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 influenza 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 2013, there were ten cases of *Haemophilus influenza* type b disease reported compared to one case in 2012 (Figure 1.1). All the cases were laboratory confirmed with positive blood or cerebral spinal fluids culture. The incidence rate was highest in those aged 55 years and above. Among the major ethnic groups, Malays had the highest incidence rate and followed by Chinese (Table 1.1 and 1.2).

Figure 1.1
E-weekly distribution of reported Hib cases, 2012 – 2013

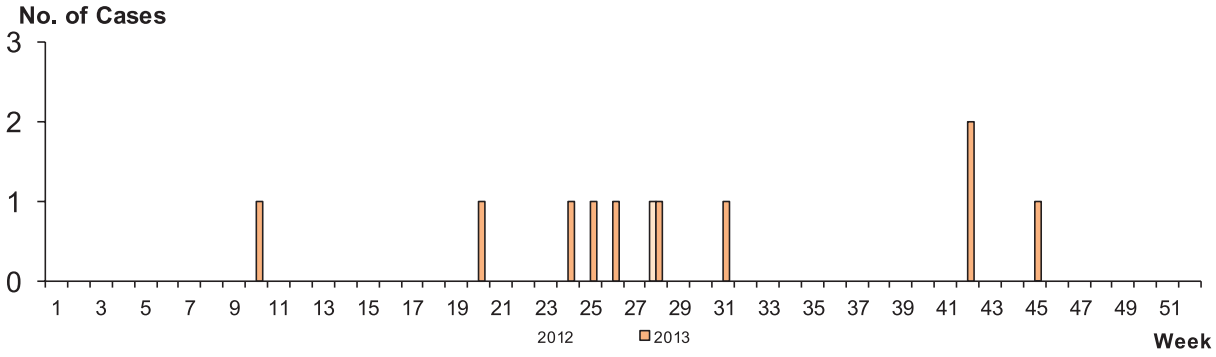


Table 1.1
Age-gender distribution and age-specific incidence rates of reported Hib cases, 2013

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	0	0	0 (0.0)	0.0
25 – 34	0	0	0 (0.0)	0.0
35 – 44	0	0	0 (0.0)	0.0
45 – 54	0	2	2 (20.0)	0.3
55 - 64	2	2	4 (40.0)	0.7
65+	4	0	4 (40.0)	0.9
Total	**6**	**4**	**10 (100.0)**	**0.2**

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

Table 1.2
Ethnic-gender distribution and ethnic-specific incidence rate of reported Hib cases, 2013

	Male	Female	Total (%)	Incidence rate per 100,000 population*
Singapore Resident				
Chinese	4	2	6 (60.0)	0.2
Malay	1	1	2 (20.0)	0.4
Indian	0	0	0 (0.0)	0.0
Others	1	0	1 (10.0)	0.8
Foreigner	0	1	1 (10.0)	0.1
Total	**6**	**4**	**10 (100.0)**	**0.2**

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

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 31,741 cases of HFMD were reported in 2013, a decrease of 14.5% compared to 37,125 cases reported in 2012 (Figure 1.2). There were no local cases with severe complications due to HFMD reported in 2013.

The incidence rate was highest in the 0 - 4 years age group, with an overall male to female ratio of 1.3:1 (Table 1.3). Among the three major ethnic groups, Malays had the highest incidence rate, followed by Chinese and Indians (Table 1.4). No HFMD deaths were reported in 2013.

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) (54.0%), followed by EV 71 (0.3%). Among the *coxsackieviruses*, CA6 (72.0%) was the predominant serotype, followed by CA16 (12.2%).

Figure 1.2
E-weekly distribution of reported hand, foot and mouth cases, 2012 – 2013

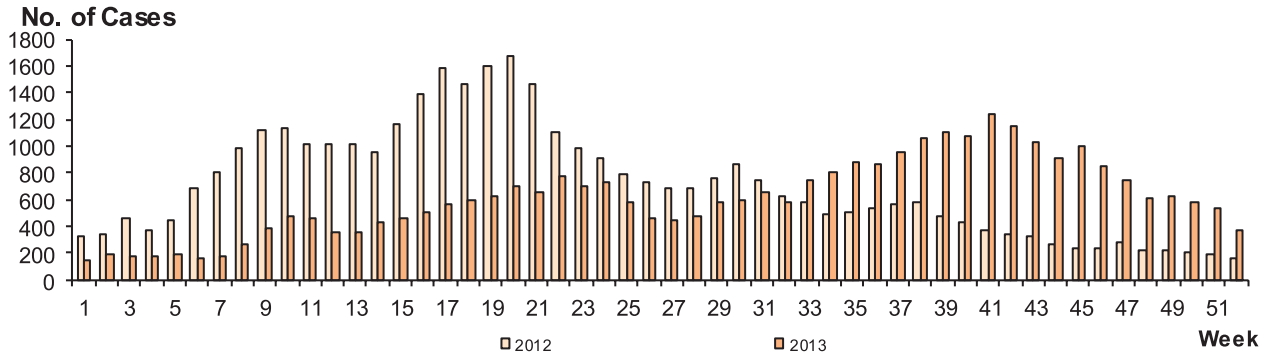


Table 1.3
Age-gender distribution and age-specific incidence rate of reported hand, foot and mouth cases^, 2013

Age (Yrs)	Male	Female	Total (%)	Incidence rate per 100,000 population*
0 - 4	11,273	8,843	20,116 (63.4)	8,979.9
5 – 14	4,189	3,345	7,534 (23.8)	1,570.3
15 – 24	642	532	1,174 (3.7)	150.3
25 – 34	782	781	1,563 (4.9)	128.0
35 – 44	645	446	1,091 (3.4)	114.2
45 – 54	104	63	167 (0.5)	22.7
55+	41	36	77 (0.3)	7.7
Total	**17,676**	**14,046**	**31,722 (100.0)**	**587.5**

^Excluding 19 tourists.
*Rates are based on 2013 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 1.4
Ethnic-gender distribution and ethnic-specific incidence rate of reported hand, foot and mouth cases^, 2013

	Male	Female	Total (%)	Incidence rate per 100,000 population*
Singapore Resident				
Chinese	11,870	9,551	21,421 (67.5)	750.6
Malay	2,235	1,773	4,008 (12.6)	781.5
Indian	500	466	966 (3.1)	274.7
Others	1,102	865	1,967 (6.2)	1,555.0
Foreigner	1,969	1,391	3,360 (10.6)	216.2
Total	**17,676**	**14,046**	**31,722 (100.0)**	**587.5**

^Excluding 19 tourists.
*Rates are based on 2013 estimated mid-year population.
(Source: Singapore Department of Statistics)

Institutional Outbreaks of HMFD

There were 2,418 reported outbreaks of HFMD in year 2013, each involving two or more cases. Table 1.5 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. These included weekly hygiene spot checks on randomly selected childcare centres or kindergartens which have outbreaks of HFMD but had not hit any specific triggers for follow-up action. 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 2013 with public education enhanced.

