

# CHILDHOOD IMMUNISATION



Immunisation is one of the best ways to protect infants, children and teenagers from vaccine-preventable diseases. Some of these diseases can be very serious, requiring hospitalisation or even resulting in death. Vaccines contain an agent that resembles a disease-causing microorganism to simulate the body's immune response to recognise the infectious agent, which allows for an effective response during a real encounter.

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Public Education

## HISTORY OF THE IMMUNISATION PROGRAMME

The National Childhood Immunisation Programme (NCIP) in Singapore covers vaccinations against TB (BCG); hepatitis B (HepB); diphtheria, pertussis and tetanus (DTaP); poliomyelitis (IPV/OPV); *Haemophilus influenzae* type b (Hib); measles, mumps and rubella (MMR); pneumococcal disease (PCV); and human papillomavirus (HPV) (Table 7.1). Only vaccinations against diphtheria and measles are compulsory by law. In November 2017, MOH introduced the National Adult Immunisation Schedule (NAIS) to provide guidance on vaccines recommended for adults (i.e. persons aged 18 years and above) and increase awareness on the importance of adult vaccination for personal protection. See Table 7.2 for the list of recommended vaccines in the NAIS.

BCG vaccination began in mid-1950s as part of the NCIP and newborns were vaccinated at birth. Although parental consent is required, acceptance has been high and close to 100% of newborns have been vaccinated in the last decade (Table 7.3). The introduction of BCG vaccination has contributed significantly to the eradication of TB meningitis in young children. BCG was discontinued for Mantoux non-reactors and BCG booster dose was also discontinued in July 2001.

Hepatitis B vaccination for infants born to hepatitis B carrier mothers was incorporated into the NCIP in October 1985. This was extended to all newborns in September 1987. To protect those born before 1987, a four-year catch-up hepatitis B vaccination programme was implemented for students from secondary schools to tertiary institutions as well as full-time national servicemen (NSFs) from 2001 to 2004.

Since January 1990, the monovalent measles vaccine given to one-year-old children was replaced by the trivalent MMR vaccine. From January 1998, the monovalent rubella vaccine given to primary six children (11-12 years of age) was also replaced by the second dose of MMR vaccine. The MMR vaccination schedule was last reviewed by the Expert Committee on Immunisation (ECI) in 2011 and the revised schedule was implemented in December of the same year. With the change in the schedule, both doses of MMR vaccine were brought forward to 12 months and 15-18 months of age, respectively. Health Promotion Board (HPB) continues to provide MMR vaccination as catch-up to primary one students (6-7 years of age) who did not receive the second dose in their pre-school years.

Pneumococcal conjugate vaccine (PCV) was included as the 10<sup>th</sup> vaccine in the NCIP in November 2009 to reduce morbidity and mortality of invasive pneumococcal disease in Singapore. The ECI recommended a schedule of two doses for the primary series and one booster dose (2+1 schedule). The two doses in the primary series are given at ages 3 and 5 months, and a single booster dose at 12 months of age.

Human papillomavirus (HPV) vaccination was first introduced into the NCIP in November 2010 and recommended for females aged 9 to 26 years old to prevent against cervical cancer and other HPV-related diseases. HPV vaccination was then incorporated into the National Adult Immunisation Schedule (NAIS) in November 2017 to emphasise the importance of HPV vaccination for personal protection in the adults. HPV vaccination is recommended as a two-dose series at 0 and 6 months for younger females who initiate the vaccination series at ages 9-13 years; three-dose series is recommended for older females aged 14-26 years at 0, 1-2 and 6 months.

The polio vaccination schedule prior to June 2013 comprised of six doses of oral polio vaccine (OPV). In order to reduce the risk of vaccine-associated paralytic poliomyelitis (VAPP) associated with the use of OPV, the ECI recommended to switch the first four doses from OPV to inactivated polio vaccine (IPV). The new five-dose schedule comprised of four IPV doses, with three primary doses given at 3, 4, and 5 months of age, and the first booster dose at 18 months of age. OPV was retained for the fifth and final dose, recommended at 10-11 years of age (primary five). The OPV dose at 6-7 years of age (primary one) was discontinued at the end of 2013.

Trivalent OPV (tOPV, containing poliovirus types 1, 2 and 3) was replaced with bivalent OPV (bOPV, containing poliovirus types 1 and 3) in 2016 to meet the World Health Organization's (WHO) requirement to switch from tOPV to bOPV. The reason for the switch was to eliminate the risk of outbreaks associated with type 2 component of tOPV, as vaccine-related poliovirus can circulate in unvaccinated individuals and may lead to paralysis, similar to wild poliovirus (WPV). Protection against WPV type 2 (WPV2) is no longer necessary, as WPV2 has been certified as eradicated by the Global Commission for the Certification of Poliomyelitis Eradication (GCC) in 2015. However, to provide some protection against circulating vaccine-derived poliovirus type 2, WHO recommended that all countries introduce at least one dose of IPV in their routine immunisation programmes.

