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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 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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