Appendix 1: The history of immunisation in New Zealand

This appendix details the history of immunisation in New Zealand. Section A1.1 is a brief summary of when each vaccine was introduced to the National Immunisation Schedule (the Schedule). This summary includes vaccines which were initially introduced as targeted programmes for a defined population and were then added to the Schedule, and those vaccines which were introduced to the Schedule and then changed to targeted programmes. Section A1.2 shows the historical immunisation schedules for New Zealand. Section A1.3 provides detailed information about the history of the Schedule – this information was previously contained within the disease chapters of earlier editions of the *Handbook*.

A1.1 History of the Schedule – summary tables

Table A1.1: Summary of when each vaccine was introduced to New Zealand

Vaccine	Year the vaccine was introduced, plus comments	
Diphtheria	1926	Became available in New Zealand for selected schools and orphanages.
	1941	Offered routinely to children aged under 7 years. See DTwP for more information.
Tetanus	1940–55	Tetanus toxoid became available as a voluntary vaccination. See DTwP for more information.
Pertussis	1945	Introduced by the Department of Health – given on request.
	1953	Combined pertussis-diphtheria vaccine became available, although usage was restricted. See DTwP for more information.

Continued overleaf

Vaccine	Year the vaccine was introduced, plus comments	
BCG	1948	Initially introduced for nurses, then later extended to all adolescents.
	1963	Adolescent BCG programme was discontinued in the South Island. Phased out in the North Island by 1990.
	1976	Neonatal BCG was introduced initially in high-risk districts, and then variably implemented throughout New Zealand.
	1990	Neonatal BCG was given for high-risk groups only. This continues in 2017.
Salk poliomyelitis (IPV)	1956	Became available; initially 8–9-year-olds were targeted, then 5–10-year-olds, then 11–15-year-olds.
	1960	Offered to all those aged 6 months to 21 years.
	2002	IPV replaced OPV on the Schedule, either as IPV or combined with the DTaP vaccine. See Hib for more information.
	2014	IPV became available for (re-)vaccination following immunosuppression (see also DTaP).
DTwP (diphtheria, tetanus, whole-cell pertussis)	1958	DTwP became available and the first Schedule commences.
	1960	DTwP was supplied to medical practitioners free of charge. See Hib for more information.
Sabin poliomyelitis (OPV)	1961	Initially introduced for children aged under 12 months, administered by the Department of Health.
	1962	In April 95% of all school children received 2 doses; in September it was offered to all adults and adolescents (administered by the Department of Health).
	1967	From April GPs were able to administer OPV along with DTwP at ages 3, 4, 5 and 18 months.
	2002	Sabin OPV was replaced by Salk-derived IPV on the Schedule, as DTaP-IPV at ages 6 weeks, 3 and 5 months, and at 4 years, and as IPV at age 11 years. See Hib for more information.

Continued overleaf

Vaccine	Year the vaccine was introduced, plus comments	
Measles	1969	Introduced for children aged 10 months to 5 years and those aged under 10 years at special risk. Due to adverse reactions, the measles programme was suspended in late 1969 until the Edmonston B strain vaccine became available in February 1970.
	1974	The recommended age changed to age 12 months.
	1981	The recommended age changed to age 12–15 months.
	1990	Measles, mumps and rubella (MMR) vaccine was introduced to the Schedule for all infants at age 12–15 months, replacing monovalent measles vaccine. See MMR for more information.
Rubella	1970	Introduced to the Schedule for all children at age 4 years.
	1979	Low uptake at age 4 years, especially by boys, spurred a change to a vaccination for girls at age 11 years (year 7/form 1).
	1990	MMR was introduced to the Schedule for all infants at age 12–15 months. See MMR for more information.
Hepatitis B	1985	Plasma-derived vaccine was introduced for newborn babies born to HBeAg-positive mothers.
	1987	Extended to newborns of HBsAg-positive mothers and newborns in high-risk districts (eg, Northland, South Auckland, Rotorua, Napier, Gisborne).
	1988	In February 1988 it was introduced to the Schedule for all infants (catch-up programmes for preschoolers are implemented during 1988).
	1989	In December 1989 recombinant HepB replaced the plasma-derived vaccine.
	1990	Funded hepatitis B immunisation was extended to all children aged under 16 years (catch-up school programmes were also implemented).
	1996	The third HepB dose was brought forward from 12–15 months to age 5 months. See Hib for more information.
	2014	HepB vaccine became available to individuals at high risk of hepatitis B or its complications (see also DTaP).
	2015	Funding extended to include other high-risk conditions.

