

Hexavalent vaccines indicators

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Burden & epidemiology

Number of new cases per year (last 3-5 years)

Please consult the relevant WHO Position Papers for details on the burden of disease caused by each pathogen included in the combination vaccine.^{1 2, 3, 4, 5, 6}

For data on the reported cases of diphtheria, tetanus and pertussis, consult the WHO global immunization database for the most updated reported data by country, or WHO Region.⁷

The latest case counts of poliomyelitis cases can be found on the Global Polio Eradication Initiative (GPEI) website.^{8, 9}

Proportion of the population affected by the disease or infected with the antigen

Please consult the relevant WHO Position Papers.^{1 2, 3, 4, 5, 6}

The combination hexavalent vaccine consists of antigens targeting six diseases. These antigens have been used individually or in combination in most countries over long periods of time. The proportion of the population affected by these diseases and the age distribution of cases vary depending on duration of vaccine use, the coverage levels achieved with the primary series and the recommended booster doses.^{1, 2, 3, 4, 5, 6}

Serogroup or serotype distribution (for serogroup- or serotype-specific vaccines)

Please consult the relevant WHO Position Papers.^{1, 2, 3, 4, 5, 6}

There are three types of polioviruses that cause poliomyelitis. These include wild poliovirus types as well as vaccine-derived viruses, which are related to each vaccine virus serotype in live attenuated vaccines regaining neurovirulence due to mutations in its genome.

Wild poliovirus (WPV) types 2 and 3 have been certified globally eradicated; WPV type 1 (WPV1) is the only remaining wild poliovirus serotype in circulation. Consult the GPEI website for the latest information on the reported cases of wild poliovirus type 1 (WPV1) and the different serotypes of circulating vaccine-derived polioviruses (cVDPV) ^{10 11}

For serotypes and/or genotypes of other organisms in the combination, please refer to the relevant position papers.

Number of deaths from the disease per year

Please consult the relevant WHO Position Papers.[1](#), [2](#), [3](#), [4](#), [5](#), [6](#)

The number of reported or estimated deaths are available in the respective position papers or compendium sheets.[1](#), [2](#), [3](#), [4](#), [5](#), [6](#)

Ongoing updates of reported or estimates of deaths are available for Tetanus,[12](#) Diphtheria and Pertussis.[13](#)

Case Fatality ratio (number of deaths / number of new cases, in %)

Please consult the relevant WHO Position Papers.[1](#), [2](#), [3](#), [4](#), [5](#), [6](#)

Case fatality ratios of the diseases targeted by the hexavalent vaccines vary between diseases and across communities. Each individual disease can result in death. The reported case fatality ratios for each individual disease are reported in the respective position papers and are strongly influenced by access to and the quality of medical care.[1](#), [2](#), [3](#), [4](#), [5](#), [6](#)

Outbreak, epidemic or pandemic risk

Diphtheria, though largely controlled in many regions as a result of vaccination, can still cause outbreaks especially in populations with low immunization coverage, high mobility, or poor living conditions.[14](#) Diphtheria outbreaks have been reported in various settings, including refugee camps in Asia, and among asylum seekers in Europe.[15](#), [16](#) Diphtheria outbreaks are also being reported in countries with high infant immunization coverage as a result of waning of immunity.[17](#), [18](#)

Because it is acquired through exposure to *Clostridium tetani* spores in the environment and is not transmitted from person to person, it does not generally cause outbreaks, although increased numbers of cases may occur following circumstances associated with contaminated wounds and disrupted health services.[19](#)

Pertussis has a well-documented history of causing outbreaks, even in populations with high vaccination coverage. Recent trends show that pertussis continues to have significant outbreak

potential worldwide, affecting both children and adults, and posing particular risks to infants.^{20, 21} Countries using acellular pertussis (aP) vaccines have generally experienced larger pertussis resurgences than countries that continue to use whole-cell pertussis (wP) vaccines, but vaccine type is only one of several important factors. This is because aP vaccines are less effective in preventing asymptomatic infection and transmission of infection and protective immunity following aP vaccines wanes faster than following wP vaccines.²²

Hepatitis B has significant potential for outbreaks, especially in settings with poor infection control or low vaccination coverage. Outbreaks of hepatitis B have been documented in both healthcare and community settings, and the virus remains a persistent public health threat in many regions.^{23, 24}

Hib has been associated with small outbreaks or clusters of Hib in day-care centres prior to widespread vaccination, along with reports of nosocomial transmission in hospitals. Large household size and crowding have also been identified as risk factors for invasive Hib disease in children.^{25, 26, 27}

Poliovirus has the potential to cause outbreaks and localized epidemics, with the risk remaining high in areas with low vaccination coverage, fragile health systems, or gaps in immunization campaigns, particularly in regions experiencing conflict or displacement.^{6, 28} Wild poliovirus (WPV) is endemic to Afghanistan and Pakistan, while vaccine-derived poliovirus (cVDPV) outbreaks have been reported in other countries.^{6, 29} Following the global withdrawal of type 2-containing OPV from routine immunization in 2016, gaps in population immunity to poliovirus type 2 have contributed to conditions that allow vaccine-derived type 2 polioviruses to emerge and circulate.^{6, 28} Although the global pandemic potential is low due to widespread immunity and effective vaccines, gaps in immunization and surveillance have led to the detection of poliovirus in environmental samples in previously polio-free countries.^{29, 28, 30, 31}

Contribution of the vaccine to achievement of the national, regional or global disease goals

There are no established global elimination goals for **Diphtheria** or **Pertussis** (some countries have defined control goals for Diphtheria).

The Maternal and Neonatal **Tetanus** Elimination (MNTE) initiative, launched by the World Health

Organization (WHO) in 1989, initially aimed to eliminate neonatal tetanus by 1995. As of December 2025, 51 of the 59 priority countries have achieved MNTE status, significantly reducing neonatal tetanus cases by 89% and deaths by 84% since 2000. Vaccination is the cornerstone of the strategy. Immunizing women of reproductive age with tetanus toxoid-containing vaccines (TTCVs) has been the primary driver of this reduction.[32](#), [33](#), [34](#)

WHO has set a target to achieve **hepatitis B** elimination by 2030, aiming for a 90% reduction in new infections and a 65% reduction in deaths. Vaccination is the cornerstone in the global effort to eliminate Hepatitis B. Widespread and timely hepatitis B vaccination, especially starting at birth, dramatically reduces new infections, chronic disease, and deaths from liver complications. The prevalence of hepatitis B surface antigen (HBsAg) in children under five years dropped from 4.7% before vaccination to 1.3% by 2015, thanks to universal vaccination.[35](#), [36](#), [37](#) As of December 2025, 118 of 194 WHO Member States had introduced universal hepatitis B birth-dose vaccination, and 25 countries provided targeted birth-dose vaccination for infants born to HBV-positive mothers.[38](#)