Table 1.5
Outbreaks of hand, foot and mouth disease in childcare centres/ kindergartens/schools, 2013

Attack rate (%)	Childcare Centres	Kindergartens	Primary Schools	Enrichment Centres	Other Institutions*
< 10	1,041	354	499	22	162
10 - 20	239	7	-	15	2
21 - 30	44	-	-	3	-
31 - 40	13	-	-	3	-
41 - 50	5	-	-	5	-
>50	2	-	-	2	-
Total	**1,344**	**361**	**499**	**50**	**164**

*96 from secondary schools, 46 from international schools, 10 from special schools, nine from polytechnics, two from private schools and one from junior college.

Cluster 1: Childcare centre at Punggol

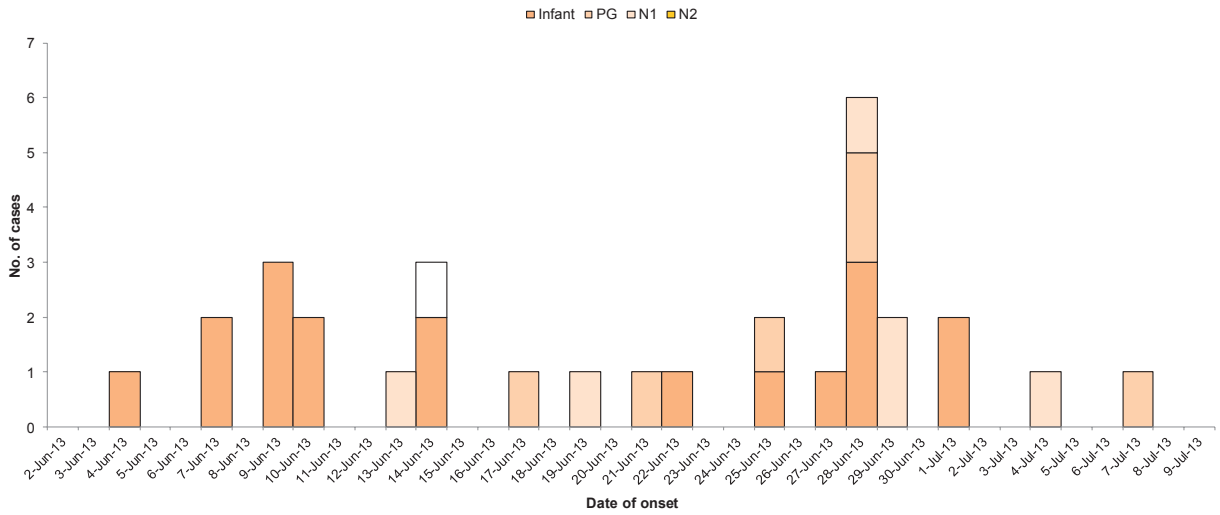
An outbreak of HFMD involving 31 children aged between 0 and 4 years occurred between 4 Jun and 7 Jul 2013 in a childcare centre at Punggol. At the time of the outbreak, the centre had 27 full-time staff and 88 children in four classes; Infant, Playgroup (PG), Nursery 1 (N1) and Nursery 2 (N2).

The class-specific attack rates ranged from 4.5% to 64.3%, with an overall attack rate of 35.2% (Table 1.6). The index case, an infant, presented with symptoms on 4 Jun 2013. The infection subsequently spread amongst other children. The last reported case was on 7 Jul 2013 (Figure 1.2). The centre was mandatorily closed for ten days from 3 to 12 Jul 2013 due to the high number of cases and the prolonged disease transmission period.

Table 1.6
Attack rates of hand, foot and mouth disease (HFMD) in a childcare centre at Punggol, 4 Jun –7 Jul 2013

Class Category	No. Enrolled			No. Affected and Attack Rates					
	Male	Female	Total	Male	%	Female	%	Total	%
Infant	14	14	28	7	50.0	11	78.6	18	64.3
PG	7	13	20	2	28.6	4	30.8	6	30.0
N1	6	12	18	3	50.0	3	25.0	6	33.3
N2	12	10	22	1	8.3	0	0.0	1	4.5
Total	**39**	**49**	**88**	**13**	**33.3**	**18**	**36.7**	**31**	**35.2**

Figure 1.3
Time distribution of 31 cases of hand, foot and mouth disease in a childcare centre at Punggol, 4 Jun –7 Jul 2013



Cluster 2: Kindergarten at Outram

An outbreak of HFMD involving 11 children aged between 3 and 6 years occurred between 6 July and 5 August 2013 in a kindergarten at Outram. At the time of the outbreak, the centre had 17 full-time staff and 232 children in four levels: Nursery 1 (N1), Nursery 2 (N2), Kindergarten 1 (K1) and Kindergarten 2 (K2).

The class-specific attack rates ranged from 2.0% to 7.4%, with an overall attack rate of 4.7% (Table 1.7).

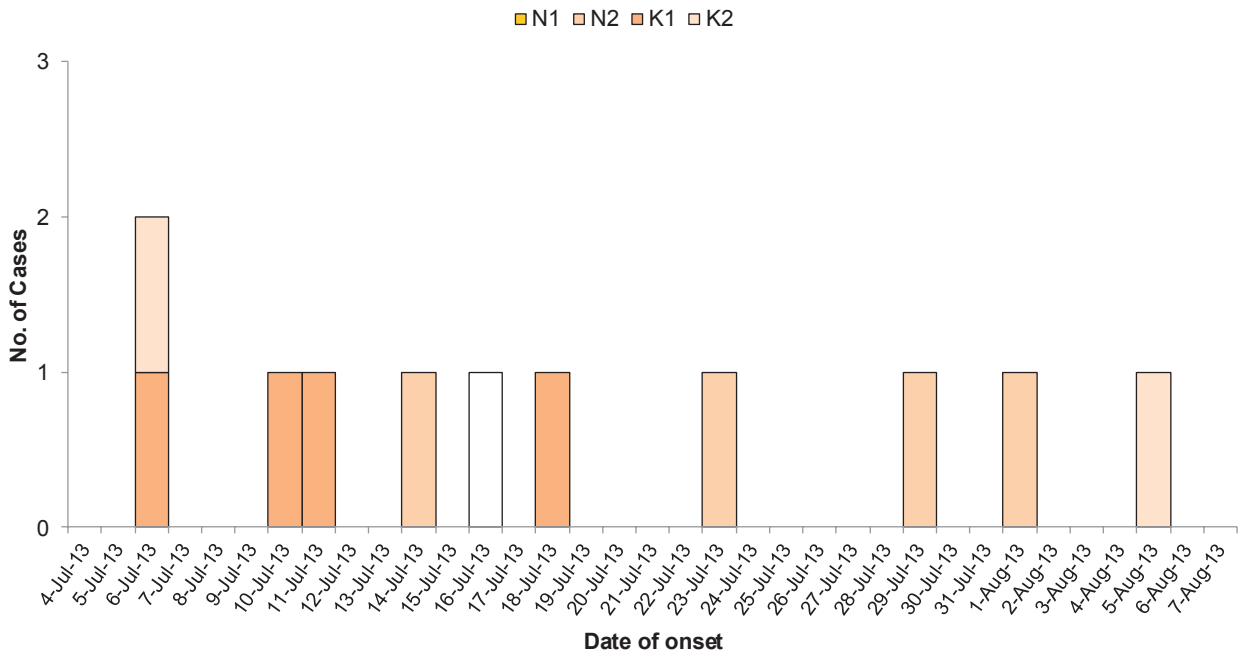
The outbreak started with two children attending the K1 or K2 class who developed symptoms on 6 July 2013. The infection subsequently spread amongst other children. The last reported case was on 5 August 2013 (Figure 1.4).