Continued overleaf

Vaccine	Year the vaccine was introduced, plus comments	
Measles, mumps and rubella (MMR)	1990	Introduced to the Schedule for all infants at age 12–15 months.
	1992	A second dose was introduced for 11-year-old (school year 7/form 1) boys and girls.
	2001	The second dose of MMR was changed from age 11 years to age 4 years. A school-based catch-up programme was offered for all 5–10-year-olds.
	2014	The 2-dose schedule at ages 15 months and 4 years continues. MMR vaccine became available for (re-)vaccination following immunosuppression.
Haemophilus influenzae type b (Hib)	1994	Hib vaccine was introduced to the Schedule as DTwPH (replacing DTwP) at ages 6 weeks, 3 months and 5 months, and as monovalent Hib at age 18 months. All children aged under 5 years were offered vaccination against Hib.
	1996	Given as DTwPH at ages 6 weeks, 3 months and 5 months, with a booster at age 15 months.
	2000	Given as Hib-HepB at ages 6 weeks and 3 months, and as DTaP/Hib at age 15 months.
	2006	Given as Hib-HepB at ages 6 weeks and 3 months, and as monovalent Hib at age 15 months. Monovalent Hib became available to older children and adults pre- or post-splenectomy.
	2008	Given as DTaP-IPV-HepB/Hib at ages 6 weeks, 3 months and 5 months, and as monovalent Hib at age 15 months. This schedule continues in 2017.
	2014	Monovalent Hib became available for additional high-risk conditions (see also DTaP).
Td (Tetanus-diphtheria)	1994	Introduced to the Schedule, replacing tetanus toxoid. See Tdap for more information.
	2002	Adult Td boosters are introduced at ages 45 and 65 years. These boosters continue in 2017.
	2014	Td became available for (re-)vaccination following immunosuppression.

Continued overleaf

Vaccine	Year the vaccine was introduced, plus comments	
Influenza	1997	Introduced to the Schedule for adults aged 65 years and older.
	1999	Introduced to the Schedule for those aged under 65 years with certain medical conditions.
	2010	Pregnant women became eligible to receive the funded vaccine.
	2013	Children aged under 5 years who have been hospitalised for respiratory illness or have a history of significant respiratory illness became eligible to receive the funded vaccine.
	2015	Funding extended to include other high-risk conditions.
Acellular pertussis (DTaP)	1999	Introduced for infants/children aged under 7 years who have a previous reaction to the whole-cell pertussis in DTwPH.
	2000	In August, DTaP was introduced for all infants to replace whole cell pertussis vaccine at ages 6 weeks, 3 months and 5 months (see also Hib).
	2014	DTaP-IPV-HepB/Hib and DTaP-IPV became available for (re-)vaccination of children with certain high-risk conditions.
Meningo-coccal B (MeNZB)	2004 to 2008	MeNZB was used as an epidemic control vaccine between 2004 and 2008. It was offered in a three-dose schedule to all aged under 20 years. (See the 2011 edition of the *Handbook* for more information.)
Adult-dose acellular pertussis (Tdap)	2006	Introduced to the Schedule at age 11 years, combined with IPV as Tdap-IPV, but changed to Tdap only in 2008. This schedule continues in 2017.
	2013	Pregnant women from 28 to 38 weeks' gestation became eligible for the funded vaccine (under the outbreak policy).
	2014	Tdap became available for (re-)vaccination of children following immunosuppression.
	2015	Tdap became available for (re-)vaccination of patients with certain high-risk conditions. Pregnant women from 28 to 38 weeks' gestation become eligible for the funded vaccine for every pregnancy.
	2019	Tdap eligibility for pregnant women extended to include when given in second or third trimester every pregnancy. It is recommended to be given from 16 weeks' gestation of every pregnancy, preferably in the second trimester, but at least two weeks before birth.

Continued overleaf

Vaccine	Year the vaccine was introduced, plus comments	
Pneumo-coccal conjugate vaccine (PCV)	2006	Introduced as PCV7 for high-risk children.
	2008	Introduced to the Schedule in June as PCV7 at ages 6 weeks, 3 months, 5 months and 15 months.
	2011	PCV10 replaced PCV7 on the Schedule. PCV13 replaced PCV7 for high-risk children.
	2014	PCV13 replaced PCV10 on the Schedule.
	2015	PCV13 became available for patients of any age with certain high-risk conditions.
	2017	PCV10 replaced PCV13 on the Schedule. PCV13 continues for high-risk individuals.
Human papilloma-virus vaccine (HPV)	2008	HPV4 was introduced to the Schedule at age 12 years, for females only. There was a catch-up programme for females born from 1990.
	2013	HPV4 was made available in hospitals for transplant patients, and for boys and men under 26 years with confirmed HIV infection.
	2014	Lower age limit for vaccine eligibility changed to age 9 years. Routine immunisation continued for girls aged 12 years, plus a targeted programme for high-risk individuals. Individuals aged under 26 years with HIV infection became eligible for HPV4.
	2015	Funding extended to include other high-risk conditions.
	2017	Funding extended to include all males and females aged 26 years and under. HPV9 replaced HPV4.
Rotavirus	2014	RV5 vaccine was introduced to the Schedule at ages 6 weeks, 3 months and 5 months.
	2017	RV1 replaced RV5, at ages 6 weeks and 3 months.
Varicella (VV)	2014	Two doses of VV were introduced for high-risk individuals.
	2017	One dose of VV was introduced onto the Schedule for children at age 15 months (born on or after 1 April 2016), with a catch-up for previously unvaccinated children turning 11 years old on or after 1 July 2017 who have not previously had a varicella infection.
Herpes zoster (HZV)	2018	From 1 April, HZV was introduced onto the Schedule as a single dose for adults aged 65 years, with a catch-up programme for adults aged 66–80 years inclusive (the catch-up programme ceases on 31 March 2020).
	2019	Catch-up programme was extended to 31 December 2020.