Although WHO has not set a formal global elimination target for invasive **Hib** disease, very low incidence is biologically and programmatically achievable where high and sustained Hib conjugate vaccine coverage is maintained. After the introduction of Hib conjugate vaccines, countries like the US, UK, and Canada documented a reduction in Hib disease incidence by over 95%, with near-elimination of invasive Hib disease in children under five years old in some high-coverage settings. More than 90% of countries have included Hib vaccines in their national immunization programs, resulting in substantial global decreases in Hib disease, where high and sustained Hib vaccine coverage is maintained.[39](#), [40](#), [41](#)

Polio vaccination has reduced reported poliomyelitis cases by over 99.9% globally since the launch of the Global Polio Eradication Initiative in 1988. Coordinated immunization campaigns have led to the certification of polio-free status in the Americas (1994), the Western Pacific (2000), Europe (2002), South-East Asia Region (2014), and Africa (2020). Globally, the vaccines (Polio mono and multivalent and IPV-containing combination vaccines) have been central to progress towards wild polio eradication, with endemic wild poliovirus transmission remaining confined to Afghanistan and Pakistan. While the number of cases of WPV has declined and is mainly restricted to two endemic countries, there has been an increase in cases caused by cVDPV. An independent evaluation concluded that the overriding failure of the tOPV to-bOPV

switch was the inability to close out outbreaks with timely, high-quality responses of an adequate scale.⁴²

Achieving high coverage with routine poliovirus vaccine coverage and a timely and effective vaccine response to a surge in cases plays a critical role in controlling outbreaks of wild poliovirus and cVDPVs.^{43, 44, 45, 46, 47}

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Benefits of the intervention

Serogroup or serotype coverage by vaccines considered (for serogroup- or serotype-specific vaccines)

Serogrouping is not relevant to the efficacy or effectiveness of diphtheria, tetanus, pertussis, or hepatitis B vaccines.

There are six serotypes of *Haemophilus influenzae* (types a to f) of which type b was the most common cause of severe disease in children. Disease due to other serotypes and non-typeable *Haemophilus influenzae* can cause disease, though they are not a common cause of severe diseases in children. Hexavalent vaccines include only the Hib component and do not protect against disease caused by other *H. influenzae* serotypes or non-typeable strains.^{48, 5}

Poliovirus has three serotypes: types 1, 2, and 3. Immunity to one serotype does not confer protection against the others, IPV-containing hexavalent vaccines include antigens against all three poliovirus serotypes.^{6, 49}

Efficacy and effectiveness estimates (e.g. against infection, disease, hospitalization, death), including in different populations

Clinical studies show that licensed hexa-aP vaccines demonstrate robust immune responses against all six targeted diseases^{50, 51, 52, 53, 54, 3, 55, 56, 57, 5, 58, 59, 60} :

The hexa-wP vaccine was licensed based on demonstration of non-inferiority in the antibody responses to the existing pentavalent (containing aP) and inactivated poliovirus vaccines (IPV).⁵⁴ Empirical data on the efficacy of this combination vaccine against each of the targeted diseases is limited.

Evidence suggests that whole-cell pertussis (wP) vaccines have a stronger effect on transmission than aP containing vaccines. This may be relevant in terms of the number of booster doses required.³

Seroprotective levels of antibodies to all three poliovirus serotypes are induced following three doses of both hexa-aP ⁵⁵ and hexa-wP ⁵⁴ when administered in a 6, 10, and 14 weeks schedule.

IPV induces limited intestinal mucosal immunity in previously unvaccinated individuals. However, a dose of IPV can enhance mucosal protection in individuals previously exposed to polioviruses or who have received OPV.⁵⁷

Duration of protection and waning of immunity in general and risk groups

Duration of protection varies by vaccine antigen, vaccination schedule and use of booster doses. Long-term persistence data are available for the individual vaccine components and for some hexavalent vaccine schedules, although the extent of evidence differs by antigen and vaccine formulation.^{1, 2, 3, 4, 5, 6, 61, 22, 62, 63, 64, 65, 66, 67}

Diphtheria - Data on the duration of seroprotection from two large representative population studies from the Netherlands, using a complete 3-dose primary series plus 3-dose booster series prior to adolescence, indicate that this schedule results in very high seroprevalence above the threshold for basic protection (≥ 0.01 IU/mL) up to 39 years of age and potentially longer.^{1, 62, 65}

Tetanus - Data from serological studies suggest that a primary series of three tetanus toxoid containing vaccine doses in infancy plus a booster during the second year of life will provide three to five years of protection. A further booster dose (e.g. in early childhood) provides protection into adolescence, and another booster during adolescence induces immunity that lasts through much of adulthood, including protection for women of reproductive age.^{2, 22, 65}

Pertussis - Whereas little is known about the duration of protection following pertussis vaccination in LMICs, several studies in HICs that use hexa-aP vaccines show that protection wanes after 4-12 years.^{3, 61} Data for hexa-wP is limited, evidence from animal models and mathematical modelling suggests that aP containing vaccines may have shorter duration of protection compared to wP containing vaccines.²²

Hepatitis B - In a study in Alaska, USA, a 3-dose vaccination schedule prevented all clinically apparent and chronic HepB infection for at least 30 years.^{4, 64, 65, 67}

Hib - Although there is some evidence of a decrease over time in the proportion of Hib vaccine recipients with antibody levels higher than the set thresholds, there is only limited evidence to suggest that this decline is associated with an increase in clinical disease.^{5, 66}

Poliomyelitis - Vaccination induces long-term protection against paralytic disease. For IPV, evidence from high-income countries indicates that circulating antibodies persist for decades and possibly for life, including detection 18 years after infant vaccination plus a childhood booster.⁶

Introduction of a hexavalent vaccine in the infant primary series should be considered within the broader national schedule, including booster-dose recommendations for the relevant antigens.

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Safety of the intervention

Type, including severity, consequences and frequency of short- and long-term adverse events following vaccination

Combination vaccines are widely used in routine immunization programmes and allow multiple vaccine antigens to be administered with fewer injections. Their safety profiles reflect the component antigens and the specific vaccine formulation.

Diphtheria, tetanus and pertussis combination vaccines (DTP) have been in use since the 1940s. More recently, this DTP combination has been used as the basis for the development of combination vaccines containing additional antigens such as hepatitis B and *Haemophilus influenzae* type b (Hib), resulting in pentavalent vaccines, or with the additional IPV, resulting in

hexavalent vaccines.