*Haemophilus influenzae* type b (Hib) vaccination was introduced into the NCIP to reduce the risk of invasive disease such as meningitis and sepsis which may lead to long-term disabilities or deaths. The ECI recommended a four-dose schedule, in line with the schedule for DTaP and IPV at 3, 4, and 5 months of age and a single booster dose given at 18 months of age. The ECI also recommended the use of combination vaccines containing DTaP, IPV and Hib for the routine schedule in June 2013.

## IMPLEMENTATION OF THE IMMUNISATION PROGRAMME

The NCIP is carried out by:

- Public and private hospitals with neonatal immunisation services;
- National Healthcare Group Polyclinics (NHGP), National University Polyclinics (NUP) and Singhealth Polyclinics (SHP);
- Paediatric clinics in KK Women's and Children's Hospital (KKH) and National University Hospital (NUH);
- Private general practice (GP) and paediatric clinics;
- Youth Preventive Services Division (YPSD), Health Promotion Board (HPB).

Vaccination of newborns for birth doses is carried out at public and private hospitals with neonatal immunisation services. Vaccination of infants and pre-school children is carried out at polyclinics, paediatric clinics in public hospitals, and private GP and paediatric clinics. The target population is based on notification of births obtained from the Registry of Births and Deaths.

Vaccination of primary school children is carried out by HPB. The target population is based on student population data from the Ministry of Education.

**Table 7.1**  
**Singapore's National Childhood Immunisation Schedule (NCIS), 2017**

Vaccination against	Birth	1 month	3 months	4 months	5 months	6 months	12 months	15 months	18 months	10-11 years*
Tuberculosis	BCG									
Hepatitis B	HepB (D1)	HepB (D2)			HepB (D3) <sup>†</sup>					
Diphtheria, tetanus and pertussis			DTaP (D1)	DTaP (D2)	DTaP (D3)				DTaP (B1)	Tdap (B2)
Poliomyelitis			IPV (D1)	IPV (D2)	IPV (D3)				IPV (B1)	OPV (B2)
<i>Haemophilus influenzae</i> type b			Hib (D1)	Hib (D2)	Hib (D3)				Hib (B1)	
Measles, mumps and rubella							MMR (D1)	MMR (D2) <sup>§</sup>		
Pneumococcal disease			PCV (D1)		PCV (D2)		PCV (B1)			
Human papillomavirus	HPV2 and HPV4 are recommended for <b>females aged 9 to 25 and 9 to 26 years</b> , respectively. Females aged <b>9 to 13 years</b> : <b>two doses</b> are recommended at the interval of <b>0 and 6 months</b> . Females aged <b>14 to 26 years</b> : <b>three doses</b> are recommended at the interval of <b>0, 1-2, 6 months</b> .									

### Footnotes:

BCG	Bacillus Calmette-Guérin vaccine
HepB	Hepatitis B vaccine
DTaP	Paediatric diphtheria and tetanus toxoid and acellular pertussis vaccine
Tdap	Tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccine
IPV	Inactivated polio vaccine
OPV	Oral polio vaccine
Hib	<i>Haemophilus influenzae</i> type b vaccine
MMR	Measles, mumps and rubella vaccine
PCV	Pneumococcal conjugate vaccine
HPV2	Bivalent human papillomavirus vaccine
HPV4	Quadrivalent human papillomavirus vaccine
D1/D2/D3	1 <sup>st</sup> dose, 2 <sup>nd</sup> dose, 3 <sup>rd</sup> dose
B1/B2	1 <sup>st</sup> booster dose, 2 <sup>nd</sup> booster dose
*	Primary 5
†	3 <sup>rd</sup> dose of HepB can be given at the same time as the 3 <sup>rd</sup> dose of DTaP, IPV, and Hib for the convenience of parents.
§	2 <sup>nd</sup> dose of MMR can be given between 15 and 18 months



**Table 7.2**  
**Singapore's National Adult Immunisation Schedule (NAIS), 2017**

Vaccine	18-26 years	27-64 years	≥ 65 years
Influenza	1 dose annually		1 dose annually
Pneumococcal*	1 or 2 doses (depending on indication)		1 dose each
Human papillomavirus (HPV) <sup>†</sup>	3 doses		
Tetanus, diphtheria and pertussis (Tdap)	1 dose per pregnancy		
Measles, mumps and rubella (MMR)	2 doses		
Hepatitis B	3 doses		
Varicella	2 doses		



Recommended for adults who have not been previously vaccinated or lack evidence of past infection/immunity



Recommended for adults with specific medical conditions or indications

**Footnotes:**

\* *Pneumococcal vaccines in the NAIS include 13-valent pneumococcal conjugate vaccine (PCV13) and 23-valent pneumococcal polysaccharide vaccine (PPSV23).*