A1.2 Previous national immunisation schedules

Table A1.2: July 2017 immunisation schedule

	DTaP-IPV-HepB/Hib	PCV10	RV1	Hib	MMR	VV	DTaP-IPV	Tdap	HPV9	Td	Influ-enza
Pregnancy								●			●
6 weeks	●	●	●								
3 months	●	●	●								
5 months	●	●									
15 months		●		●	●	●					
4 years					●		●				
11 or 12 years								●	●		
45 years										●	
65 years										●	●

Table A1.3: July 2014 immunisation schedule

	DTaP-IPV-HepB/Hib	PCV13	RV5	Hib	MMR	DTaP-IPV	Tdap	HPV4	Td	Influ-enza
6 weeks	●	●	●							
3 months	●	●	●							
5 months	●	●	●							
15 months		●		●	●					
4 years					●	●				
11 years							●			
12 years (girls only)								● × 3 doses		
45 years									●	
65 years									●	●

Table A1.4: July 2011 immunisation schedule

	DTaP-IPV-HepB/Hib	PCV10	Hib	MMR	DTaP-IPV	Tdap	HPV4	Td	Influenza
6 weeks	●	●							
3 months	●	●							
5 months	●	●							
15 months		●	●	●					
4 years				●	●				
11 years						●			
12 years (girls only)							● × 3 doses		
45 years								●	
65 years								●	●

Table A1.5: June 2008 immunisation schedule

	DTaP-IPV-HepB/Hib	PCV7	Hib	MMR	DTaP-IPV	Tdap	HPV4	Td	Influenza
6 weeks	●	●							
3 months	●	●							
5 months	●	●							
15 months		●	●	●					
4 years				●	●				
11 years						●			
12 years (girls only)							● × 3 doses		
45 years								●	
65 years								●	●

Table A1.6: February 2006 immunisation schedule

	DTaP-IPV	Hib-HepB	Hib	Tdap-IPV	MMR	MeNZB	Td	Influenza
6 weeks	●	●				●		
3 months	●	●				●		
5 months	●	●				●		
10 months						●		
15 months			●		●			
4 years	●				●			
11 years				●				
45 years							●	
65 years							●	●

Table A1.7: February 2002 immunisation schedule

	DTaP-IPV	Hib-HepB	Hep B	DTaP/Hib	Polio (IPV)	MMR	Td	Influenza
6 weeks	●	●						
3 months	●	●						
5 months	●		●					
15 months				●		●		
4 years	●					●		
11 years					●[a]		●	
45 years							●[b]	
65 years							●[b]	●

a For those children who had not received a fourth dose of polio vaccine.

b With the introduction of Td at ages 45 and 65 years, 10-yearly boosters were no longer recommended.

Table A1.8: January 2001 immunisation schedule

	DTaP	Hib-HepB	HepB	DTaP/Hib	Polio (OPV)	MMR	Td	Influenza
6 weeks	●	●			●			
3 months	●	●			●			
5 months	●		●		●			
15 months				●		●		
4–5 years					●	●[a]		
11 years					●[b]		●	
65 years								●

a MMR was also offered to children aged 5–10 years in a school catch-up programme.

b For those children who had not received a fourth dose of polio vaccine.

Table A1.9: August 2000 immunisation schedule

	DTaP	Hib-HepB	HepB	DTaP/Hib	Polio (OPV)	MMR	Td	Influenza*
6 weeks	●	●			●			
3 months	●	●			●			
5 months	●		●		●			
15 months				●		●		
11 years					●	●	●	
65 years								●

* Influenza vaccine was introduced for adults aged 65 years and older in 1997 and in 1999 for individuals aged 6 months and older at increased risk of influenza complications.