None of these combination vaccines has produced any adverse events that had not been observed with the individual components and currently used combination vaccines have excellent safety records.[6](#), [68](#), [69](#), [54](#)

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Values and preferences

Perception of the target population on the risk of disease

Perception of the risk of diphtheria, tetanus, pertussis, hepatitis B, Hib and poliomyelitis among target populations varies depending on local disease prevalence, cultural beliefs and awareness levels.[70](#), [71](#), [72](#), [73](#), [74](#)

In rural Kaduna State, Nigeria, awareness and knowledge of diphtheria were low despite an ongoing outbreak, although 61.5% of respondents who knew of the disease considered it life-threatening.[71](#)

In the UK, parents showed limited and sometimes inaccurate understanding of tetanus and diphtheria, including uncertainty about transmission and the continuing need for vaccination.[72](#)

Among pregnant women in Georgia, 81% perceived pertussis during pregnancy as serious and 92% considered it serious for infants.[73](#)

For hepatitis B, approximately half of pregnant women in northern and central Uganda perceived their lifetime risk of acquiring the infection as low.[74](#)

For Hib, a UK qualitative study identified substantial gaps in parents' understanding of the disease and its severity.[72](#)

In regions where polio remains endemic, such as Afghanistan and Pakistan,[75](#) the public is often more aware of the disease's dangers due to its ongoing presence. However, challenges like misinformation, cultural resistance, and distrust in vaccination programs can undermine risk perception, even in high-risk areas. Conversely, in polio-free regions, the perceived risk of polio is

generally low, as the disease is no longer part of the collective memory. This complacency can lead to gaps in vaccination coverage, as seen in recent outbreaks of vaccine-derived poliovirus (cVDPV) in previously polio-free countries such as the United Kingdom and Israel.^{70, 75, 76}

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Acceptability to stakeholders

Acceptability of the vaccine and of vaccination against the disease

The acceptability of child combination vaccination including DTP, HepB, Hib and polio vaccination, varies globally and is influenced by factors such as cultural beliefs, misinformation, relationships between parents and healthcare professionals, and perceived disease risk.^{77, 78, 79, 80, 81}

Evidence from Malaysia suggests that acceptability of introducing a fully liquid hexa-aP vaccine is also influenced by perceptions of vaccine safety, reduced number of injections, convenience, and confidence in the immunization programme.⁷⁹

DTP vaccine acceptance was high among parents in France (85%) and India (98%).⁸⁰

Pertussis vaccine acceptance in countries such as the United Kingdom, Italy, Ireland, Australia, West Germany and Russia has been influenced by adverse events and to lesser extent the low effectiveness of selected wP vaccines.⁸¹

In polio endemic regions, vaccine resistance has been linked to misconceptions about vaccine safety and cultural opposition, despite awareness of the disease's severity. Conversely, in polio-free countries, vaccine acceptability is generally high, though complacency has led to gaps in coverage, as evidenced by recent vaccine-derived poliovirus (cVDPV) outbreaks in the United Kingdom and Israel. Addressing these challenges, global initiatives led by WHO, UNICEF, and the Global Polio Eradication Initiative (GPEI) have prioritized public education and community engagement to sustain vaccination acceptance and achieve eradication goals.^{77, 78}

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Financing & funding

Estimated financial cost of materials per vaccine dose (syringes, needles, safety box) (in USD)

Price for one auto-disable (AD) syringe and needle

- As of October 2025, the UNICEF procurement price for 2026 ranges from US\$ 0.023 to US\$ 0.046, depending on supplier and product.⁸²
- The 2026 PAHO Revolving Fund for Access to Vaccines price ranges from US\$ 0.03 to US\$ 0.04, depending on supplier and product.⁸³

Price for one 5-litre safety box

- The UNICEF procurement price for 2026 ranges from US\$ 0.375 to US\$ 0.860, depending on supplier and product.⁸⁴
- The 2026 PAHO Revolving Fund for Access to Vaccines price ranges from US\$ 0.41 to US\$ 0.47, depending on supplier and product.⁸³

Each 5-litre safety box can hold around 100 syringes.

Estimated vaccine financial cost per dose (in USD)

Hexavalent vaccine (hexa-wP)

As of October 2026, the UNICEF price per dose for countries eligible for Gavi pricing is US\$ 2.85 in the 10-dose presentation.⁸⁵

For different groupings of middle-income countries (MICs), the UNICEF price per dose For SII's hexa-wP vaccine ranges from US\$ 3.00 in the 10-dose to US\$ 4.50 in the single dose presentations.⁸⁵

UNICEF prices are subject to change. The latest vaccine price information is available from UNICEF Supply Division.⁸⁵

The 2026 PAHO Revolving Fund vaccines pricelist reports a price per dose ranging from US\$ 2.85 in the 10-dose to US\$ 4.5 in the single-dose presentation.⁸⁶

For fully self-financing MICs, the country-reported price for 2025 per dose ranges from US\$ 21.05 to US\$ 39.73 depending on supplier and presentation.⁸⁷

Pentavalent vaccine (penta-wP)

As of January 2026, the UNICEF price per dose for countries eligible for Gavi pricing ranges from US\$ 0.78 in the 10-dose to US\$ 1.26 in the single-dose, depending on supplier.⁸⁸

UNICEF prices are subject to change. The latest vaccine price information is available from UNICEF Supply Division.⁸⁸

The 2026 PAHO Revolving Fund vaccines pricelist reports a price per dose ranging from US\$ 1.31 to US\$ 4.15 depending on supplier and presentation.⁸⁶

For fully self-financing MICs, the country-reported price for 2025 per dose ranges from US\$ 1.21 to US\$ 4.96 depending on supplier and presentation.⁸⁷

IPV vaccine

As of April 2026, the UNICEF prices per dose for countries accessing Gavi prices ranges from US\$ 1.04 in the 5-dose presentation to US\$ 2.8, in the single-dose presentation depending on supplier.⁸⁹

UNICEF price for self-procuring MICs is €3.5 per dose.⁸⁹

The 2026 PAHO Revolving Fund vaccines pricelist reports a price per dose ranging from US\$ 1.18 to US\$ 1.98 depending on supplier and presentation.⁸⁷

For fully self-financing MICs, the country-reported prices per dose for 2025 range from US\$ 2.05 to US\$ 12.33 depending on supplier and presentation.⁸⁷

Estimated financial cost per person vaccinated (in USD)

In European countries with vaccine procurement through public tenders the price per child vaccinated with standard vaccines ranged from €59 to €117 when using pentavalent and from

€98 to €220 when using hexa-aP vaccines.⁹⁰

A 2022 study focused on Peru estimated the total cost of fully vaccinating a child with the hexa-aP vaccine at \$126.42, compared to US\$ 116.27 under the existing schedule using the current scheme using the wP-containing pentavalent vaccines with IPV and OPV.⁹¹

Cost-effectiveness ratio

While hexavalent vaccines may have higher upfront costs, they can help reduce logistical challenges and overall societal burden, offering potential economic and practical benefits for immunization programs. The magnitude and direction of costs and savings are context dependent and vary according to current pentavalent and IPV vaccine presentations, wastage, cold-chain requirements, delivery platform, co-financing status, and whether the programme currently uses one or two IPV doses.

Studies from Peru (penta-wP compared to hexa-aP), Argentina (penta -wP compared to hexa-aP), Colombia (aP compared to hexa-wP), and South Korea (DTaP-IPV-Hib-HepB compared to DTaP-IPV/Hib) have reported potential economic and operational benefits of hexavalent vaccine use in specific programme contexts.^{92, 93, 94, 95, 96, 97, 98}

Cost-effectiveness varies considerably by several factors, including, the burden of disease, vaccination coverage, vaccine price, delivery costs, delivery approaches, and schedules. Caution is recommended when comparing estimates of cost-effectiveness for different interventions evaluated by different methods and in different contexts (e.g., with different concurrent health interventions and standards of care).