<sup>†</sup> *Two types of HPV vaccines are in the NAIS – bivalent HPV vaccine (HPV2) and quadrivalent HPV (HPV4) vaccine.*

**Notification of vaccination**

The data utilised in this report was based on:

- (a) Notifications of all vaccinations carried out in infants and pre-school children by healthcare institutions in both the public and private sectors to the National Immunisation Registry (NIR) at HPB; and (Note: notifications of diphtheria and measles immunisation are compulsory.)
- (b) Vaccination records kept by YPSD for vaccinations administered in schools and at the Immunisation Clinic, Student Health Centre, HPB; and
- (c) Notification of vaccinations recommended in the NAIS have been excluded from this report as the NAIS has just been introduced and notification by medical practitioners is voluntary.

All data are updated annually (including figures for the preceding years).

**Vaccination against TB**

In 2017, BCG vaccination was completed in 33,230 infants, giving a coverage of 98.5% (Table 7.3).

**Table 7.3**  
**BCG vaccination of infants, 2008-2017**

Year	Public hospitals (%)	Polyclinics	Private clinics & hospitals (%)	Total	Coverage for children at 2 years of age*
2008	14,004 (42.9)	143 (0.4)	18,513 (56.7)	32,660	99.5
2009	13,987 (42.1)	98 (0.3)	19,134 (57.6)	33,219	99.4
2010	13,926 (42.4)	84 (0.3)	18,815 (57.3)	32,825	99.5
2011	13,301 (41.7)	67 (0.2)	18,494 (58.0)	31,862	99.5
2012	12,277 (41.1)	111 (0.4)	17,460 (58.5)	29,848	99.4
2013	12,690 (41.0)	49 (0.2)	18,236 (58.9)	30,975	99.3
2014	13,108 (39.5)	43 (0.1)	20,031 (60.4)	33,182	98.6
2015	12,569 (40.5)	54 (0.2)	18,444 (59.4)	31,067	99.3
2016	14,127 (41.6)	73 (0.2)	19,729 (58.1)	33,929	99.1
2017	14,264 (42.5)	67 (0.2)	18,899 (56.9)	33,230	98.5

\* Coverage refers to vaccination given to all Singaporean and Singapore-PR children.



## Vaccination against diphtheria, pertussis and tetanus

### Infants and pre-school children

In 2017, the primary course of vaccination was completed in 32,383 children, giving a coverage of 96.0% (Table 7.4). The first booster dose was given to 30,576 children by two years of age (90.7%).

**Table 7.4**  
**Diphtheria, pertussis and tetanus vaccination of infants and pre-school children, 2008-2017**

Year	Coverage for children at 2 years of age*			
	Completed primary course		1 <sup>st</sup> booster dose given	
	No.	Coverage (%)	No.	Coverage (%)
2008	31,994	97.5	29,556	90.0
2009	32,603	97.6	30,998	92.8
2010	32,014	97.0	30,165	91.4
2011	30,976	96.7	29,356	91.7
2012	29,184	97.1	27,581	91.8
2013	30,274	97.1	28,650	91.8
2014	32,438	96.4	30,510	90.7
2015	30,269	96.8	28,400	90.8
2016	33,009	96.4	30,761	89.8
2017	32,383	96.0	30,576	90.7

\* Coverage refers to vaccinations given to all Singaporean and Singapore PR children.

### School children

In 2017, the second booster dose (using Tdap) was given to 37,367 primary five students (93.5%) (Table 7.5).

**Table 7.5**  
**Diphtheria, tetanus and pertussis vaccination (Tdap) of primary five students (10-11 years of age), 2008-2017**

Year	Total no. of primary 5 students	2 <sup>nd</sup> booster dose given*	
		No.	Coverage (%)
2008	49,126	47,146	96.0
2009	45,498	43,240	95.0
2010	45,555	43,238	94.9
2011	49,071	45,848	93.4
2012	43,579	40,079	92.0
2013	42,901	39,217	91.4
2014	40,065	36,392	90.8
2015	39,865	36,748	92.2
2016	40,044	36,670	91.6
2017	40,590	37,945	93.5

\* From 2017, coverage is inclusive of vaccinations given by private practitioners.

## Vaccination against *Haemophilus influenzae* type b

In 2017, the primary course of *Haemophilus influenzae* type b (Hib) vaccination was completed in 32,327 children (95.9%). The overall coverage for children who had completed the full course of Hib vaccination (primary and booster doses) by two years of age was 90.5% (Table 7.6).