Table A1.10: 1996 immunisation schedule

	DTwPH	HepB	Polio (OPV)	MMR	Td
6 weeks	●	●	●		
3 months	●	●	●		
5 months	●	●	●		
15 months	●			●	
11 years			●	●	●

Table A1.11: 1994 immunisation schedule

	DTwPH	HepB[a]	Polio (OPV)	MMR[b]	DT	Hib	Td
6 weeks	●	●					
3 months	●	●	●				
5 months	●		●				
12–15 months		●		●			
18 months			●		●	●[c]	
5 years			●				
11 years				●			
15 years							●[d]

a Hepatitis B was introduced for all neonates, with catch-up for children aged under 5 years in 1988. In 1990 free immunisation was extended to all children aged under 16 years.

b MMR was introduced at 12–15 months in 1990 and at age 11 years in 1992.

c A single dose of Hib was also offered to all children aged under 5 years.

d Ten-yearly boosters of Td were recommended.

Table A1.12: 1984 immunisation schedule

	DTwP	Polio (OPV)	Measles	DT	Rubella	Tetanus
6 weeks	●					
3 months	●	●				
5 months	●	●				
12–15 months			●*			
18 months		●		●		
5 years		●				
11 years (girls only)					●	
15 years						●

* Measles vaccine administered at age 12 months was changed to age 12–15 months in 1981.

Table A1.13: 1980 immunisation schedule

	DTwP	Polio (OPV)	Measles	DT	Rubella	Tetanus
3 months	●	●				
5 months	●	●				
12 months			●[a]			
18 months		●		●		
5 years		●				
11 years (girls only)					●[b]	
15 years						●

a Measles vaccine administered at age 10 months was changed to age 12 months in 1974.

b Rubella vaccine was introduced in 1979.

Table A1.14: 1971 immunisation schedule

	DTwP	Polio	Measles	DT	Rubella	Tetanus
3 months	●	●				
5 months	●	●				
10 months			●[a]			
18 months		●		●		
4 years					●[b]	
5 years				●		
15 years						●

a Measles vaccine was introduced in 1969 for children aged 10 months to 5 years who had not had measles, and for those aged under 10 years at special risk.

b Rubella vaccine was introduced in 1970 for children at age 4 years, along with a school-based programme for children aged 5–9 years.

Table A1.15: 1967 immunisation schedule

	DTwP	Polio[a]	DT
3 months	●	●	
4 months	●	●	
5 months	●	●	
18 months		●	●[b]
5 years			●

a Between 1961 and 1967 polio vaccine was administered by the Department of Health.

b The DT booster at age 18 months was introduced in 1964.

Table A1.16: 1961 immunisation schedule

	DTwP	DT
3 months	●	
4 months	●	
5 months	●	
5 years		●

A1.3 History of the Schedule: background information

Note that the following information describes the vaccines which have been, or currently are, on the National Immunisation Schedule. Vaccines which are used for targeted programmes only (ie, hepatitis A, meningococcal) are not discussed. Information about the Meningococcal B Immunisation Programme can be found in earlier editions of the *Handbook*.

A1.3.1 Diphtheria-containing vaccines

During the 1920s the Department of Health, at the instigation of individual school medical officers or medical officers of health, began delivering diphtheria immunisations in a few selected schools and orphanages, but there was no national policy. By 1941 diphtheria immunisation was offered routinely to children aged under 7 years through the School Medical Service and the Plunket Society.

From 1960 the Department of Health programme was delivered by GPs using three doses of non-adsorbed triple vaccine (diphtheria, tetanus and whole-cell pertussis vaccine, DTwP) at ages 3, 4 and 5 months, and a dose of double (diphtheria and tetanus, DT) vaccine before school entry at age 5 years. (For the history of the Schedule's diphtheria toxoid-containing vaccine history after 1960, see section A1.3.13 'Tetanus-containing vaccines').

A1.3.2 Hib-containing vaccines

Haemophilus influenzae type b (Hib) vaccine was added to the Schedule in January 1994, which meant that diphtheria, tetanus, whole-cell pertussis and Hib (DTwPH) vaccine replaced the diphtheria, tetanus and whole-cell pertussis (DTwP) vaccine given at ages 6 weeks, 3 months and 5 months. A monovalent Hib vaccine was given at age 18 months, and a catch-up programme of a single dose of monovalent Hib vaccine was recommended for all children aged under 5 years (ie, those born from January 1989).

From February 1996 the fourth dose was changed to age 15 months and given as DTwPH to reduce the two immunisation events in the second year to one at age 15 months.

DTwPH led to a more than 90 percent reduction in the number of invasive Hib cases in those aged under 5 years but resulted in an increase in the percentage of Hib cases occurring in those aged under 6 months, some of whom had received age-appropriate vaccination. When a supply issue resulted in a change of vaccine in 2000, the opportunity was taken to change to PRP-OMP (polyribosylribitol phosphate outer membrane protein, as Comvax, Hib-HepB combination), which offers substantial protection after a single dose.