Is there a Gavi programme to support the introduction of this vaccine? If a Gavi programme is available, what support is available to countries?

Scope of Gavi support: Hexavalent is supported by the guaranteed vaccine budget. All Gavi-eligible countries that have not yet introduced hexavalent into their national vaccination schedule are eligible for support for the three-dose whole-cell pertussis (wP) hexavalent vaccine. Adoption of hexavalent vaccine is implemented as a replacement for the existing pentavalent

and IPV schedules. Gavi does not support procurement of routine bOPV.⁹⁹

Specific requirements for funding request: Within the holistic application, explain the timing and process of switching from pentavalent and IPV to hexavalent. Countries should allow 6–12 months between decision and planned launch.⁹⁹

Special co-financing considerations: Co-financing calculations will include a subsidy equivalent to the country's IPV eligibility (one or two doses), based on the annual weighted average price of IPV. Fully self-financing lower-middle income countries (LMICs) are eligible for a temporary subsidy in 2026 to purchase hexavalent vaccines equivalent to their IPV eligibility (one or two doses), aligned with the annual weighted average IPV price. This subsidy will be reduced by 50% in 2027, and by 2028 LMICs will be required to fully finance their hexavalent vaccination programmes. For initial self-financing countries using ten-dose pentavalent vials, switching to hexavalent is cost-neutral, as both vaccines are co-financed at US\$ 0.20 per dose.⁹⁹

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Market (feasibility)

Available vaccines, licensing status, prequalification status, presentation, formulation, dosage and route of administration

Four hexavalent vaccines are available: three of which contains acellular pertussis (hexa-aP) vaccines and one contains whole-cell pertussis (hexa-wP) vaccine.¹⁰⁰

Two of those vaccines are WHO prequalified (one of the hexa-aP and one hexa-wP).¹⁰¹

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Service delivery (feasibility)

Number of doses and timing of administrations

There are several schedule options for hexavalent vaccine. The schedule recommendation for hexavalent consists of three primary doses, starting as early as six weeks of age, with a minimum interval of four weeks between doses.^{102, 103}

For the primary vaccination schedule, the pentavalent vaccines can be replaced with either hexa-wP or hexa-aP, including primary schedules administered at 6, 10 and 14 weeks of age.

For booster doses, countries may opt to continue to use the vaccines currently used for these doses. However, if there is a switch from an wP-containing vaccine to aP-containing vaccine for the primary schedule, additional booster doses of the pertussis vaccine may be required as recommended in the WHO pertussis position paper.

For the birth dose of hepatitis B vaccine, the monovalent hepatitis B vaccine should continue to be used.

During transition, wP-containing pentavalent and hexavalent vaccines are considered interchangeable, but countries should ensure completion of the recommended IPV schedule, including IPV2 where applicable.¹⁰²

Countries currently using bOPV in their vaccination schedules and are categorized to be at medium or high readiness to move to IPV-only schedules may reduce the number of bOPV doses from three to two and administer them with the second and third doses of IPV.¹⁰⁴

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Logistics (feasibility)

Cold chain volume required per vaccine dose (in cm³)

For hexavalent vaccines with vial presentations, cold-chain space requirements vary by product and presentation ranging from 2.11 cm³/dose to 14.06 cm³/vial. ¹⁰⁵

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Sources

1.

World Health Organization (2017). Diphtheria vaccines: WHO position paper, August 2017. *Wkly Epidemiol Rec.* 92(31):417–435 (<https://www.who.int/publications/i/item/who-wer9231>, accessed 29 June 2026).

2.

World Health Organization (2017). Tetanus vaccines: WHO position paper, February 2017. *Wkly Epidemiol Rec.* 92(6):53–76 (<https://www.who.int/publications/i/item/WHO-WER9206>, accessed 29 June 2026).

3.

World Health Organization (2015). Pertussis vaccines: WHO position paper, August 2015. *Wkly Epidemiol Rec.* 90(35):433–460 (<https://www.who.int/publications/i/item/WHO-WER9035>, accessed 29 June 2026).

4.

World Health Organization (2017). Hepatitis B vaccines: WHO position paper, July 2017. *Wkly Epidemiol Rec.* 92(27):369–392 (<https://www.who.int/publications/i/item/WER9227>, accessed 29 June 2026).

5.

World Health Organization (2013). Haemophilus influenzae type b (Hib) vaccination position paper, July 2013. *Wkly Epidemiol Rec.* 88(39):413–426 (<https://www.who.int/publications/i/item/who-wer8839-413-426>, accessed 29 June 2026).

6.

World Health Organization (2022). Polio vaccines: WHO position paper, June 2022. *Wkly Epidemiol Rec.* 97(25):277–300 (<https://www.who.int/publications/i/item/WHO-WER9725-277-300>, accessed 29 June 2026).

7.

Global immunization data. In: World Health Organization. Geneva: World Health Organization; n.d. (<https://immunizationdata.who.int/global?topic=Reported-cases-and-incidence&location=>, accessed 11 July 2026).

Polio this week. In: Global Polio Eradication Initiative, Geneva (<https://polioeradication.org/about-polio/polio-this-week/>, accessed 13 July 2026).

8.

Global Polio Eradication Initiative (GPEI) – Polio this week (website) (<https://polioeradication.org/about-polio/polio-this-week/>), accessed August 26 2026).

9.

Global Polio Eradication Initiative (GPEI) – Poliovirus cases count (website) (<https://polioeradication.org/wild-poliovirus-count/>) and (<https://polioeradication.org/circulating-vaccine-derived-poliovirus-count/>, accessed August 26 2026).

10.

Wild poliovirus count. In: Global Polio Eradication Initiative [website]. Geneva: Global Polio Eradication Initiative; 2026 <https://polioeradication.org/wild-poliovirus-count/>, accessed 15 July 2026).

11.

Circulating vaccine-derived poliovirus count. In: Global Polio Eradication Initiative . Geneva: Global Polio Eradication Initiative; 2026 (<https://polioeradication.org/circulating-vaccine-derived-poliovirus-count/>, accessed 29 July 2026).

12.

WHO Global Health Observatory (<https://www.who.int/data/gho/data/indicators/indicator-details/GHO/number-of-deaths> accessed August 26 2026)

13.

World Health Organization. Global Health Estimates 2021: Deaths by Cause, Age, Sex, by Country and by Region, 2000–2021. Geneva: WHO; 2024 (<https://www.who.int/data/global-health-estimates>, accessed August 26 2026)

14.

Centers for Disease Control and Prevention (2025). Diphtheria: Chapter 1. In: Surveillance Manual. Atlanta: CDC. (<https://www.cdc.gov/surv-manual/php/table-of-contents/chapter-1-diphtheria.html>, accessed 1 July 2025).

15.

Fatihatur R, Adnan N, Laila N (2024). Diphtheria outbreak in Serang City, Banten, Indonesia, 2024: epidemiological investigation and response. J Teknol Kesehat Borneo. doi:10.30602/jtkb.v5i2.354.

16.