**Table 7.6**  
***Haemophilus influenzae* type b vaccination of infants and pre-school children, 2009-2017\***

Year	Coverage for children at 2 years of age <sup>†</sup>			
	Completed primary course		Booster dose given	
	No.	Coverage (%)	No.	Coverage (%)
2009	26,042	78.0	25,137	75.2
2010	25,886	78.4	24,587	74.5
2011	25,817	80.6	24,720	77.2
2012	24,650	82.1	23,579	78.5
2013	26,286	84.3	25,367	81.3
2014	28,796	85.6	28,267	84.0
2015	30,076	96.1	28,028	89.6
2016	32,952	96.2	30,705	89.7
2017	32,327	95.9	30,527	90.5

\* Hib vaccination was introduced into the NCIP in 2013.

† Coverage refers to vaccinations given to all Singaporean and Singapore PR children.

## Vaccination against poliomyelitis

### Infants and pre-school children

In 2017, primary polio vaccination was completed in 32,380 children, giving a coverage of 96% (Table 7.7). The first booster dose was given to 30,534 children by two years of age (90.5%).

### School children

In 2017, the second booster dose was given to 39,445 primary five students (97.2%) (Table 7.8).

**Table 7.7**  
**Polio vaccination of infants, pre-school and school children, 2008-2017**

Year	Coverage for children at 2 years of age*				School Children		
	Completed primary course		1 <sup>st</sup> booster dose given		2 <sup>nd</sup> booster dose given <sup>‡</sup>		
	No.	Coverage (%)	No.	Coverage (%)	School entrants	No.	Coverage (%)
2008	31,980	97.4	29,339	89.4	43,548	40,055	92.0
2009	32,588	97.6	30,815	92.2	43,142	39,752	92.1
2010	31,993	96.9	30,072	91.1	39,465	37,037	93.8
2011	30,963	96.7	29,271	91.4	39,886	36,714	92.1
2012	29,183	97.1	27,521	91.6	39,682	36,782	92.7
2013	30,272	97.0	28,589	91.7	40,385	37,275	92.3
2014	32,426	96.4	30,459	90.5	-	-	-
2015	30,256	96.7	28,251	90.3	-	-	-
2016	32,993	96.3	30,735	89.7	-	-	-
2017	32,380	96.0	30,534	90.5	-	-	-

\* Coverage refers to vaccinations given to all Singaporean and Singapore PR children.

† Coverage by YPSD did not include vaccinations given by private practitioners.

‡ The OPV booster dose for school entrants was discontinued at the end of 2013.

**Table 7.8**  
**Polio vaccination of primary five students (10-11 years of age), 2008-2017**

Year	Total no. of primary 5 students	Booster dose given*	
		No.	Coverage (%)
2008	49,126	47,314	96.3
2009	45,498	43,895	96.5
2010	45,555	44,286	97.2
2011	49,071	47,531	96.9
2012	43,579	42,091	96.6
2013	42,901	41,661	97.1
2014	40,065	38,819	96.9
2015	39,865	38,663	97.0
2016	40,004	38,815	97.0
2017	40,590	39,445	97.2

\* From 2017, coverage is inclusive of vaccinations given by private practitioners.

## Vaccination against measles, mumps and rubella

### Pre-school children

In 2017, the first dose of measles, mumps and rubella vaccination was completed in 32,177 children (95.4%) (Table 7.9). The second dose was given to 30,342 children by two years of age (90%).

**Table 7.9**  
**Measles, mumps and rubella vaccination of pre-school and primary school children, 2008-2017**

Year	Coverage for children at 2 years of age*				Primary school children†	
	Dose 1		Dose 2§		Dose 2§	
	No.	Coverage (%)	No.	Coverage (%)	No.	Coverage (%)
2008	31,315	95.4	-	-	40,342	93.0
2009	32,105	96.1	-	-	39,852	92.4
2010	31,335	94.9	-	-	36,979	93.7
2011	30,557	95.4	-	-	36,548	91.6
2012	28,652	95.4	-	-	36,341	91.6
2013	29,807	95.6	26,622	85.3	-	-
2014	32,063	95.3	29,060	86.4	-	-
2015	29,786	95.2	27,796	88.9	-	-
2016	32,406	94.6	30,126	88.0	-	-
2017	32,177	95.4	30,342	90.0	-	-

\* Coverage refers to vaccinations given to all Singaporean and Singapore PR children.

† Coverage among all students in respective cohorts [11-12 years of age (primary six) up to 2007, 6-7 years of age (primary one) from 2008 to 2011 (reported up to 2012)].

§ Dose 2 was administered in primary schools, at 11-12 years of age (primary six) up to 2007 and 6-7 years of age (primary one) from 2008 to 2011 (reported up to 2012). From December 2011, dose 2 was administered at 15-18 months of age (reported from 2013).



## Vaccination against hepatitis B

In 2017, the three-dose primary course of hepatitis B vaccination was completed in 32,392 children. The overall coverage of children who had completed the primary course of vaccination by two years of age remained high at 96% (Table 7.10).