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

Table 1.7
Attack rates of hand, foot and mouth disease in a kindergarten at Outram, 6 July - 5 August 2013

Class Category	No. Enrolled			No. Affected and Attack Rates					
	Male	Female	Total	Male	%	Female	%	Total	%
N1	26	24	50	0	0.0	1	4.2	1	2.0
N2	31	23	54	3	9.7	1	4.3	4	7.4
K1	34	30	64	2	5.9	2	6.7	4	6.3
K2	41	23	64	1	2.4	1	4.3	2	3.1
Total	**132**	**100**	**232**	**6**	**4.5**	**5**	**5.0**	**11**	**4.7**

Figure 1.4
Time distribution of 11 cases of hand, foot and mouth disease in a kindergarten at Outram, 6 July – 5 August 2013



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.

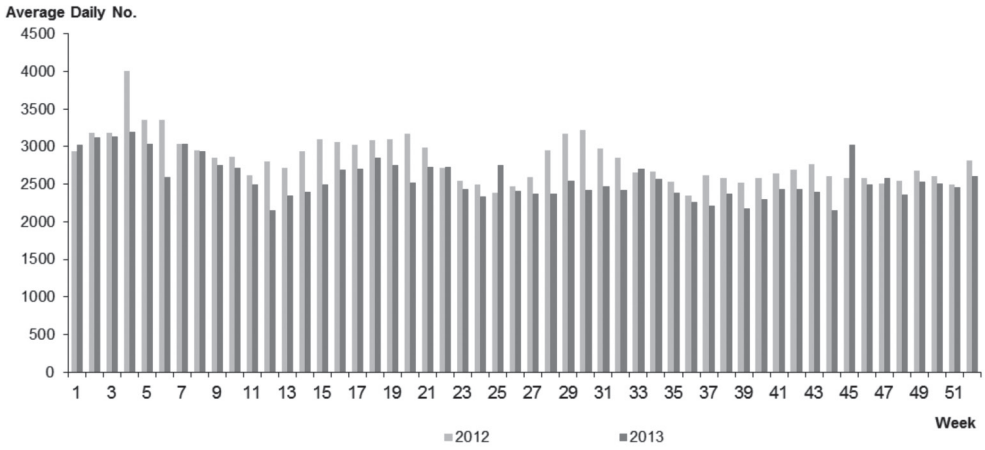
In temperate and cold climates, influenza reaches peak incidence in winter. As the Northern and Southern Hemispheres have winter at different times of the year, there are two flu seasons each year: December-March in the Northern Hemisphere; and June-September in the Southern Hemisphere.

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.

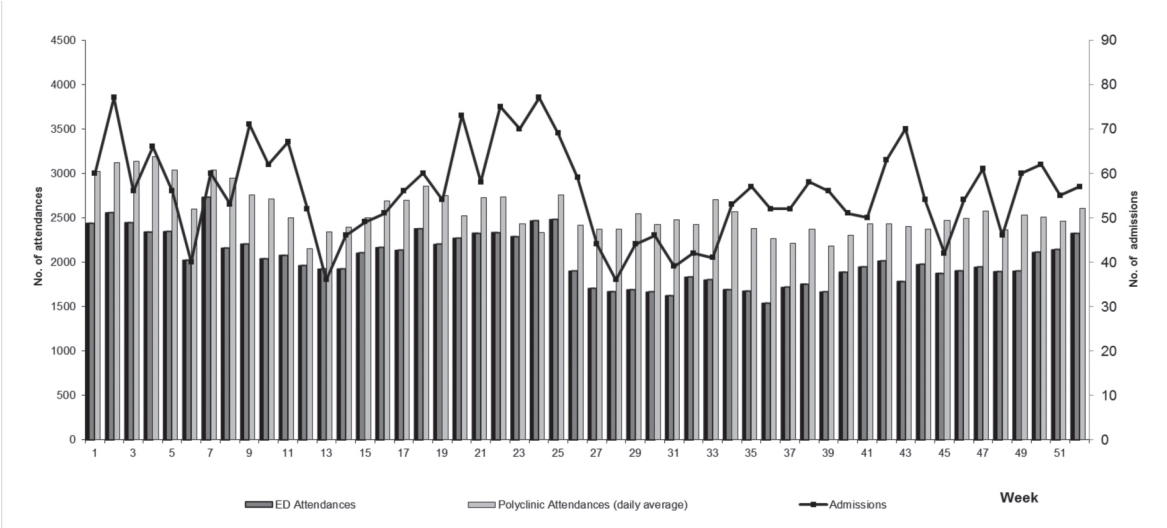
There were a total of 703,527 attendances at polyclinics for ARI in 2013, a decrease of 9.0% compared to 773,139 seen in 2012. No clear seasonal pattern for ARI was observed although higher average daily numbers of ARI attendances were observed from Epidemiological week (E-week) 1 to 7, with the exception of E-week 6. The average daily number of polyclinics attendances for ARI peaked at 3,190 in E-week 4 (Figure 1.5).

Figure 1.5
E-weekly distribution of acute respiratory infection attendance at polyclinics 2012 – 2013



An annual total of 106,086 ARI cases were seen at the emergency departments (ED) of public hospitals in 2013, an increase of 0.1% compared to 105,930 cases reported in 2012. The average weekly ARI attendance at ED was 2,040 with higher attendances observed in E-weeks 7. In addition, ARI admissions peaked at 77 cases in E-week 2 and 24 (Figure 1.6).