Brockhaus L, Urwyler P, Leutwyler U, Würfel E, Vasconcelos M, Goldenberger D et al. (2024). Diphtheria in a Swiss asylum seeker reception centre: outbreak investigation and evaluation of testing and vaccination strategies. Int J Public Health. doi:10.3389/ijph.2024.1606791

17.

Australian Centre for Disease Control, Diphtheria in Australia –

Epidemiological update As at 6 July 2026. (https://www.cdc.gov.au/sites/default/files/2026-07/20260707-diphtheria_epi_summary_-_web.pdf, accessed 15 July 2026).

18.

Clarke KEN, MacNeil A, Hadler S, Scott C, Tiwari TSP, Cherian T. Global Epidemiology of Diphtheria, 2000-2017(1). Emerg Infect Dis. 2019;25(10):1834-42 doi:10.3201/eid2510.190271 .

19.

Finkelstein P, Teisch L, Allen C, Ruiz G (2017). Tetanus: a potential public health threat in times of disaster. *Prehosp Disaster Med.* 32:339–342. doi:[10.1017/S1049023X17000012](https://doi.org/10.1017/S1049023X17000012).

20.

Khalil A, Samara A, Campbell H, Ladhani SN, Amirthalingam G (2024). Recent increase in infant pertussis cases in Europe and the critical importance of antenatal immunizations: we must do better...now. *Int J Infect Dis.* 146:107148. doi:[10.1016/j.ijid.2024.107148](https://doi.org/10.1016/j.ijid.2024.107148).

21.

Bricks LF, Vargas-Zambrano JC, Macina D (2024). Epidemiology of pertussis after the COVID-19 pandemic: analysis of the factors involved in the resurgence of the disease in high-, middle-, and low-income countries. *Vaccines (Basel)*. 12(12):1346. doi:[10.3390/vaccines12121346](https://doi.org/10.3390/vaccines12121346) .

22.

World Health Organization (2015). Pertussis vaccines: WHO position paper, August 2015. *Wkly Epidemiol Rec.* 90(35):433–460 (<https://www.who.int/publications/i/item/WHO-WER9035> , accessed 29 June 2026).

23.

Lanini S, Puro V, Lauria F, Fusco F, Nisii C, Ippolito G (2009). Patient to patient transmission of hepatitis B virus: a systematic review of reports on outbreaks between 1992 and 2007. *BMC Med.* 7:15. doi:[10.1186/1741-7015-7-15](https://doi.org/10.1186/1741-7015-7-15).

24.

Lee C, Emeto T, Walsh N (2022). Prevalence of hepatitis B virus amongst refugees, asylum seekers and internally displaced persons in low- and middle-income countries: a systematic review. *J Viral Hepat.* 30:4–18. doi:[10.1111/jvh.13770](https://doi.org/10.1111/jvh.13770) .

25.

Shane AL, Pickering LK (2013). Infections associated with group childcare. In: Cherry JD, Demmler-Harrison GJ, Kaplan SL, Steinbach WJ, Hotez PJ, editors. *Principles and practice of pediatric infectious diseases*. 4th ed. Philadelphia: Elsevier Saunders; 2012:24–32.e6. doi:[10.1016/B978-1-4377-2702-9.00102-1](https://doi.org/10.1016/B978-1-4377-2702-9.00102-1).

26.

European Centre for Disease Prevention and Control. *Disease information about invasive Haemophilus influenzae disease*. Stockholm: ECDC; updated 2023 Nov 28 (<https://www.ecdc.europa.eu/en/invasive-haemophilus-influenzae-disease/facts>, accessed 2026 June 30).

27.

Arnold C, Makintube S, Istre GR. Day care attendance and other risk factors for invasive Haemophilus influenzae type b disease. *Am J Epidemiol*. 1993 Sep 1;138(5):333-40. doi:10.1093/oxfordjournals.aje.a116863.

28.

Global Polio Eradication Initiative (GPEI) (2026). Circulating vaccine-derived poliovirus count. Geneva: Global Polio Eradication Initiative. (<https://polioeradication.org/circulating-vaccine-derived-poliovirus-count/>, accessed 29 July 2026).

29.

Wild poliovirus count. Global Polio Eradication Initiative [website]. Geneva; 2026 (<https://polioeradication.org/wild-poliovirus-count/>, accessed 15 July 2026).

30.

Namageyo-Funa A, Greene SA, Henderson E, et al. (2024). Update on Vaccine-Derived Poliovirus Outbreaks - Worldwide, January 2023–June 2024. *MMWR Morb Mortal Wkly Rep*. 2024;73:909–916. DOI: doi:10.15585/mmwr.mm7341a1.

31.

Huseynov S, Saxentoff E, Diedrich S, Martin J, Wieczorek M, Cabrerizo M, et al. Detection of vaccine-derived poliovirus type 2 in wastewater - five European countries, September–December 2024. *MMWR Morb Mortal Wkly Rep*. 2025;74(7):122–124. doi:10.15585/mmwr.mm7407a4.

32.

Maternal and neonatal tetanus elimination (MNTE). In: World Health Organization [website]. Geneva: World Health Organization; no date (<https://www.who.int/initiatives/maternal-and-neonatal-tetanus-elimination-%28mnte%29> , accessed 30 June 2026).

33.

Maternal and neonatal tetanus elimination (MNTE) - Progress towards global MNT elimination. In: World Health Organization [website]. Geneva: World Health Organization; no date ([https://www.who.int/initiatives/maternal-and-neonatal-tetanus-elimination-\(mnte\)/progress-towards-global-mnt-elimination](https://www.who.int/initiatives/maternal-and-neonatal-tetanus-elimination-(mnte)/progress-towards-global-mnt-elimination), accessed 2 September 2026).

34.

Jones CE, Yusuf N, Ahmed B, Kassogue M, Wasley A, Kanu FA (2024). Progress toward achieving and sustaining maternal and neonatal tetanus elimination - worldwide, 2000–2022. *MMWR Morb Mortal Wkly Rep.* 73:614–621. doi:10.15585/mmwr.mm7328a1.

35.

Chen D (2009). Hepatitis B vaccination: the key towards elimination and eradication of hepatitis B. *J Hepatol.* 50(4):805–816. doi:10.1016/j.jhep.2009.01.002.

36.

Al-Busafi S, Alwassief A (2024). Global perspectives on the hepatitis B vaccination: challenges, achievements, and the road to elimination by 2030. *Vaccines.* 12. doi:10.3390/vaccines12030288.

37.

Zhao H, Zhou X, Zhou Y (2020). Hepatitis B vaccine development and implementation. *Hum Vaccin Immunother.* 16:1533–1544. doi:10.1080/21645515.2020.173216.

38.

Global hepatitis report 2026. Geneva: World Health Organization; 2026. Licence: CC BY-NC-SA 3.0 IGO (<https://www.who.int/publications/i/item/9789240122383>, accessed 30 June 2026)

39.

Slack M, Esposito S, Haas H, Mihályi A, Nissen M, Mukherjee P, Harrington L (2020). Haemophilus influenzae type b disease in the era of conjugate vaccines: critical factors for successful eradication. *Expert Rev Vaccines.* 19:903–917. doi:10.1080/14760584.2020.182594.