**Table 7.10**  
**Hepatitis B vaccination of infants, 2008-2017**

Year	Coverage for children at 2 years of age who completed primary course*	
	No.	Coverage (%)
2008	31,910	97.2
2009	32,446	97.1
2010	31,854	96.5
2011	30,837	96.3
2012	29,134	97.0
2013	30,192	96.8
2014	32,371	96.2
2015	30,209	96.6
2016	32,913	96.1
2017	32,392	96.0

\* Coverage refers to vaccinations given to all Singaporean and Singapore PR children.

## Vaccination against pneumococcal disease

In 2017, the two-dose primary course of pneumococcal vaccination was completed in 29,345 children, giving a coverage of 87% (Table 7.11). The booster dose was given to 27,489 children by two years of age (81.5%).

**Table 7.11**  
**Pneumococcal vaccination of infants and pre-school children, 2009-2017**

Year	Coverage for children at 2 years of age*			
	Completed two-dose primary course†		Booster (3 <sup>rd</sup> ) dose given	
	No.	Coverage (%)	No.	Coverage (%)
2009	8,094	24.3	5,409	16.2
2010	9,810	29.7	7,161	21.7
2011	16,317	51.0	12,996	40.6
2012	19,396	64.6	15,687	52.2
2013	22,332	71.6	18,788	60.2
2014	26,303	78.2	23,043	68.5
2015	25,764	82.4	23,555	75.3
2016	28,942	84.5	26,607	77.7
2017	29,345	87.0	27,489	81.5

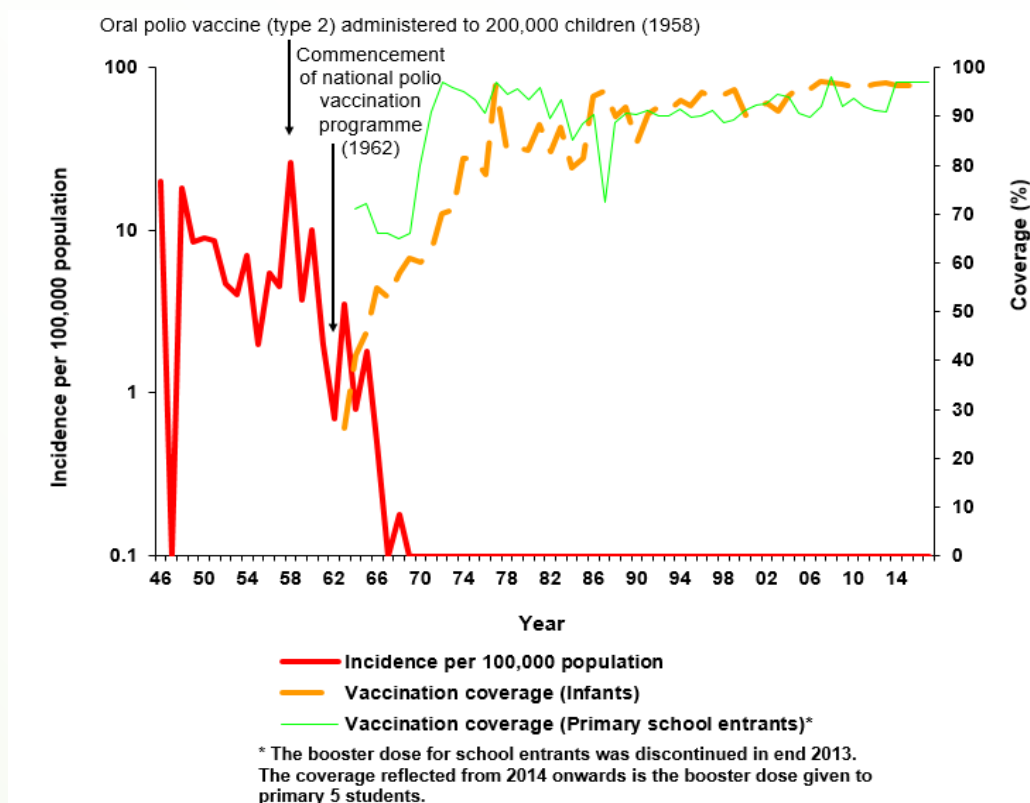
\* Coverage refers to vaccinations given to all Singaporean and Singapore PR children.

† Starting from 2017 publication, the coverage for the completion of primary course is reported at 2 years of age, instead of 1 year as reported in previous publications up to 2016.