Figure 1.6
Weekly polyclinic attendance, emergency department (ED) attendances and admissions for ARI, 2013

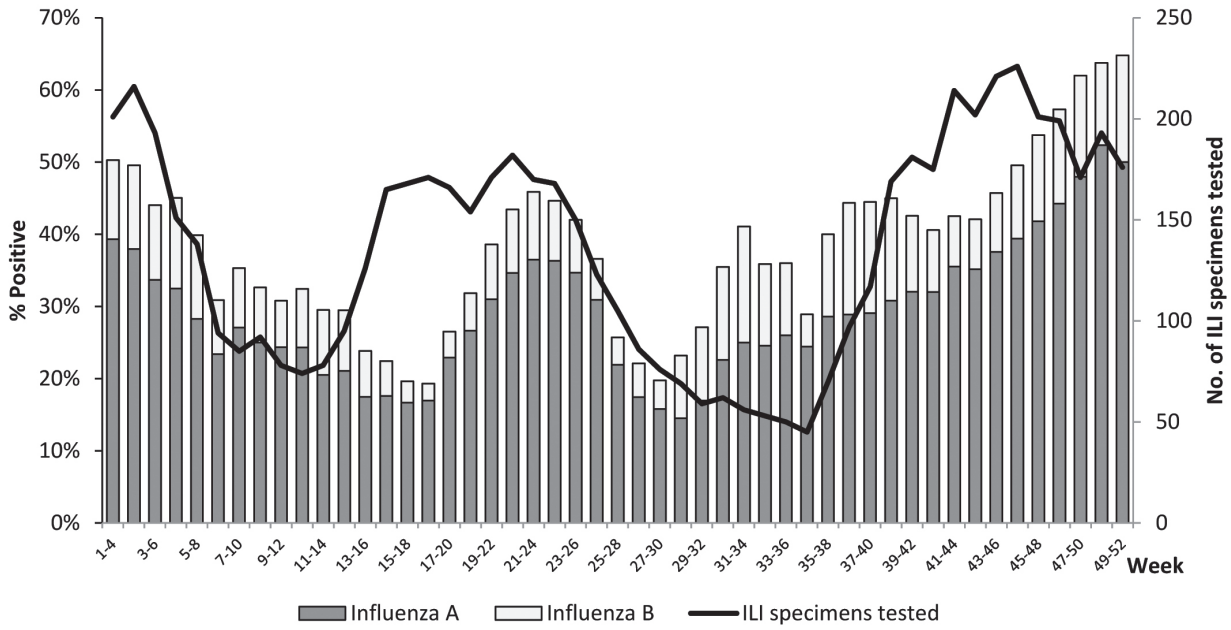


Virological surveillance of influenza viruses was carried out on throat and/or nasopharyngeal specimens obtained from polyclinics, hospitals and sentinel private clinics throughout the year. The typing, subtyping and isolation of influenza viruses was carried out at the National Public Health Laboratory (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

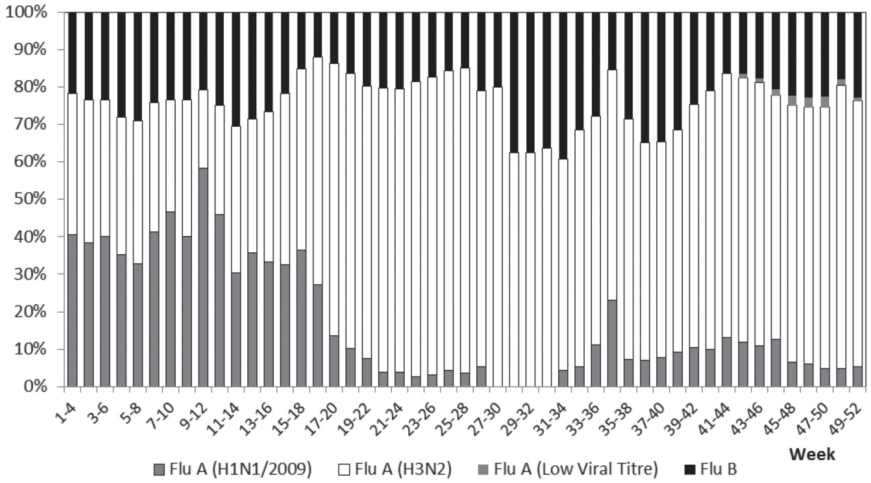
Figure 1.7. Higher levels of influenza activity were observed for the 4-weekly moving average between E-weeks 45-48 and 49-52, with a range of 52.2% to 64.2%. Influenza activity peaked in E-weeks 49-52 with 64.2% of ILI samples testing positive for influenza viruses. 77.0% of the positive samples in E-weeks 22-25 were influenza A viruses. Of these, 71.7% were of the H3N2 subtype. In 2013, 42.2% of all ILI samples tested positive for influenza viruses. Of the positive samples, 77.1% tested positive for influenza A viruses, of which 78.6% were of the influenza A(H3N2) subtype.

Figure 1.7
4-Week Moving Virological Surveillance of Influenza A & B, 2013



Between E-weeks 1-4 and 11-14 in 2013, influenza A viruses (A(H1N1)pdm09 and A(H3N2)) were the predominant subtypes in Singapore, co-circulating with low levels of seasonal influenza B viruses. This is followed by influenza A(H3N2) virus gaining strong predominance in Singapore for the remainder of 2013 (Figure 1.8).

Figure 1.8
4-Week moving influenza typing results, 2013



Based on sequencing and haemagglutination inhibition results, circulating A(H1N1)pdm09 and A(H3N2) viruses of 2013 were antigenically similar to current vaccine viruses, A/California/07/2009 and A/Victoria/361/2011 (cell-grown virus), respectively. Oseltamivir-resistance A(H1N1)pdm09, due to the H275Y mutation, was not detected in 284 samples screened.

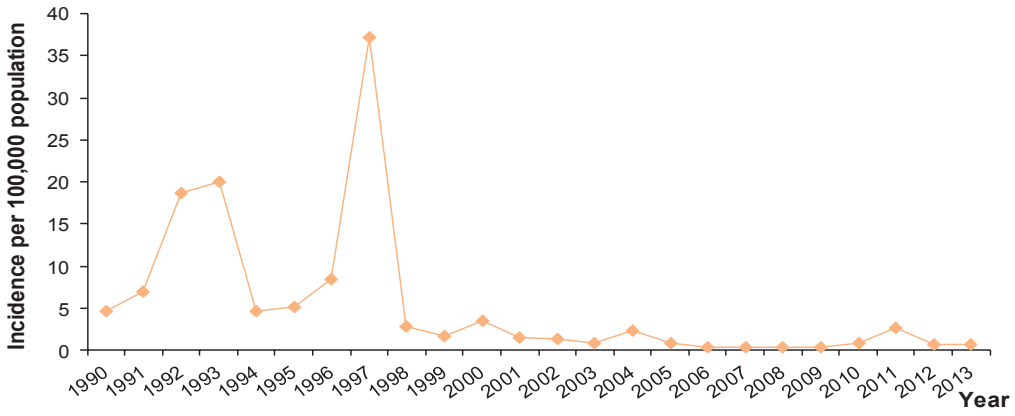
Viruses of both B/Yamagata and B/Victoria lineages co-circulated in Singapore throughout the year. Although majority of Influenza B viruses during November 2012 to March 2013 were of B/Victoria lineage, viruses of B/Yamagata lineage predominated over those of B/Victoria lineage since May 2013 until December 2013. Majority of viruses of B/Yamagata lineage were antigenically similar to B/Massachusetts/2/2012, a vaccine strain recommended for northern hemisphere 2013-14 influenza season, although low reactors had been detected. Those of the B/Victoria lineage were B/Brisbane/60/2008-like viruses.