40.

Gilsdorf J (2021). Hib vaccines: their impact on Haemophilus influenzae type b disease. *J Infect Dis.* 224:S321–S330. doi:10.1093/infdis/jiaa537.

41.

World Health Organization. *Introduction of Hib (Haemophilus influenzae type b) vaccine*. WHO Immunization Data Portal. Geneva: WHO; 2026. (<https://immunizationdata.who.int/global/wiise-detail-page/introduction-of-hib-%28haemophilus-influenzae-type-b%29-vaccine>, accessed 30 June 2026).

42.

Meeting of the Strategic Advisory Group of Experts on Immunization, March 2024: conclusions and recommendations. *Weekly Epidemiological Record* 2024; 99 (22): 285-306 (<https://iris.who.int/server/api/core/bitstreams/0edba627-cee7-466c-8f80-558dc03fab58/content>, accessed 9 September 2026).

43.

Frequently asked questions and considerations for the introduction of hexavalent vaccine DTwP-HepB-Hib-IPV in routine immunization programmes. In: World Health Organization [website]. Geneva: World Health Organization; 2025 (<https://www.technet-21.org/en/resources/guidance/frequently-asked-questions-and-considerations-for-the-introduction-of-hexavalent-vaccine-dtwp-hepb-hib-ipv-in-national-immunization-programmes-update-june-2025>, accessed 24 August 2026).

44.

World Health Organization (2022). Polio vaccines: WHO position paper – June 2022. *Wkly Epidemiol Rec.* 97(25):277–296. (<https://www.who.int/publications/m/item/polio-vaccines-who-position-paper-june-2022>, accessed 24 June 2026).

45.

Global Polio Eradication Initiative website. In: Global Polio Eradication Initiative [website]. Geneva: Global Polio Eradication Initiative; no date (<https://polioeradication.org/>, accessed 24 June 2026).

46.

Poliomyelitis: Fact sheet. In: World Health Organization [website]. Geneva: World Health Organization; no date (<https://www.who.int/news-room/fact-sheets/detail/poliomyelitis> , accessed 24 June 2026).

47.

Poliomyelitis overview. In: Centers for Disease Control and Prevention [website]. Atlanta: CDC; no date (<https://www.cdc.gov/polio/index.html> , accessed 24 June 2026).

48.

Shuel M, Hoang L, Law DKS, Tsang R (2011). Invasive *Haemophilus influenzae* in British Columbia: non-Hib and non-typeable strains causing disease in children and adults. *Int J Infect Dis*. 15:e167–e173. doi:10.1016/j.ijid.2010.10.005.

49.

Centers for Disease Control and Prevention (CDC) (no date). Polio vaccines [website]. Atlanta: CDC. (<https://www.cdc.gov/polio/vaccines/index.html>, accessed 24 June 2025).

50.

Boisnard F, Manson C, Serradell L, Macina D (2023). DTaP-IPV-HB-Hib vaccine (Hexaxim): an update 10 years after first licensure. *Expert Rev Vaccines*. 22:1196–1213. doi:10.1080/14760584.2023.2280236 .

51.

Dakin N, Borrow R, Arkwright PD. A review of DTaP-IPV-HB-PRP-T hexavalent vaccines in paediatric patients. *Expert Review of Vaccines* 2023; 22 (1): 104-117. doi:10.1080/14760584.2023.2161519

52.

Wanlapakorn N, Sarawanangkoor N, Srimuan D, Thatsanathorn T, Thongmee T, et al. (2024). Antibody persistence to diphtheria toxoid, tetanus toxoid, *Bordetella pertussis* antigens, and *Haemophilus influenzae* type b following primary and first booster with pentavalent versus hexavalent vaccines. *Hum Vaccin Immunother*. 20. doi:10.1080/21645515.2024.2352909.

53.

Knuf M, Haas H, García-Corbeira P, Turriani E, Mukherjee P, et al. (2021). Hexavalent vaccines: what can we learn from head-to-head studies? *Vaccine*. doi:10.1016/j.vaccine.2021.08.086.

54.

Sharma H, Parekh S, Pujari P, Kawade A, Lalwani S, et al. A phase III randomized-controlled study of safety and immunogenicity of DTwP-HepB-IPV-Hib vaccine (HEXASILL®) in infants. *npj*

Vaccines. 2024;9:41. doi:10.1038/s41541-024-00828-w.

55.

Madhi SA, Mitha I, Cutland C, Groome M, Santos-Lima E. Immunogenicity and safety of an investigational fully liquid hexavalent combination vaccine versus licensed combination vaccines at 6, 10, and 14 weeks of age in healthy South African infants. *Pediatr Infect Dis J*. 2011;30(4):e68-74. doi:10.1097/INF.0b013e31820b93d2.

56.

Steiner M, Ramakrishnan G, Gartner B, Van Der Meeren O, Jacquet J, et al. (2010). Lasting immune memory against hepatitis B in children after primary immunization with 4 doses of DTPa-HBV-IPV/Hib in the first and 2nd year of life. *BMC Infect Dis*. 10:9. doi:10.1186/1471-2334-10-9.

57.

Sanchez L, Rungmaitree S, Kosalaraksa P, Jantarabenjakul W, Leclercq J, Yaiprayoon Y, Midde VJ, Varghese K, Mangarule S, Noriega F (2023). Immunogenicity and safety of a hexavalent DTwP-IPV-HB-PRPT vaccine versus separate DTwP-HB-PRPT, bOPV, and IPV vaccines administered at 2, 4, 6 months of age concomitantly with rotavirus and pneumococcal conjugate vaccines in healthy infants in Thailand. *Pediatr Infect Dis J*. 42(8):711-718. doi:10.1097/INF.0000000000003975 .

58.

Patterson J, Kagina BM, Gold M, Hussey GD, Muloiwa R (2018). Comparison of adverse events following immunisation with acellular and whole-cell pertussis vaccines: a systematic review. *Vaccine*. 36:6007-6016. doi:10.1016/j.vaccine.2018.08.022.

59.

Dakin N, Borrow R, Arkwright PD. A review of DTaP-IPV-HB-PRP-T hexavalent vaccines in paediatric patients. *Expert Review of Vaccines* 2023; 22 (1): 104-117. doi:10.1080/14760584.2023.2161519.

60.

Madhi SA, Mitha I, Cutland C, Groome M, Santos-Lima E. Immunogenicity and safety of an investigational fully liquid hexavalent combination vaccine versus licensed combination vaccines at 6, 10, and 14 weeks of age in healthy South African infants. *Pediatr Infect Dis J*.

2011;30(4):e68-74 doi:10.1097/INF.0b013e31820b93d2.

61.

Wendelboe, A., Van Rie, A., Salmaso, S., & Englund, J. (2005). Duration of Immunity Against Pertussis After Natural Infection or Vaccination. *Pediatric Infectious Disease Journal*, 24(5), S58-S61. doi:10.1097/01.inf.0000160914.59160.41.