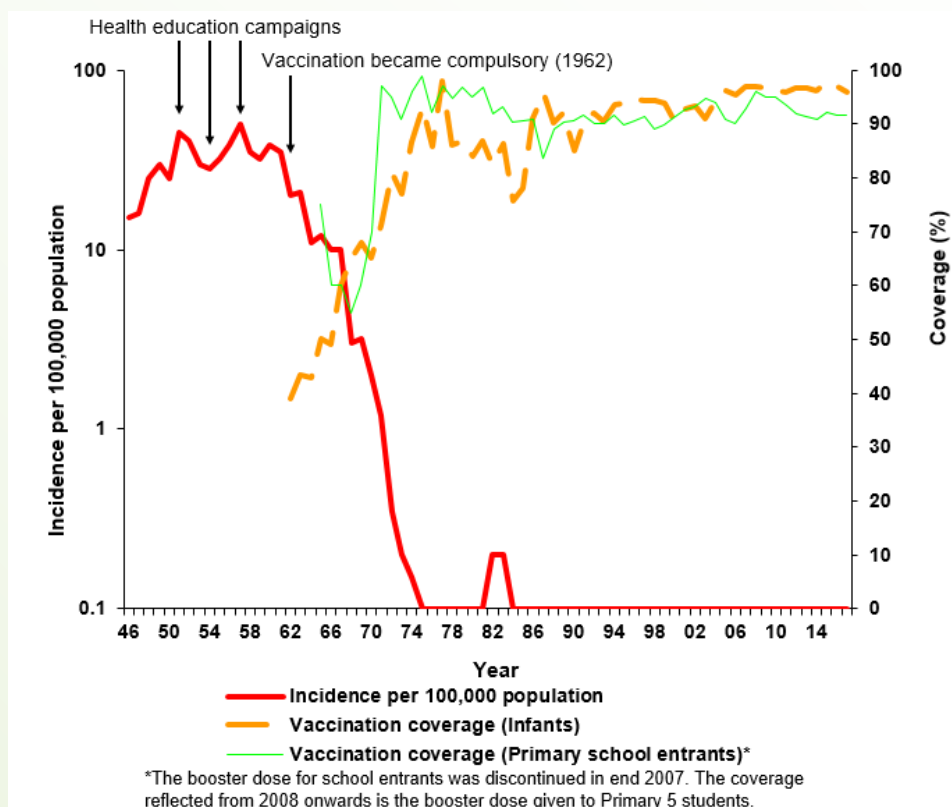
## EFFECTIVENESS OF THE IMMUNISATION PROGRAMME

The effectiveness of childhood immunisation programme against poliomyelitis and diphtheria is shown in Figures 7.1 and 7.2. In 2017, no indigenous case of poliomyelitis or neonatal tetanus were reported. There was one indigenous diphtheria case involving a 23-year-old Bangladeshi national who worked as a construction worker in Singapore (refer to Chapter 2 for more details).