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 – 2013



A total of 46 laboratory confirmed cases of measles were reported in 2013 compared to 38 cases reported in 2012 (Figure 1.10). The highest incidence rate was observed in children under the age of 1 year (Table 1.8). Among the three major ethnic groups, Malays had the highest incidence rate, followed by Chinese and Indian (Table 1.9). Three 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, 2012 – 2013

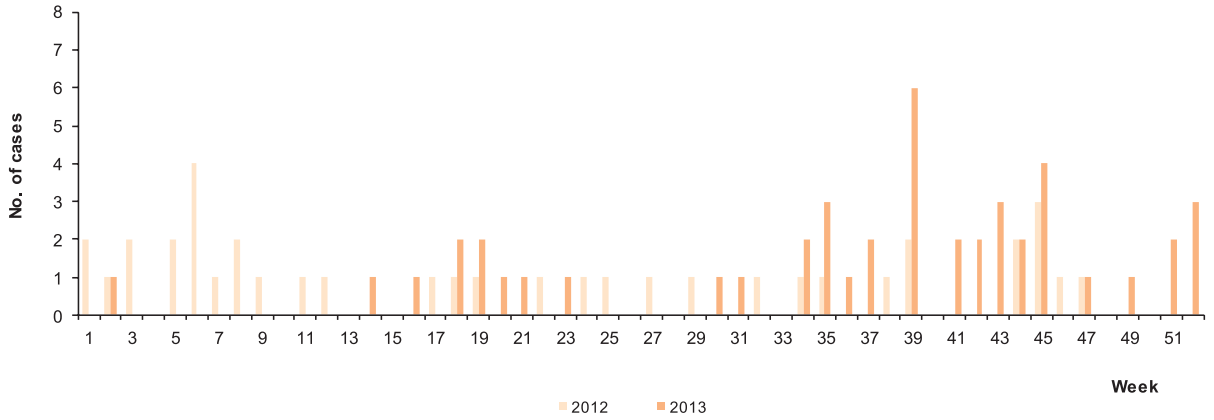


Table 1.8
Age-gender distribution and age-specific incidence rate of reported measles cases^, 2013

Age (Yrs)	Male	Female	Total (%)	Incidence rate per 100,000 population*
< 6 mths	1	2	3 (7.9)	39.8
6 mths – < 1yr	11	2	13 (34.2)	
1 – 4 yrs	8	4	12 (31.6)	6.5
5 – 9 yrs	0	0	0 (0.0)	0.0
10 – 14 yrs	0	1	1 (2.6)	0.4
15 – 24 yrs	1	0	1 (2.6)	0.1
25 – 34 yrs	1	3	4 (10.5)	0.3
35 – 44 yrs	2	2	4 (10.5)	0.4
45 – 54 yrs	0	0	0 (0.0)	0.0
55+	0	0	0 (0.0)	0.0
Total	**24**	**14**	**38 (100.0)**	**0.7**

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

Table 1.9
Ethnic-gender distribution and ethnic-specific incidence rate of reported measles cases^, 2013

	Male	Female	Total (%)	Incidence rate per 100,000 population*
Singapore Resident				
Chinese	13	5	18 (7.4)	0.6
Malay	3	2	5 (13.2)	1.0
Indian	1	1	2 (5.3)	0.6
Others	2	2	4 (10.5)	3.2
Foreigner	5	4	9 (23.7)	0.6
Total	**24**	**14**	**38 (100.0)**	**0.7**

^Excluding eight foreigners seeking medical treatment in Singapore
*Rates are based on 2013 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 2013, there were three cases of meningococcal infection reported compared to zero case in 2012 (Table 1.10). All the cases were laboratory confirmed with positive blood or cerebral spinal fluids culture (Table 1.11).

Table 1.10
Age-gender distribution and age-specific incidence rates of reported meningococcal infection cases, 2013

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

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

Table 1.11
Epidemiological data of three reported meningococcal infection cases, 2013

Case particulars				
Gender	Age	Ethnic group	Causative agent	Status
M	6 months	Chinese	*Neisseria meningitides Grp B*	Recovered
M	41 years	Chinese	*Neisseria meningitides Grp C*	Died
M	58 years	Chinese	*Neisseria meningitides Grp C (non-groupable)*	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 – 2013

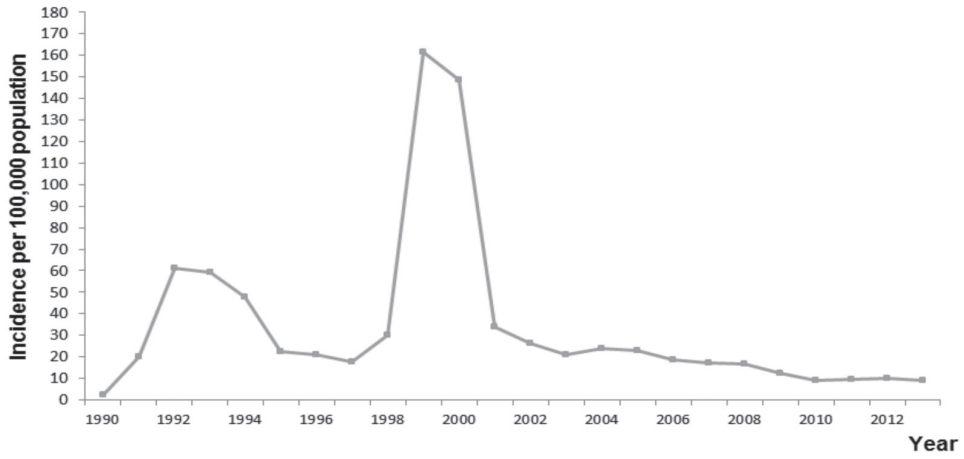
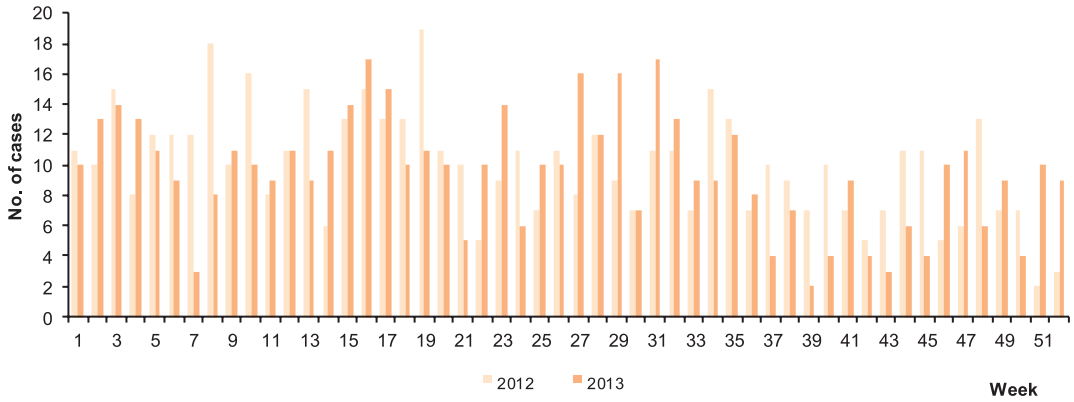


Figure 1.12
E-weekly distribution of reported mumps cases, 2012 – 2013



A total of 495 cases (9.2 per 100,000 population) were reported in 2013 as compared to 521 cases in 2012 (Figure 1.12). The incidence rate was highest in the 5 – 14 years age group (Table 1.12). Among the three major ethnic groups, Malays had the highest incidence rate, followed by Chinese. Foreigners comprised 26.5% of cases (Table 1.13).