This vaccine was used until 2008, when a hexavalent vaccine containing PRP-T Hib component was introduced. This vaccine induces a minimal first-dose response, with some protection after the second dose. It was acknowledged that there was a risk that the change would result in an increase in cases aged under 6 months, but this risk was outweighed by the benefit of reducing the number of injections at each of the first three visits and the reduction in IPD with the introduction of pneumococcal conjugate vaccine (PCV7).

The Hib component of Infanrix-hexa, PRP-T, requires a primary course of three doses with a booster dose at age 15 months, though some protection is induced after the second dose.

In 2006, Hib (as PRP-T) was funded for older children and adults pre- or post-splenectomy. In 2014 funding was extended to include other high-risk conditions.

A1.3.3 Hepatitis B-containing vaccines

HepB was added to the Schedule gradually, starting in September 1985, when it was offered to newborn babies of HBeAg-positive mothers. Three 10 μg doses of plasma-derived vaccine were given, as recommended by the manufacturer. In March 1987 the immunisation programme was extended to newborns of all HBsAg-positive mothers and to children born in certain high-risk districts (Northland, Takapuna, Auckland, South Auckland, Rotorua, Napier and Gisborne).

In 1988 a universal infant vaccination programme was introduced using four low doses (2 μg) of the plasma-derived vaccine H-B-Vax. A catch-up campaign for all preschoolers was undertaken in 1989, and household and sexual contacts of HBsAg-positive women identified during antenatal screening were also entitled to free immunisation.

In December 1988 H-B-Vax was replaced by a recombinant vaccine, Engerix-B. This was given at the manufacturer's recommended dose (10 μg) at 6 weeks, 3 months and 15 months of age. Babies of carrier mothers also received a dose of vaccine, plus HBIG at birth. From February 1990 free hepatitis B immunisation was extended to all children aged under 16 years.

In February 1996 the third dose of HepB was brought forward from 15 to 5 months of age to give early protection to infants and to complete the HepB schedule in the first year of life, in the expectation that this would improve vaccine uptake. This schedule continues in 2017, with 10 μg given at ages 6 weeks, 3 months and 5 months as DTaP-IPV-HepB/Hib (Infanrix-hexa). For infants born to HBsAg-positive mothers, an additional dose of HepB (HBvaxPRO, 5 μg) plus HBIG is given at birth.

In 2014, HepB was made available to individuals at high risk of hepatitis B disease or its complications. In 2015, funding was extended to include other high-risk conditions.

A1.3.4 HPV vaccines

Human papillomavirus (HPV) vaccination, using Gardasil, a quadrivalent vaccine containing virus-like particles (VLPs) derived from HPV types 16, 18, 6 and 11, began in New Zealand on 1 September 2008 and was initially offered only to females born in 1990 and 1991. In 2009 the programme was extended to females born from 1992 onwards. In 2009 and 2010 HPV immunisation was offered through most participating schools to females in school years 8 to 13.

From 2011 the HPV immunisation was only offered in participating schools to females in school year 8. HPV immunisation was also available through family doctors, local health centres and most Family Planning clinics for females who did not attend a participating school or who did not want to have it at school. In 2013 HPV vaccine was funded (for delivery in hospitals only) for other groups at risk of HPV-related disease; from 2014, high-risk groups have also been able to access HPV vaccine in primary care. In 2015, funding was extended to include other high-risk conditions.

Males became eligible for HPV vaccine in 2017, with funding extended to include all males and females aged 26 years and under. The nine-valent HPV vaccine (HPV9, Gardasil 9) replaced HPV4, and a two-dose schedule was recommended for children aged 9–14 years.

A1.3.5 Influenza vaccines

Funded influenza immunisation was introduced in 1997 for people aged 65 years and older. From 1999 the vaccine became funded for younger people (aged from 6 months to 64 years) who were at increased risk of influenza complications. In 2010 funded vaccine was extended to pregnant women, and in 2013 to children aged under 5 years who have been hospitalised for respiratory illness or have a history of significant respiratory illness. In 2015, funding was extended to include other high-risk conditions. In 2018, quadrivalent influenza vaccine replaced the previously used trivalent vaccine.

A1.3.6 Measles-containing vaccines

The measles vaccine was introduced in 1969 for children aged 10 months to 5 years who had not had measles, and for those aged under 10 years at special risk. In 1974 the recommended age for measles vaccine was changed from 10 months to 12 months, and in 1981 it was changed to age 12–15 months. These changes attempted to achieve a balance between too early immunisation, where the vaccine is neutralised by maternally acquired antibody, and the requirement to protect the very young during an epidemic.