**Figure 7.1**  
Incidence of reported poliomyelitis cases and vaccination coverage in Singapore, 1946-2017

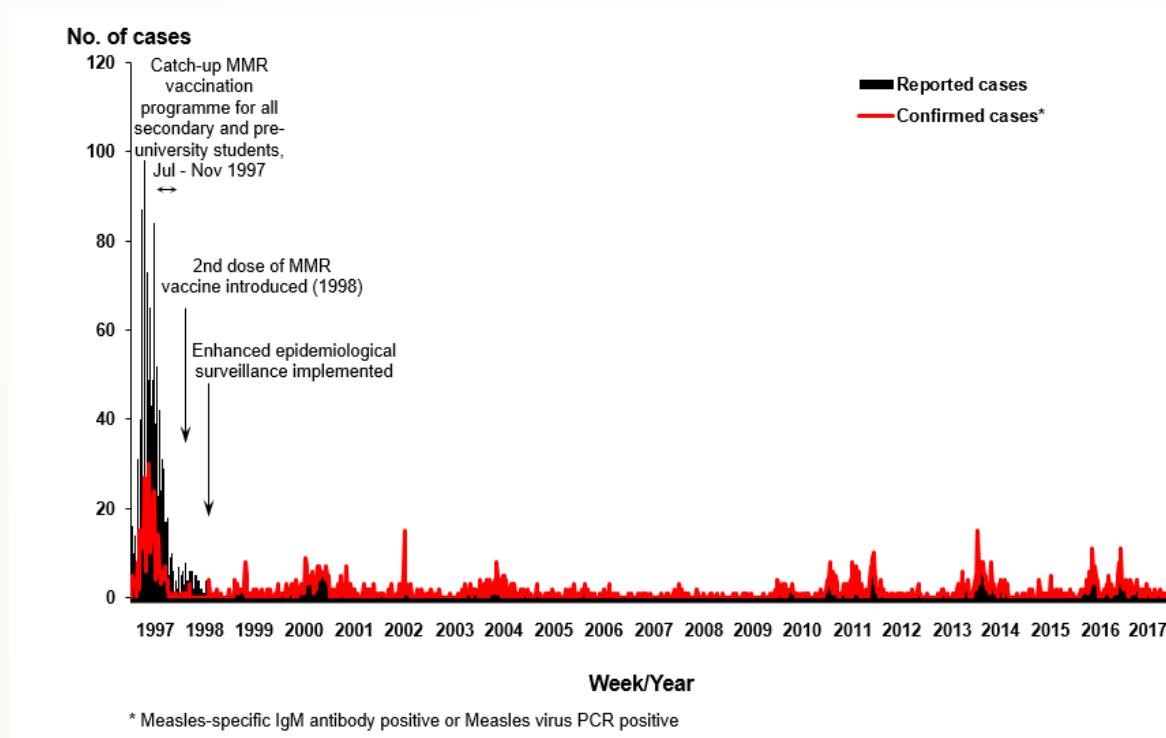


**Figure 7.2**  
Incidence of reported diphtheria cases and vaccination coverage in Singapore, 1946-2017



With the implementation of 'catch-up' measles vaccination programme using the MMR vaccine in 1997, and the introduction of the second dose of MMR vaccine to all primary six school children (11-12 years of age) in 1998 and subsequent changes in the immunisation schedule for the second dose (to primary one school children aged 6-7 years in 2008 and 15-18 months of age in 2011), the incidence of measles decreased from 1,413 cases in 1997 to 136 in 2016 (Figure 7.3).

**Figure 7.3**  
**Impact of catch-up MMR vaccination programme and introduction of second dose of MMR vaccine on the incidence of reported measles cases in Singapore, 1997-2017**



Rubella incidence decreased from 48 cases in 2013 to 15 cases in 2017. There were no reported cases of indigenous congenital rubella and two termination of pregnancy due to rubella infection was carried out in 2017 (Table 7.12).

The resurgence of mumps which began in 1998, continued until the year 2002. The resurgence was due to poor protection conferred by the Rubini strain of the MMR vaccine which was subsequently de-registered in 1999. The incidence of mumps remained largely unchanged in recent years; there were 478 cases in 2014, 473 cases in 2015, 540 cases in 2016 and 524 cases in 2017 (Table 7.13).

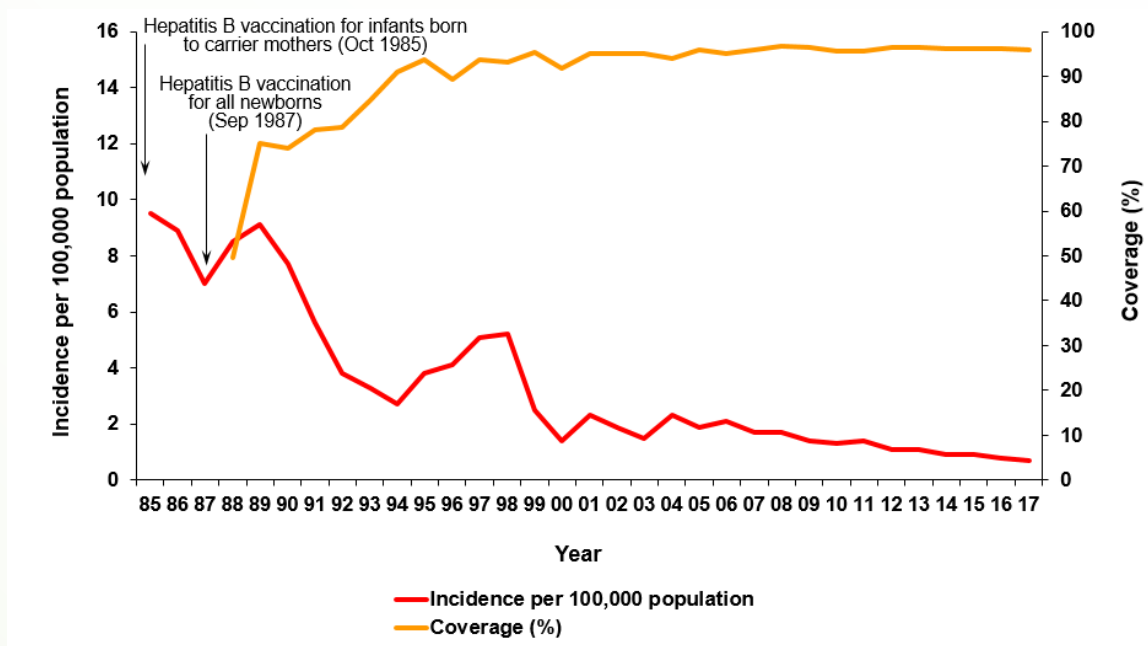
**Table 7.12**  
**No. of therapeutic abortions performed for rubella infection, 2008-2017**

Year	Total no. of abortions	No. of therapeutic abortions performed for rubella infections
2008	12,222	0
2009	12,316	0
2010	12,082	0
2011	11,940	0
2012	10,624	1
2013	9,282	2
2014	8,515	0
2015	7,942	1
2016	7,217	0
2017	6,815	2

The incidence of acute hepatitis B cases for all age groups declined from 243 cases in 1985 to 38 cases in 2017 (Figure 7.4). During the same period, the reported number of cases in children <15 years decreased from 10 to 0 (Table 7.13).