Table 1.12
Age-gender distribution and age-specific incidence rate of reported mumps cases, 2013

Age (Yrs)	Male	Female	Total (%)	Incidence rate per 100,000 population*
0 - 4	39	25	65 (12.9)	28.6
5 – 14	95	50	145 (29.3)	30.2
15 – 24	20	27	47 (9.5)	6.0
25 – 34	46	40	86 (17.4)	7.0
35 – 44	53	23	76 (15.4)	8.0
45 – 54	24	18	42 (8.5)	5.7
55+	20	15	35 (7.1)	6.3
Total	**297**	**198**	**495 (100.0)**	**9.2**

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

Table 1.13
Ethnic-gender distribution and ethnic-specific incidence rate of reported mumps cases, 2013

	Male	Female	Total (%)	Incidence rate per 100,000 population*
Singapore Resident				
Chinese	140	120	260 (52.5)	9.1
Malay	45	18	63 (12.7)	12.3
Indian	4	6	10 (2.0)	2.8
Others	21	10	31 (6.3)	24.5
Foreigner	87	44	131 (26.5)	8.4
Total	**297**	**198**	**495 (100.0)**	**9.2**

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

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 17 laboratory confirmed cases of pertussis were reported in 2013 compared to 24 in 2012 (Figure 1.13). Of the cases, 15 were aged below 1 year, and the rest were young adults aged 15-34 years. Among the three major ethnic groups, Malays had the highest incidence rate, followed by Indians (Table 1.10 and 1.11). 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, 2012 – 2013

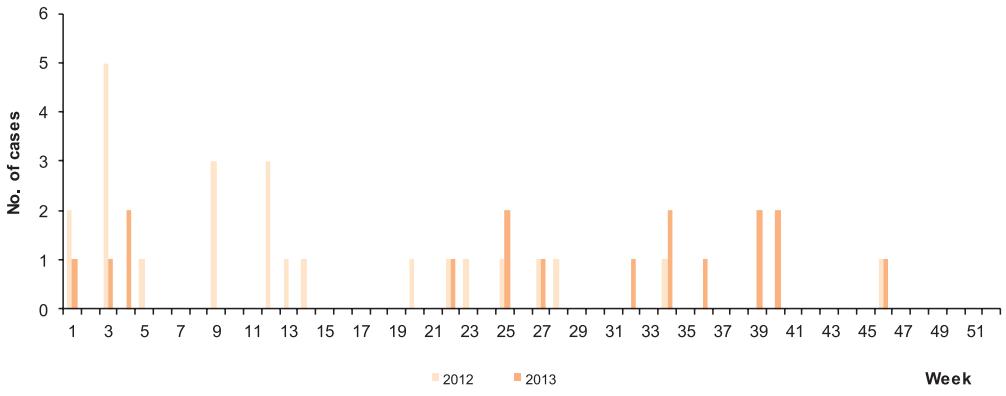


Table 1.14
Age-gender distribution and age-specific incidence rate of reported pertussis cases, 2013

Age (Yrs)	Male	Female	Total (%)	Incidence rate per 100,000 population*
0 – < 1yr	5	10	15 (88.2)	37.3
1 – 4 yrs	0	0	0 (0.0)	0.0
5 – 9 yrs	0	0	0 (0.0)	0.0
10 – 14 yrs	0	0	0 (0.0)	0.0
15 – 24 yrs	1	0	1 (5.9)	0.1
25 – 34 yrs	0	1	1 (5.9)	0.1
35 – 44 yrs	0	0	0 (0.0)	0.0
45 – 54 yrs	0	0	0 (0.0)	0.0
55+	0	0	0 (0.0)	0.0
Total	**16**	**4**	**17 (100.0)**	**0.3**

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

Table 1.15
Ethnic-gender distribution and ethnic-specific incidence rate of reported pertussis cases, 2013

	Male	Female	Total (%)	Incidence rate per 100,000 population*
Singapore Resident				
Chinese	1	7	8 (47.1)	0.3
Malay	4	2	6 (35.3)	1.2
Indian	1	1	2 (11.8)	0.6
Others	0	0	0 (0.0)	0.0
Foreigner	0	1	1 (5.9)	0.1
Total	**6**	**11**	**17 (100.0)**	**0.3**

*Rates are based on 2013 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 166 laboratory confirmed cases of invasive pneumococcal infection were reported in 2013, an increase of 1.8% compared to 163 cases reported in 2012 (Figure 1.14). The incidence rate was highest in those aged 55 years and above. Among the three major ethnic groups, Malays had the highest incidence rate, followed by Indians and Chinese (Tables 1.16 and 1.17). Of these 166 laboratory confirmed IPD cases, the number of serotyped cases was 132, which correspond to 79.5% of laboratory confirmed IPD cases. The predominant pneumococcal type for children cases was 19A and for adult cases was 6B. (Tables 1.18 and 1.19). Six 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, 2012 – 2013

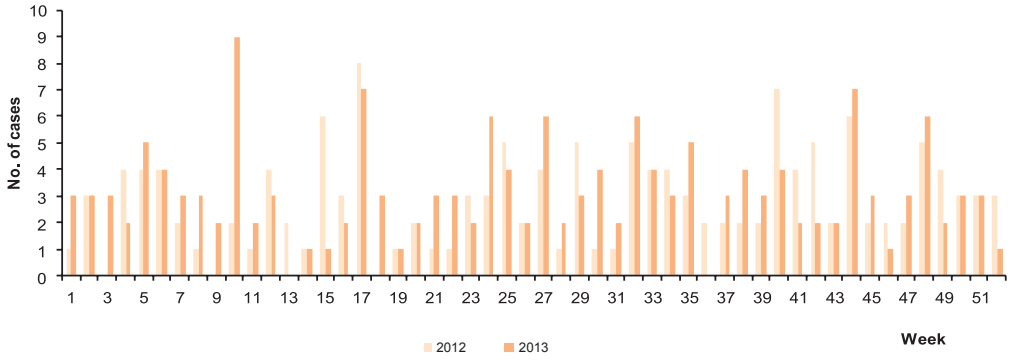


Table 1.16
Age-gender distribution and age-specific incidence rate of reported invasive pneumococcal cases, 2013