MMR (measles, mumps and rubella) vaccine was introduced in 1990 to be given at age 12–15 months in place of the measles vaccine. The dose at age 11 years was introduced in 1992. In 1996 the timing of the first dose of MMR was changed to age 15 months, to be given at the same time as the booster dose of diphtheria, tetanus, whole-cell pertussis and *Haemophilus influenzae* type b (DTwPH) vaccine.

At the start of the 1997 epidemic, the measles immunisation campaign, using MMR, targeted all children aged under 10 years. During the campaign the recommended time for the first dose was brought forward to age 12 months, and in Auckland a dose was recommended for children aged 6–11 months, to be repeated at age 15 months.

The national coverage achieved in the campaign is not known, but estimates for the school-aged population range from 55 percent for Auckland to 85 percent for the Wellington region.

In 2001 the Schedule was changed to give the first dose of MMR at age 15 months and the second dose at 4 years. There was a school catch-up programme for the second MMR dose for children aged 5–10 years. This schedule of two doses of MMR at 15 months and 4 years continues.

Vaccine-derived maternal antibody levels, which protect young infants, are lower and wane earlier than the antibody levels derived from natural infection. It is likely that in due course the age of the first dose of measles-containing vaccine will be changed to age 12 months.

In 2014, MMR vaccine became available for (re-)vaccination following immunosuppression (upon specialist advice).

A1.3.7 Mumps-containing vaccines

Mumps vaccine (as MMR) was introduced to the Schedule in 1990 for children aged 12–15 months. (See section A1.3.6.)

A1.3.8 Pertussis-containing vaccines

A monovalent pertussis vaccine was introduced by the Department of Health in 1945, and from 1953 it was also available combined with the diphtheria and tetanus vaccine. Routine childhood immunisation began in 1960 using the plain (ie, no adjuvant, not adsorbed) diphtheria, tetanus and whole-cell pertussis (DTwP) triple vaccine. Three doses were given, at ages 3, 4 and 5 months.

In 1971 the policy was altered to two doses of adsorbed triple vaccine given at ages 3 and 5 months. It was believed efficacy would be unaltered and the risk of serious reactions would be reduced. Following this schedule change, there was a progressive increase in hospitalisation rates in 1974, 1978 and 1982. Review of the increase in hospitalisations led to the addition, in 1984, of a third dose of DTwP, given at age 6 weeks, to provide earlier protection. From 1994 whole-cell pertussis vaccine was administered as a quadrivalent vaccine with diphtheria and tetanus toxoids and conjugate *Haemophilus influenzae* type b (diphtheria, tetanus, whole cell pertussis and *Haemophilus influenzae* type b – DTwPH).

A fourth dose of pertussis vaccine was added in 1996 (as DTwPH vaccine), given at age 15 months, with the goals of increasing protection in young children and reducing risk of transmission to younger siblings.

Acellular pertussis vaccine was introduced in August 2000, and diphtheria, tetanus and acellular pertussis (DTaP) and DTaP/Hib replaced the whole-cell pertussis vaccines. In February 2002 the vaccine given at ages 6 weeks, 3 months and 5 months was changed to DTaP with inactivated polio vaccine (DTaP-IPV), and a booster dose of DTaP-IPV was introduced and given at age 4 years to protect children during the early school years and to decrease transmission of the infection to younger children.

In 2006 the timing of the booster components of the pertussis schedule was changed to extend vaccine-induced protection into adolescence. Following the three doses of a pertussis-containing vaccine in the first

year of life, booster doses are given at ages 4 and 11 years. Since March 2008 the acellular pertussis vaccine has been delivered as DTaP-IPV-HepB/Hib for the primary immunisation series, scheduled at ages 6 weeks, 3 months and 5 months; as DTaP-IPV at age 4 years; and as Tdap at age 11 years. In comparison with DTaP, Tdap contains smaller doses of tetanus and diphtheria toxoids and the pertussis antigens.

Since January 2013 pregnant women have been eligible for a booster dose of Tdap vaccine. Initially, this was under the outbreak policy and became part of high-risk funded vaccine criteria in July 2015. In 2014, pertussis-containing vaccines (as DTaP-IPV-HepB/Hib, DTaP-IPV and Tdap) became available for (re-)vaccination of children with certain high-risk conditions. This was extended to high-risk adults (as Tdap) in 2015. In 2019 eligibility for pregnant women was extended to include when given any time in their second or third trimester, with a recommendation it be given from 16 weeks' gestation every pregnancy, preferably in the second trimester, but at least two weeks before birth.