62.

Borrow, R., Balmer, P. and Roper, M.H. (2007) The immunologic basis for immunization: module 3: tetanus. Geneva: World Health Organization.
(http://apps.who.int/iris/bitstream/10665/43687/1/9789241595551_eng.pdf, accessed 30 June 2025).

63.

Swart, E.M., et al. (2016) 'Long-term protection against diphtheria in the Netherlands after 50 years of vaccination: results from a seroepidemiological study', *PLoS ONE*, 11(2), e0148605. doi:10.1371/journal.pone.0148605.

64.

Bruce, M.G., et al. (2016) 'Antibody levels and protection after hepatitis B vaccine: results of a 30-year follow-up study and response to a booster dose', *Journal of Infectious Diseases*, 214, pp. 16-22. doi:10.1093/infdis/jiw144.

65.

Wanlapakorn, N., Sarawanangkoor, N., Srimuan, D., Thatsanathorn, T., Klinfueng, S. and Poovorawan, Y. (2024) 'Persistence of hepatitis B surface antibody until 7 years of age following administration of hexavalent and pentavalent vaccines in children at 2, 4, 6, and 18 months', *Vaccine: X*, 20. doi:10.1016/j.jvacx.2024.100561

66.

Wanlapakorn, N., Sarawanangkoor, N., Srimuan, D., Thatsanathorn, T., Thongmee, T. and Poovorawan, Y. (2024) 'Antibody persistence to diphtheria toxoid, tetanus toxoid, Bordetella pertussis antigens, and Haemophilus influenzae type b following primary and first booster with pentavalent versus hexavalent vaccines', *Human Vaccines & Immunotherapeutics*, 20. doi:10.1080/21645515.2024.2352909.

67.

Avdičová, M., Crasta, P., Hardt, K. and Kovac, M. (2015) 'Lasting immune memory against hepatitis B following challenge 10-11 years after primary vaccination with either three doses of hexavalent DTPa-HBV-IPV/Hib or monovalent hepatitis B vaccine at 3, 5 and 11-12 months of age', *Vaccine*, 33(23), pp. 2727-2733. doi:10.1016/j.vaccine.2014.06.070.

68.

Frequently asked questions and considerations for the introduction of hexavalent vaccine DTwP-HepB-Hib-IPV in routine immunization programmes. In: World Health Organization [website]. Geneva: World Health Organization; 2024 (<https://www.technet-21.org/en/resources/guidance/frequently-asked-questions-and-considerations-for-the-introduction-of-hexavalent-vaccine-dtwp-hepb-hib-ipv-in-national-immunization-programmes-update-june-2025> , accessed 24 August 2026).

69.

GACVS report on hexavalent vaccines. In: World Health Organization [website]. Geneva: World Health Organization; 2005 (<https://www.who.int/groups/global-advisory-committee-on-vaccine-safety/topics/hexavalent-vaccines> , accessed 11 July 2025).

70.

Centers for Disease Control and Prevention (CDC) (2024). Polio Vaccine Questions and Answers. (<https://www.cdc.gov/vaccines/vpd/polio/public/index.html>, accessed 30 June 2026).

71.

Babandi, Z.S., Suleiman, A.G., Darma, M.A., Indabo, U.H., Shehu, S., Hamza, A.S., Henry, J., Umar, U.M., Ojediran, S.L., Amadu, L., Ibrahim, M.S. & Ejembi, C.L. (2024). Knowledge and Perception of Diphtheria among Residents of a Rural Community in Kaduna State, Northwest Nigeria. *Journal of Community Medicine and Primary Health Care*, 36, pp.111-123. doi:10.4314/jcmphc.v36i2.9.

72.

Hilton, S., Hunt, K. & Petticrew, M. (2007). Gaps in parental understandings and experiences of vaccine-preventable diseases: a qualitative study. *Child Care Health Dev.*, 33(2), pp.170-179. doi:10.1111/j.1365-2214.2006.00647.x.

73.

Chamberlain, A.T., Seib, K., Ault, K.A., Orenstein, W.A., Frew, P.M., Malik, F., Cortés, M., Cota, P., Whitney, E.A.S., Flowers, L.C., Berkelman, R.L. & Omer, S.B. (2015). Factors Associated with Intention to Receive Influenza and Tetanus, Diphtheria, and Acellular Pertussis (Tdap) Vaccines during Pregnancy: A Focus on Vaccine Hesitancy and Perceptions of Disease Severity and Vaccine Safety. PLoS Currents.

[doi:10.1371/currents.outbreaks.d37b61bceebae5a7a06d40a301cfa819](https://doi.org/10.1371/currents.outbreaks.d37b61bceebae5a7a06d40a301cfa819).

74.

Nankya-Mutyoba, J., Aizire, J., Makumbi, F., Ocama, P. & Kirk, G.D. (2019). Hepatitis B virus perceptions and health seeking behaviors among pregnant women in Uganda: implications for prevention and policy. BMC Health Services Research, 19, 760. [doi:10.1186/s12913-019-4516-0](https://doi.org/10.1186/s12913-019-4516-0).

75.

Global Polio Eradication Initiative (GPEI) (no date). Polio Today: Endemic Countries. (<https://polioeradication.org/about-polio/polio-infected-countries/>, accessed 28 August 2026).

76.

Circulating vaccine-derived poliovirus count. In: Global Polio Eradication Initiative . Geneva: Global Polio Eradication Initiative; no date (<https://polioeradication.org/circulating-vaccine-derived-poliovirus-count/> , accessed 24 August 2026).

77.

Global Polio Eradication Initiative (GPEI) (no date). Polio Today: Endemic Countries. (<https://polioeradication.org/about-polio/polio-infected-countries/> accessed 28 August 2026).

78.

Global Polio Eradication Initiative (no date). Circulating vaccine-derived poliovirus count [website]. Geneva: Global Polio Eradication Initiative. Available at: (<https://polioeradication.org/circulating-vaccine-derived-poliovirus-count/> , accessed 24 August 2026).

79.

Al Bashar, L., Dube, E., Kandasamy, T., Zaini, N., Abdul Rahman, H., et al. (2023) 'Parents' and healthcare professionals' perception toward the introduction of a new fully liquid hexavalent vaccine in the Malaysian national immunization program: a cross-sectional study instrument

development and its application', *Frontiers in Immunology*, 14. doi:10.3389/fimmu.2023.1052450

80.

Bakhache, P., Yewale, V., Parikh, R., Clancey, G., Spickernell, G., Berlaimont, V. & Turriani, E. (2022). Diphtheria-tetanus-pertussis (DTP) vaccination: understanding the perspectives and expectations of parents and healthcare professionals in France and India. *Human Vaccines & Immunotherapeutics*, 18(1), 1961468. doi:10.1080/21645515.2021.1961468.

81.

Gangarosa EJ, Galazka AM, Wolfe CR, Phillips LM, Miller E, Chen RT et al. Impact of anti-vaccine movements on pertussis control: the untold story. *The Lancet* 1998;351:356-361.

82.