Age (Yrs)	Male	Female	Total (%)	Incidence rate per 100,000 population*
0 - 4	6	3	9 (5.4)	4.0
5 – 14	7	2	9 (5.4)	1.9
15 – 24	2	0	2 (1.2)	0.3
25 – 34	11	5	16 (9.6)	1.3
35 – 44	4	7	11 (6.6)	1.2
45 – 54	16	2	18 (10.9)	2.4
55+	73	28	101 (60.9)	18.2
Total	**119**	**47**	**166 (100.0)**	**3.1**

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

Table 1.17
Ethnic-gender distribution and ethnic-specific incidence rate of reported invasive pneumococcal cases, 2013

	Male	Female	Total (%)	Incidence rate per 100,000 population*
Singapore Resident				
Chinese	69	32	101 (60.8)	3.5
Malay	24	7	31 (18.7)	6.0
Indian	10	4	14 (8.4)	4.0
Others	2	1	3 (1.8)	2.4
Foreigner	14	3	17 (10.3)	1.1
Total	**119**	**47**	**166 (100.0)**	**3.1**

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

Table 1.18
Distribution of pneumococcal serotypes among children cases, 2013

Pneumococcal Type/ Group	Number of isolates (n = 18) (%)
Type 14 *§	2 (11.1)
Group 15	1 (5.6)
Group 17	1 (5.6)
Type 19A §	7 (38.9)
Type 23F *§	3 (16.6)
Type 6B *§	3 (16.6)
Type 6C	1 (5.6)

* Serotype included in PCV7, § serotype included in PCV13

Table 1.19
Distribution of pneumococcal serotypes among adult cases, 2013

Pneumococcal Type/ Group	Number of isolates (n = 144) (%)
Type 1 *§	1 (0.9)
Type 3 *§	10 (8.8)
Type 4 *§	9 (7.9)
Type 5 *§	1 (0.9)
Type 8	4 (3.4)
Group 10	1 (0.9)
Group 11	2 (1.8)
Group 12	1 (0.9)
Type 14 *§	9 (7.9)
Group 17	2 (1.8)
Type 20	2 (1.8)
Group 33	2 (1.8)
Type 15A	1 (0.9)
Type 15F	1 (0.9)
Type 18C *§	1 (0.9)
Type 18F	2 (1.8)
Type 19A §	10 (8.8)
Type 19F *§	3 (2.5)
Type 23A	5 (4.4)
Type 23F *§	8 (7.0)
Type 6A §	3 (2.5)
Type 6B *§	12 (10.5)
Type 6C	8 (7.0)
Type 7F §	7 (6.1)
Type 9V *§	2 (1.8)
Non-groupable	7 6.1)

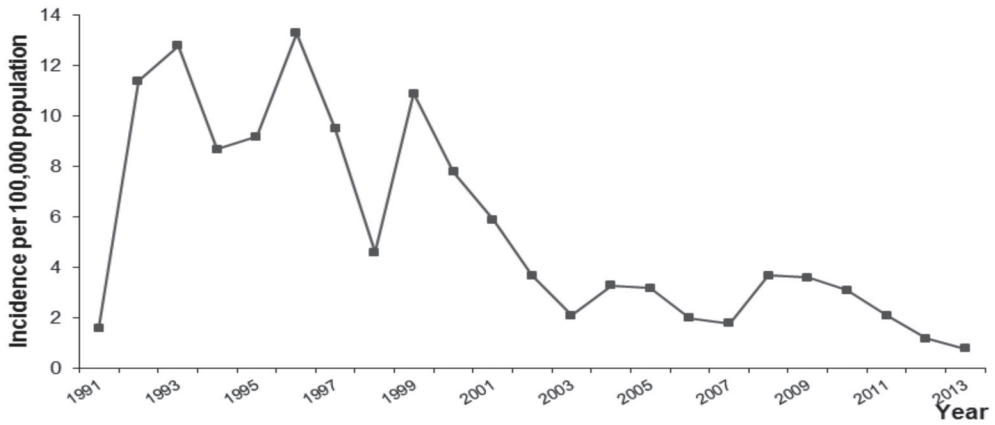
* Serotype included in PCV7, § serotype included in PCV13

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 2013 (0.8 per 100,000 population) (Figure 1.15).

Figure 1.15
Incidence of reported rubella cases, 1991 – 2013



A total of 48 cases of rubella were reported in 2013, a decrease of 25.0% compared to 64 cases reported in 2012 (Figure 1.16). The incidence rate was highest in the 0 - 4 year age group (Table 1.20). Of the 7 female cases, 24.1% (0.5 per 100,000 female population) were in the reproductive age group of 15 – 44 years. Among the three major ethnic groups, Chinese had the highest incidence rate, followed by Indian. Foreigners comprised 59.1% of cases (Table 1.21).

There was one case of congenital rubella reported in an infant who had been brought to Singapore for medical treatment. There were two reported termination of pregnancy resulting from acquired maternal rubella infection.

Figure 1.16
E-weekly distribution of reported rubella cases, 2012 – 2013

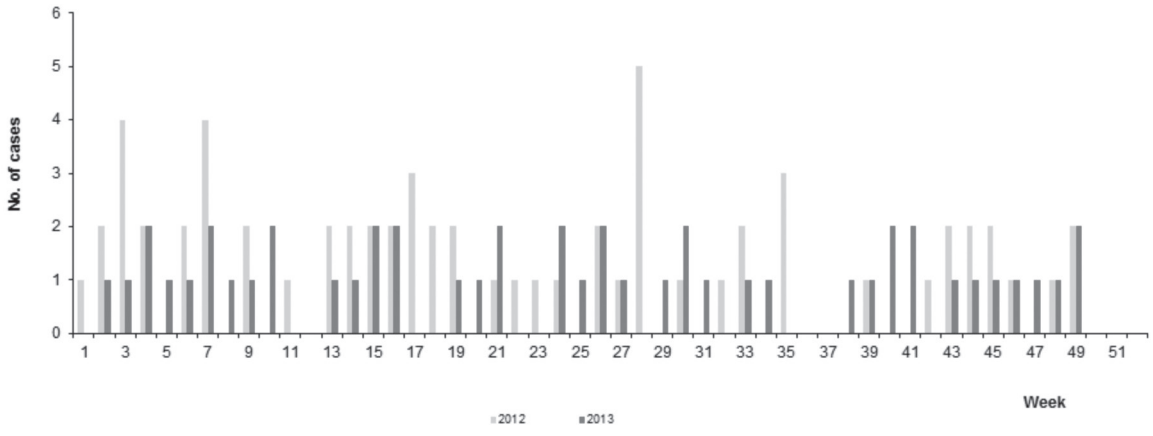


Table 1.20
Age-gender distribution and age-specific incidence rate of reported rubella cases^, 2013