A1.3.9 Pneumococcal vaccines

The 7-valent pneumococcal conjugate vaccine (PCV7, Prevenar 7) and the 23-valent pneumococcal polysaccharide vaccine (23PPV, Pneumovax 23) were introduced in 2006 for high-risk individuals. PCV7 became part of the Schedule in June 2008, with four doses recommended at ages 6 weeks, 3 months, 5 months and 15 months.

In July 2011 the 10-valent pneumococcal conjugate vaccine (PCV10, Synflorix) replaced PCV7 and the 13-valent pneumococcal conjugate vaccine (PCV13, Prevenar 13) was introduced for some high-risk children. PCV13 replaced PCV10 on the Schedule in July 2014. In 2015, PCV13 became available for adults with certain high-risk conditions.

In July 2017, PCV10 replaced PCV13 on the usual childhood schedule, with PCV13 and 23PPV continuing for high-risk individuals.

A1.3.10 Poliomyelitis-containing vaccines

Limited supplies of the Salk vaccine (inactivated polio vaccine, IPV) became available in 1956, and immunisation initially targeted 8- and 9-year-old children. As supplies improved, immunisation was extended to include all 5–10-year-olds, then children aged 11–15 years, with

approximately 80 percent coverage. By 1960 immunisation was offered to everyone between 6 months and 21 years of age (with three doses of vaccine).

The Sabin vaccine (oral polio vaccine, OPV) was introduced in August 1961, initially for children up to age 12 months; eight months later it was made available to all school children. On completion of this programme in September 1962 the vaccine was offered to adolescents and adults.

In 1967 OPV was given with diphtheria, tetanus and whole-cell pertussis (DTwP) vaccine at ages 3, 4, 5 and 18 months. The deletion of the DTwP dose at age 4 months in 1971 meant the OPV dose at age 4 months was also removed. An extra dose of polio vaccine was added at age 5 years in 1980, based on serological data, which showed decreased immunity to poliovirus types 1 and 3 in school entrants.

In 1996, as part of the Schedule changes, the third dose of the primary series was moved back to the first year of life, with OPV given at ages 6 weeks, 3 months and 5 months. The booster dose was moved to age 11 years, to be given at the same time as the MMR and adult tetanus and diphtheria (Td) vaccines. In 2001 the Schedule was changed to give the fourth dose of OPV at age 4 years, at the same time as the second dose of MMR. Students aged 5–10 years in 2001 who did not receive the fourth dose of polio vaccine at age 4 years were offered a dose at age 11 years.

IPV replaced OPV in 2002 and was included in three doses of DTaP-IPV in the first year of life, with a booster at age 4 years. Those children who had not received four doses of polio vaccine were offered IPV with Tdap, as Tdap-IPV (Boostrix-IPV) at age 11 years in 2006 and 2007. From 2008 Tdap has been offered at age 11 years, as all children should now have received four doses of polio vaccine by age 4 years.

Combined diphtheria, tetanus, acellular pertussis, hepatitis B, inactivated polio vaccine and *Haemophilus influenzae* type b vaccine (DTaP-IPV-HepB/Hib, Infanrix-hexa) replaced DTaP-IPV (Infanrix-IPV) and Hib-HepB (Comvax) on the Schedule in March 2008.

In 2014, IPV vaccine became available for (re-)vaccination following immunosuppression.

A1.3.11 Rotavirus vaccines

The three-dose pentavalent rotavirus vaccine (RV5, RotaTeq) was introduced to the Schedule in 2014, for infants at ages 6 weeks, 3 months and 5 months. In 2017, the two-dose monovalent vaccine (RV1, Rotarix) replaced RV5 on the Schedule, for infants at ages 6 weeks and 3 months.

A1.3.12 Rubella-containing vaccines

Immunisation with an attenuated rubella vaccine (Cendehill strain) was first offered to all 4-year-old New Zealand children in 1970, the rationale being to prevent transmission of the wild virus in 5–9-year-old children, who were the main sufferers from clinical disease. At the same time, the Department of Health delivered a school-based programme, which succeeded in immunising 95 percent of children aged 5–9 years. The acceptance rate of the preschool entry dose of rubella was only about 40 percent, and many practitioners did not feel it was appropriate to immunise males.

In 1979 the immunisation policy for rubella was altered to offer the vaccine to girls aged 11 years, in school year 7 (form 1). The aim was to immunise females before they attained childbearing age. In 1990 MMR was introduced at age 12–15 months for all children, and rubella vaccine continued to be offered to girls in school year 7. Since 1992 two doses of rubella vaccine – as measles, mumps and rubella (MMR) vaccine – have been offered to all children, the first dose in the second year of life and the second dose at age 11 years. This was changed in 2001, maintaining the first dose of MMR at age 15 months and changing the second to age 4 years. The aim of this strategy was to prevent rubella epidemics, reduce the background incidence of rubella and continue to protect women before childbearing, therefore eventually eliminating CRS.

