 (43.86%) cases remained unknown. Table 1.30 lists the pathogens which may be tested for under the SIDPIC programme.

Table 1.28
SIDPIC Performance Indicators 2014

Surveillance Indicators	NUH	TTSH	SGH	KKH	TOTAL
No. of cases screened*	3238	4902	1017	883	10039 [^]
Death	1577	2181	151	85	3994
Non-death	1661	2721	866	797	6045
No. of SIDPIC cases	108	21	1	41	171
Aetiology Found	60	10	0	25	95
Unknown Aetiology	47	11	1	16	75
Co-morbidity found	1	0	0	0	1
No. of missed cases#	0	5	4	0	9

¹Inclusion criteria of SIDPIC programme:

- Age 1 to 49 years.
- Previously healthy. Exclusion criteria:
 - Immunosuppression (e.g. HIV/ AIDS, cancers, and immune disorders)
 - Chronic diseases (e.g. cardiac, lung, renal and hepatic)
- Clinical presentation suggestive of infection
- Death or critically ill cases
- Routine testing has not identified a known cause

* The total number of cases screened refers to the sum of ICU admissions and death certificates screened.

[^] Prior to 2014, only cases aged between 1 and 49 years were reported. From 2014 onwards, all age groups were reported.

Based on surrogate indicator of viral encephalitis notified to MOH that is not identified as SIDPIC cases. All 9 cases were admitted to general wards and did not fulfilled SIDPIC recruitment criteria.

Table 1.29
Distribution of cases based on syndrome² classification, 2014

Syndrome	Aetiology Found*	Unknown Aetiology	Total (%)	KKH	Total
Neurological	12	15	27 (15.79)	883	10039 [^]
Cardiac	25	9	34 (19.88)	85	3994
Respiratory	29	31	60 (35.09)	797	6045
Gastrointestinal	12	7	19 (11.11)	41	171
Multisystem	18	13	31 (18.13)	25	95
Total	96*	75	171 (100.0)	16	75

*Included 1 case with co-morbidity found.

Syndrome Classification:

- i. Neurological – meningitis or encephalitis
- ii. Cardiac – myocarditis, pericarditis, endocarditis
- iii. Respiratory – pneumonia, acute respiratory distress syndrome (ARDS), respiratory failure
- iv. Gastrointestinal – hepatitis, hepatic failure, severe diarrhoea
- v. Multisystem – sepsis, haemorrhagic fever, rash, shock

Table 1.30
SIDPIC Lab Test Panels

	Pneumonia		Encephalitis		Viral Haemorrhagic Fever
First line panel*	Respiratory Samples Multiplex PCR Influenza PCR H5N1 PCR SARS CoV-PCR MERS-CoV PCR TB PCR Blood Bacterial culture Mycoplasma serology Legionella serology Chlamydia serology H5N1 PCR SARS CoV-PCR	Urine Urine culture Pneumococcal Ag Legionella Ag Other samples (e.g. lung tissue) PCP stain Fungal stain	Cerebrospinal Fluid Bacterial culture AFB PCR, culture Fungal culture Enterovirus PCR HSV/ CMV/ VZV/ EBV PCR Dengue PCR JE IgM, PCR WNV PCR Nipah PCR Respiratory Samples EV PCR Nipah PCR	Stool Enterovirus PCR Poliovirus PCR Other samples (e.g. Brain tissue) Histopathology	Blood & Respiratory Samples Dengue PCR, serology Chikungunya PCR, serology Yellow fever PCR, serology Lassa, Ebola, Marburg fever
Second line panel#	Blood Brucella serology Respiratory Samples Viral isolation Hantaan virus PCR Nipah PCR Zikavirus (Micronesia area)		Cerebrospinal Fluid Viral isolation, also consider lymphocytic choriomeningitis virus Rickettsial isolation Kunjin Chandipura Measles Polio Rabies, and other viral encephalitides dependent on travel history, e.g. WEE, SLE, VEE, Kyasanur forest disease (India)	Toscana (from Europe/ Spain) Sindbis virus (Europe/ Australia/ Asia) Stool Viral isolation Other samples (e.g. Brain tissue) EM	Blood & Respiratory Samples VEE, CCHF, RVF and other South American arenaviruses, e.g. Junin, Machupo, Guanarito and Sabia viruses, depending on travel history HFRS Virus isolation EM
	Myocarditis		Gastrointestinal		
First line panel*	Blood EV71 PCR Stool Enterovirus PCR	Other samples (e.g. Cardiac tissue) Histopathology	Stool Vibrio Cholera E. coli O157:H7	Other samples (e.g. Liver/ intestinal tissue) Histopathology Special stains	Blood Bacterial culture Yellow fever PCR, serology
Second line panel#	Blood Virus isolation	Other samples (e.g. Cardiac tissue) EM, special stains	Stool Rotavirus, astrovirus, sapovirus, adenovirus 40.41, Norovirus PCR Viral isolation	Other samples (e.g. Liver/ intestinal tissue) EM, special stains	

* **First line panel:** These are the first-line tests which may be conducted after a check has been made to ensure that these pathogens have not already been tested for, as part of the patient's clinical management.

Second line panel: These tests may be conducted after the SIDPIC physician and the laboratory have evaluated the epidemiological and clinical features of the case.

Abbreviations:

AFB = Acid-fast bacillus
Ag = Antigen
CCHF = Crimean-Congo haemorrhagic fever
CMV = Cytomegalovirus
E. coli
O157:H7 = Escherichia coli serotype O157:H7
EBV = Epstein-Barr virus
EM = Electron microscopy
EV = Enterovirus
EV71 = Enterovirus Type 71
H5N1 = Influenza A virus subtype H5N1
HFRS = Haemorrhagic fever with renal syndrome
HSV = Herpes simplex virus
JE IgM = Japanese encephalitis immunoglobulin M

MERS-CoV = Middle East respiratory syndrome coronavirus
PCP = Pneumocystis carinii pneumonia
PCR = Polymerase chain reaction
RVF = Rift Valley fever
SARS-CoV = Severe acute respiratory syndrome coronavirus
SLE = St Louis encephalitis
TB = Tuberculosis
VEE = Venezuelan equine encephalitis
VZV = Varicella zoster virus
WEE = Western equine encephalitis
WNV = West Nile Virus

CHICKENPOX (VARICELLA)

There were a total of 3,987 attendances in polyclinics for chickenpox in 2014 compared with 4,282 attendances in 2013. 87.8% of the attendances were by Singaporeans and Permanent Residents. Persons below the age of 20 years represented 65.5% of attendances for chickenpox (Table 1.31).

Table 1.31
Profile of chickenpox (varicella) polyclinic attendances by age group and nationality, 2014

Age (Yrs)	Singaporeans/PRs			Foreigners			Total (%)
	Total	Male	Female	Total	Male	Female	
0 - 9	1,602	841	761	32	16	16	1,634 (41.0)
10 -19	956	559	397	19	11	8	975 (24.5)
20 - 29	345	188	157	259	234	25	604 (15.1)
30 - 39	219	121	98	134	117	17	353 (8.9)
40 - 49	188	120	68	37	31	6	225 (5.6)
50 - 59	111	68	43	2	2	0	113 (2.8)
60+	80	45	35	3	3	0	83 (2.1)
Total	3,501	1,942	1,559	486	414	72	3,987 (100.0)