Age (Yrs)	Male	Female	Total (%)	Incidence rate per 100,000 population*
0 - 4	3	2	5 (11.4)	2.2
5 – 14	0	0	0 (0.0)	0.0
15 – 24	2	0	2 (4.5)	0.3
25 – 34	8	3	11 (25.0)	0.9
35 – 44	10	4	14 (31.8)	1.5
45 – 54	4	3	7 (15.9)	1.0
55+	2	3	5 (11.4)	0.5
Total	**29**	**15**	**44 (100.0)**	**0.8**

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

Table 1.21
Ethnic-gender distribution and ethnic-specific incidence rate of reported rubella cases^, 2013

	Male	Female	Total (%)	Incidence rate per 100,000 population*
Singapore Resident				
Chinese	6	8	14 (31.8)	0.5
Malay	1	0	1 (2.3)	0.2
Indian	0	1	1 (2.3)	0.3
Others	1	1	2 (4.5)	1.6
Foreigner	21	5	26 (59.1)	1.7
Total	**29**	**15**	**44 (100.0)**	**0.8**

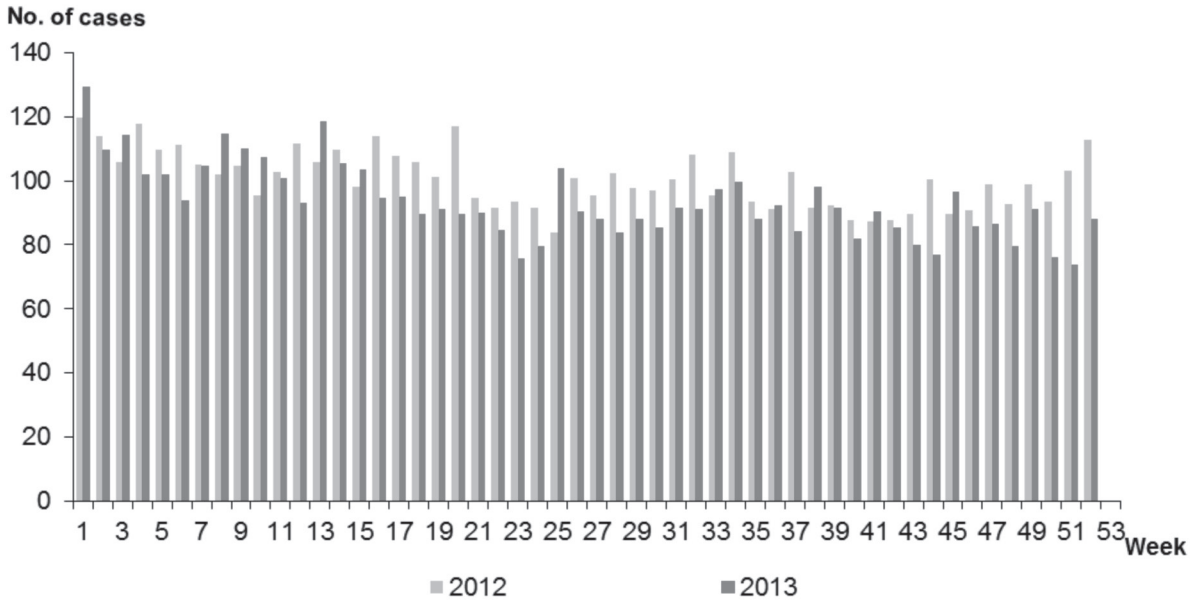
^Excluding four foreigners seeking medical treatment in Singapore
*Rates are based on 2013 estimated mid-year population.
(Source: Singapore Department of Statistics)

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 2013, the polyclinics reported 25,563 attendances for conjunctivitis, an increase of 5.37% compared to 24,261 attendances reported in 2012 (Figure 1.17). There were no institutional outbreaks of viral conjunctivitis reported in 2013.

Figure 1.17
E-weekly distribution of reported conjunctivitis cases, 2012 – 2013



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 2013, a total of 3,416 hospital patients were screened by SIDPIC project coordinators in participating hospitals (Table 1.22). Of these, 194 SIDPIC cases that fulfilled the inclusion criteria[1] were identified. The majority of SIDPIC cases (33%) had illnesses with respiratory syndromes (Table 1.23). Of the 194 cases identified in 2013, 85 were found to have alternate aetiologies. 51 of these 85 cases had causative pathogens found. The top three causative pathogens were respiratory viruses (37.35%), *Escherichia coli (13.73%)* and *Streptococcus pneumoniae (11.76%)*. The remaining cases had clinical presentations that were consistent with the clinical diagnosis, e.g. auto-immune disorders. Despite extensive laboratory testing, the aetiology in 105 (54.12%) cases remained unknown. Table 1.24 lists the pathogens which may be tested for under the SIDPIC programme.

[1] Inclusion 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

Table 1.22
SIDPIC Performance Indicators 2013

Surveillance Indicators	NUH	TTSH	SGH	KKH	TOTAL
No. of cases screened	886	963	1138	429	3416
Death	208	186	207	3	604
Non-death	678	777	931	426	2812
No. of SIDPIC cases	113	31	9	41	194
Aetiology Found	52	10	4	19	85
Unknown Aetiology	59	21	3	22	105
Co-morbidity found	2	0	2	0	4

Table 1.23
Distribution of cases based on syndrome[2] classification, 2013

Syndrome	Aetiology Found*	Unknown Aetiology	Total (%)
Neurological	16	18	34 (17.53)
Cardiac	11	14	25 (12.88)
Respiratory	26	38	64 (32.99)
Gastrointestinal	1	10	11 (5.67)
Multisystem	35	25	60 (30.93)
Total	**89***	**105**	**194 (100.0)**

*Included 4 cases with co-morbidity found.

[2] 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 1.24
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 Sanples** • VEE, CCHF, RVF and other South American arenaviruses, e.g. Junin, Machupo, Guanarito and Sabia viruses, depending on travel history • HFRS • Virus isolation • EM

Table 1.24
SIDPIC Lab Test Panels

	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 4,282 attendances in polyclinics for chickenpox in 2013 compared with 4,766 attendances in 2012. 86.7% of the attendances were by Singaporeans and Permanent Residents. Persons below the age of 20 years represented 64.9% of attendances for chickenpox (Table 1.25).

Table 1.25
Profile of chickenpox (varicella) polyclinic attendances by age group and nationality, 2013

	Singaporeans/PRs			Foreigners			Total
Age (Yrs)	Total	Male	Female	Total	Male	Female	Total (%)
0 - 9	1,731	899	832	36	26	10	1,767 (41.3)
10 - 19	1,050	616	434	30	23	7	1,080 (25.2)
20 - 29	375	209	166	332	274	58	707 (16.5)
30 - 39	204	106	98	140	119	21	344 (8.0)
40 - 49	178	124	54	30	20	10	208 (4.9)
50 - 59	90	53	37	2	2	0	92 (2.1)
60+	83	46	37	1	0	1	84 (2.0)
Total	**3,711**	**2,053**	**1,658**	**571**	**464**	**107**	**4,282 (100.0)**