In 2001 there was an MMR school catch-up programme throughout the country for all children aged 5–10 years who would no longer receive an MMR dose in school year 7.

The rubella schedule continues as two doses of MMR vaccine offered at ages 15 months and 4 years.

In 2014, MMR vaccine became available for (re-)vaccination following immunosuppression (upon specialist advice).

A1.3.13 Tetanus-containing vaccines

The history of tetanus vaccine use prior to the 1960 introduction of diphtheria, tetanus and whole-cell pertussis (DTwP) vaccine is not well recorded, but tetanus vaccine was widely used in World War II and subsequently by the armed forces. In New Zealand, universal infant immunisation with tetanus toxoid began in 1960 with the use of three doses of triple vaccine. Anyone born before 1960 is less likely to have received a primary series, unless they were in the armed forces. Older women appear to be at particular risk.

The first scheduled vaccine used for infants (from 1960) was the DTwP vaccine, with three doses at monthly intervals at ages 3, 4 and 5 months, and a diphtheria and tetanus (DT) booster before school entry (at age 5 years). A DT booster at age 18 months was added in 1964, primarily to enhance protection against tetanus. There was a change to a more immunogenic adsorbed vaccine in 1971, and the dose given at age 4 months was dropped.

In 1980 the dose of DT given at age 5 years was replaced by the monovalent tetanus toxoid given at age 15 years, as part of a move from 10-yearly to 20-yearly boosters for tetanus. It was considered that more frequent boosters were unnecessary and the cause of significant local reactions. There was a return to a three-dose primary series of DTwP (by the addition of a 6-weeks-of-age vaccination) in 1984 because two doses had been inadequate to control pertussis. In 1996 the booster of Td, which had been changed from tetanus toxoid in 1994 (see below), and previously given at age 15 years, was changed to age 11 years.

In 2002 the primary schedule for tetanus, given in combination vaccines at ages 6 weeks, 3 months and 5 months, followed by a dose at 15 months, was changed when a further dose was introduced at age 4 years. The Td given at age 11 years continued.

Since 2006 the childhood schedule for tetanus has been given in combination vaccines at ages 6 weeks, 3 months, 5 months (DTaP-IPV-HepB/Hib), 4 years (DTaP-IPV) and 11 years (Tdap).

Td replaced the tetanus toxoid vaccine in 1994, and 10-yearly boosters were recommended. The change was recommended to maintain the adult population's immunity to diphtheria, in response to outbreaks overseas affecting adults and the absence of natural boosting because the disease had become rare. From 2002 adult boosters have been recommended at ages 45 and 65 years (instead of 10-yearly) as a pragmatic attempt to increase coverage in the adult population.

In 2014, Td became available for (re-)vaccination following immunosuppression.

A1.3.14 BCG vaccines

BCG immunisation was first introduced to New Zealand in 1948 and later extended to all adolescents. BCG immunisation of neonates was introduced in 1976, initially in districts with high rates of active TB.

Universal screening and vaccination of 13-year-olds was discontinued in the South Island in 1963, was phased out in regions of the North Island in the 1980s, and had ceased by 1990. It was stopped because TB had declined to a point at which the advantages of vaccination were outweighed by the disadvantages (cost, side-effects and reduced diagnostic value of the Mantoux test). BCG vaccine is now only available to neonates and children aged under 5 years at high risk of TB.

A1.3.15 Varicella vaccines

In 2014 two doses of varicella vaccine (VV, Varilrix) were introduced for individuals at high risk of varicella infection. In 2017 one dose of VV was introduced to the Schedule at age 15 months (for children who were born on or after 1 April 2016). One catch-up VV dose was introduced for previously unvaccinated children turning 11 years old on or after 1 July 2017 who had not previously had a varicella infection.

A1.3.16 Herpes zoster vaccines

HZV was introduced onto the Schedule on 1 April 2018, as a single dose for adults aged 65 years, with a catch-up programme for adults aged 66–80 years inclusive (the catch-up programme ceases on 31 March 2020).

Bibliography

Dow DA, Mansoor O. 1996. New Zealand immunisation schedule history. *New Zealand Medical Journal* 109: 209–12.

Reid S. 2006. Evolution of the New Zealand Childhood Immunisation Schedule from 1980: A personal view. *New Zealand Medical Journal* 119(1236): 73–83. URL: http://www.nzma.org.nz/__data/assets/pdf_file/0004/17851/Vol-119-No-1236-23-June-2006.pdf

Reid S. 2012. The further and future evolution of the New Zealand Immunisation Schedule. *New Zealand Medical Journal* 125(1354): 86–99. URL: http://www.nzma.org.nz/__data/assets/pdf_file/0017/31625/Vol-125-No-1354.pdf