**Figure 7.4**  
**Incidence of reported acute hepatitis B cases and vaccination coverage in Singapore, 1985-2017**



A national sero-prevalence survey was conducted in 2012 to determine the prevalence of antibodies against vaccine preventable diseases and other diseases of public health importance in the adult Singapore resident population aged 18-79 years using residual sera from the National Health Survey 2010. The overall sero-prevalence was 85.0% for rubella in those aged 18-79 years. 11.1% of women aged 18-44 years remained susceptible to rubella infection. About 43.9% of Singapore residents aged 18-79 years possessed immunity against hepatitis B virus (anti-HBs  $\geq 10$  mIU/mL). The overall prevalence of HBsAg in the population was 3.6%.

Table 7.13

**Reported cases of diphtheria, poliomyelitis, measles, mumps, rubella, acute hepatitis B, neonatal tetanus, pertussis, congenital rubella, and childhood tuberculous meningitis in Singapore, 1988-2017**

Year	Diphtheria	Poliomyelitis	Measles	Mumps*	Rubella*	Acute hepatitis B†	Neonatal tetanus‡	Pertussis§	Congenital rubella¹	Childhood tuberculous meningitis#
1988	0	0	192	-	-	2	0	11††	0	0
1989	1(1)	0	146	-	-	4	0	1††	2	0
1990	1	1(1)	143	-	-	1	0	8‡‡	4	0
1991	1(1)	0	216	636	51	3	0	5††	1	0
1992	1	0	606	1,981	370	3	0	14††	4	0
1993	0	0	665	1,962	423	2	0	1††	4	0
1994	0	0	159	1,636	299	2	1	2††	2	0
1995	0	0	185	786	326	0	0	1††	2*	2*
1996	1(1)	0	308	765	487	3	0	4(1)‡‡	2*	2*
1997	0	0	1,413	674	360	0	0	2††	0*	2*
1998	0	0	114	1,183	179	0	0	1**	0*	0
1999	0	0	65††	6,384(28)	432	0	0	1††	2*	1*
2000	0	0	141††	5,981**	312**	0	0	2(1)‡‡	0	1*
2001	0	0	61††	1,399**	242**	0	0	1**	2*	0
2002	0	0	57††	1,090**	152**	0	0	0	1	1
2003	0	0	33††	878**	88**	0	0	1‡‡	0	0
2004	0	0	96††	1,003**	141**	0	0	1‡‡	0	0
2005	0	0	33††	1,004**	139**	0	0	2††	1	0
2006	0	1(1)§§	28††	844**	90**	0	0	3‡‡	0	0
2007	0	0	15††	780**	83**	0	0	38††	0	0
2008	0	0	18††	801**	180**	0	0	33††	2	0
2009	0	0	13††	631**	178**	0	0	13	0	0
2010	0	0	49††	452‡‡	158‡‡	0	0	8††	2§§	2
2011	0	0	148††	501‡‡	110‡‡	0	0	29††	2	0
2012	0	0	38††	521‡‡	64‡‡	0	0	24††	2§§	0
2013	0	0	46††	495‡‡	48‡‡	0	0	17††	1§§	0
2014	0	0	148††	478‡‡	17‡‡	0	0	21††	0	0
2015	0	0	42††	473‡‡	15‡‡	0	0	57††	0	0
2016	0	0	126††	540‡‡	10‡‡	0	0	82††	0	0
2017	1	0	70††	524‡‡	15††	0	0	79††	0	0

( ) Imported cases.

\* Notifiable with effect from April 1990.

† Indigenous cases below 15 years of age.

‡ Source: Central Claims Processing System, Ministry of Health.

§ All pertussis cases reported prior to 1986 were based on clinically diagnosed cases seen at the Communicable Disease Centre.

†† Cases diagnosed in KK Women's and Children's Hospital, Singapore General Hospital and National University Hospital.

# Below 10 years of age.

\*\* Based on clinically diagnosed cases.

‡‡ Based on laboratory confirmed cases.

§§ Foreigner who came for treatment.

## PUBLIC EDUCATION

HPB educates parents on the importance of childhood immunisations through educational materials. Under the Healthier Child, Brighter Future initiative, the “Healthy Start For Your Baby” guide also contains a chapter on childhood immunisations. This educates parents on the importance of immunisation and to have their children vaccinated according to Singapore’s National Childhood Immunisation Schedule. This guidebook is distributed to new mothers before they are discharged from the maternity hospitals. Parents can also visit HealthHub website (at the following URL address: [healthhub.sg/healthy-baby](https://healthhub.sg/healthy-baby)) for more information. NIR also sends a pamphlet “Protect your child from infectious diseases, Get them vaccinated” together with reminder letters to parents whose child have missed vaccinations.