UNICEF Supply Division (2025). Auto-disable (AD) syringes price data 2011-2027 . Copenhagen: United Nations Children's Fund. October 2025(<https://www.unicef.org/supply/documents/auto-disable-ad-syringe-price-data>, accessed 24 June 2026).

83.

Pan American Health Organization (2026). Revolving fund: Syringes and Safety Boxes 2026 Prices

. July 2026 (<https://www.paho.org/en/documents/syringes-and-safety-boxes-2026-prices>, accessed 24 September 2026).

84.

UNICEF Supply Division (2025). Safety boxes price data 2011-2027. October 2025 (<https://www.unicef.org/supply/media/24401/file/Safety-Boxes-SB-pricing-data-2011-2027.pdf>, accessed 24 June 2026).

85.

UNICEF (2026). DTWP-HepB-IPV-Hib (hexavalent) vaccine price data. (<https://www.unicef.org/supply/documents/dtwp-hepb-ipv-hib-hexavalent-vaccine-price-data>, accessed 30 June 2026).

86.

Pan American Health Organization (PAHO) (2026). Revolving fund vaccine prices. July 2026 (<https://www.paho.org/en/documents/vaccine-prices-revolving-fund-2026>, accessed 13 July 2026).

87.

World Health Organization (WHO) (2026). 2025 MI4A vaccine purchase data. (<https://www.who.int/teams/immunization-vaccines-and-biologicals/vaccine-access/mi4a/mi4a-vaccine-purchase-data>, accessed 28 September 2026).

88.

UNICEF Supply Division (2026). DTP-HepB-Hib (pentavalent) vaccine price data. January 2026. (<https://www.unicef.org/supply/documents/dtp-hepb-hib-pentavalent-vaccine-price-data>, accessed 30 June 2026).

89.

UNICEF Supply Division (2026). Inactivated Polio Vaccine (IPV) price data . April 2026 (<https://www.unicef.org/supply/documents/inactivated-polio-vaccine-ipv-price-data> , accessed 30 June 2026).

90.

Salo, H., Sakalauskaite, M., Lévy-Bruhl, D., Lindstrand, A., Valentiner-Branth, P., Wichmann, O. & Puumalainen, T. (2023). Prices of paediatric vaccines in European vaccination programmes. Vaccine X, 15, 100392. doi:10.1016/j.jvacx.2023.100392.

91.

Seinfeld, J., Rosales, M.L., Sobrevilla, A. et al. (2022). Economic assessment of incorporating the hexavalent vaccine as part of the National Immunization Program of Peru. BMC Health Services Research, 22, 651. doi:10.1186/s12913-022-08006-1.

92.

Seinfeld, J., Rosales, M.L., Sobrevilla, A. & López Yescas, J.G. (2022). Economic assessment of incorporating the hexavalent vaccine as part of the National Immunization Program of Peru. BMC Health Services Research, 22(1), 651. doi:10.1186/s12913-022-08006-1.

93.

Olivera, I., Pérez, C.G., Lazarov, L., Lopez, E., Oddo, C. & Dibarboure, H. (2023). Cost minimization analysis of a hexavalent vaccine in Argentina. BMC Health Services Research, 23(1), 1067. doi:10.1186/s12913-023-10038-0.

94.

Romero, M., Góngora, D.-S., Caicedo, M.-L., Benchabane, D. & Lopez, J.-G. (2021). Cost-Minimization and Budget Impact Analysis of a Hexavalent Vaccine (Hexaxim®) in the Colombian Expanded Program on Immunization. Value in Health Regional Issues, 26, 150–159. doi:10.1016/j.vhri.2021.06.001.

95.

Min, S., Kwon, S.H., Lee, Y.W., Lee, J.M., Bae, E.J. & Lee, E.K. (2023). Estimating the Total Societal Cost of a Hexavalent Vaccine versus a Pentavalent Vaccine with Hepatitis B in South Korea. Vaccines (Basel), 11(5), 984. doi:10.3390/vaccines11050984.

96.

Olivera, M., Soto, J., Llamas, L.M., Reyes, N., Cid, M., et al. (2020) 'Valuing the cost of improving Chilean primary vaccination: a cost minimization analysis of a hexavalent vaccine', BMC Health Services Research, 20, p. 295. doi:10.1186/s12913-020-05115-7.

97.

Aljunid, S.M., Ismail, A., Nor, N.M., Zafar, A., Suleiman, A., et al. (2022) 'Economic impact of switching from partially combined vaccine "Pentaxim® and hepatitis B" to fully combined vaccine "Hexaxim®" in the Malaysian National Immunization Program', BMC Health Services Research, 22, p. 34. doi:10.1186/s12913-021-07428-7.

98.

Mogale, M., Burnett, R.J., Olivier, D., Mphahlele, J. (2014) 'Economic assessment of implementing Hexaxim® vaccine within the South African Expanded Programme on Immunisation (EPI-SA)', International Journal of Infectious Diseases, 21(Suppl.), pp. 1–460 (Abstract, 16th ICID). ([https://www.ijidonline.com/article/S1201-9712\(14\)01366-6/fulltext](https://www.ijidonline.com/article/S1201-9712(14)01366-6/fulltext), accessed August 30, 2026).

99.

Gavi, the Vaccine Alliance (2026). Gavi 6.0 Funding Guidelines v1.0 April 2026 (<https://www.gavi.org/sites/default/files/support/guidelines-2026/gavi-60-funding-guidelines->

[annexes.pdf](#), accessed 24 June, 2026).

100.

World Health Organization. Full Vaccine Product List. 2026 (<https://www.who.int/teams/immunization-vaccines-and-biologicals/vaccine-access/mi4a/mi4a-vaccine-purchase-data>, accessed 23 September 2026).

101.

Prequalified vaccines. Geneva: World Health Organization; 2026 (<https://extranet.who.int/prequal/vaccines/prequalified-vaccines>, accessed 24 June 2026).

102.

World Health Organization, UNICEF. Frequently asked questions and considerations for the introduction of hexavalent vaccine DTwP-HepB-Hib-IPV in routine immunization programmes. June 2025 (<https://www.technet-21.org/en/resources/guidance/frequently-asked-questions-and-considerations-for-the-introduction-of-hexavalent-vaccine-dtwp-hepb-hib-ipv-in-national-immunization-programmes-update-june-2025>, accessed 8 July 2026).

103.

World Health Organization. Meeting of the Strategic Advisory Group of Experts on Immunization, March 2025: conclusions and recommendations. *Weekly Epidemiological Record*. 2025;100(23):193–218. (<https://www.who.int/publications/i/item/who-wer10023-219-238>, accessed 2 July 2026).

104.

Meeting of the Strategic Advisory Group of Experts on Immunization, March 2026: conclusions and recommendations. *Weekly Epidemiological Record* 2026;101 (18):66–77 (<https://iris.who.int/server/api/core/bitstreams/5a7e6a5d-2810-476a-a808-b62024b73728/content>, accessed 29 July 2026).

105.

NITAG Resource Center. Vaccine Evidence Compendium: Hexavalent vaccines. 2026. See detailed product [comparison table](#)