

QUICK GUIDE

to Vaccine- Preventable Diseases & Vaccines in Ethiopia



A resource for Regional Health Bureau staff



ACRONYMS

BCG	Bacille Calmette-Guerin
DHS	Demographic and Health Survey
DRS	Developing Regional States
DTP3	Third dose of diphtheria-tetanus-pertussis-containing vaccine
EPI	Expanded Program on Immunization
Hib	Haemophilus influenzae type B
Hep B	Hepatitis B
HPV	Human papillomavirus
IPV	Inactivated Polio Vaccine
MCV	Measles-containing vaccine
OPV	Oral Polio Vaccine
PCV	Pneumococcal conjugate vaccine
RHB	Regional Health Bureau
TT	Tetanus toxoid
TB	Tuberculosis
VPD	Vaccine-preventable disease

ABOUT THIS GUIDE

The purpose of this quick guide is to provide basic information about vaccine-preventable diseases and their vaccines, so that Expanded Program on Immunization (EPI) program managers may apply this knowledge of key epidemiologic and clinical features of each vaccine-preventable disease to make decisions for their EPI program.

This guide is intended for use by Regional Health Bureau (RHB) staff, both EPI and non-EPI focused staff, who may be involved in planning, managing, or ensuring funding of essential routine EPI services.

This guide is meant to be a “quick” reference for RHB staff; it is not a comprehensive source of information on vaccine-preventable diseases and vaccines. For more information, consult the major source documents used in developing this quick guide:

1. WHO’s Immunization in Practice: a practical guide for health staff – 2015 update. Available at: <http://www.who.int/iris/handle/10665/193412>
2. USAID Global Health eLearning Center’s “Immunization Essentials” online course. Available at: <https://www.globalhealthlearning.org/course/immunization-essentials>
3. WHO Fact Sheet on Immunization. Available at: <http://www.who.int/en/news-room/fact-sheets/detail/immunization-coverage>

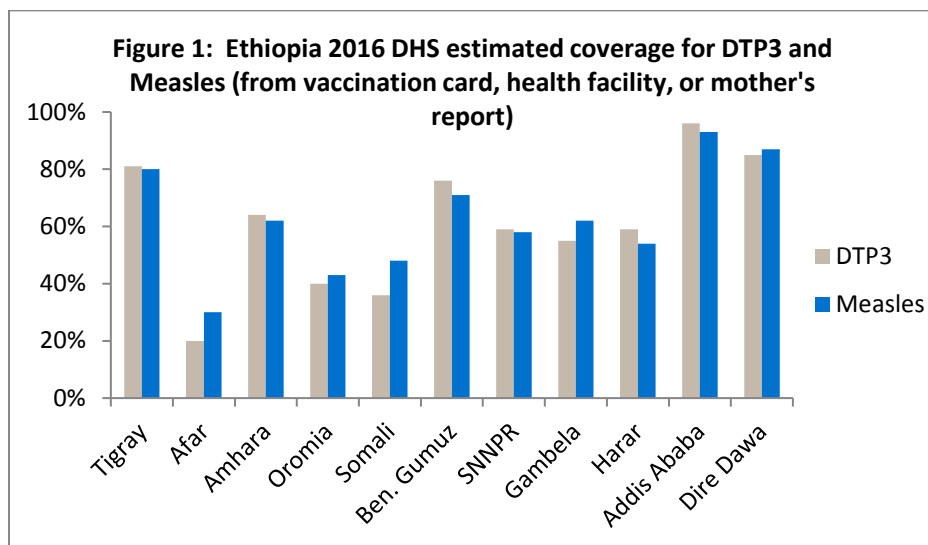
WHY IMMUNIZATION MATTERS

Immunization prevents illness, disability and death from a whole range of diseases. Helping to avert 2-3 million deaths each year throughout the world, immunization is one of the most cost-effective health investments.

VPDs AND VACCINES IN ETHIOPIA

Over the past 15 years, Ethiopia has made impressive improvements in its health system. The 2016 Demographic and Health Survey (DHS) indicates that child mortality dropped by 60% and that the infant mortality rate dropped from 97 to 48 deaths per 1000 live births over the previous 16 years.

Outstanding as these accomplishments are, the nationwide figures obscure the massive challenges that still affect parts of the country, particularly in some Developing Regional States (DRS). Moreover, the 2016 DHS shows a mixed picture for routine immunization performance across regions (Figure 1). This is based on coverage for a third dose of vaccine that protects against diphtheria, pertussis, and tetanus (DTP3), which is the standard indicator for immunization program performance.



The data show that almost half of Ethiopia's children are unprotected against major childhood killer diseases. In the Developing Regional States, particularly Afar and Somali regions, only about one fifth and one third, respectively, of children receive DTP3. In addition, measles vaccination rates in all four DRS are below the 95% coverage level that is needed to prevent outbreaks: Afar's measles coverage is 30%, Somali's is 48%, Gambela's is 62%, and Benshangul

Gumuz's is 71%. These data point out the critical needs that must be addressed, under exceedingly difficult conditions, if children are to receive the benefits of vaccination. If they can be reached with vaccination, then there is the possibility that other basic health interventions could also reach them as well.

Ethiopia's immunization schedule calls for vaccination against the following diseases – diphtheria, pertussis, haemophilus influenzae type B, hepatitis B, tetanus, polio, tuberculosis, pneumococcus, rotavirus, measles, and human papillomavirus.

The following pages provide detail on each of these vaccine-preventable diseases and their available vaccines in the national Ethiopia immunization schedule.

Disease	How it is transmitted	Signs, symptoms, and complications	Vaccine information	How vaccine is administered
Diphtheria Bacterial infection that produces a toxin that can harm or destroy human body tissues and organs. Most common sites of infection are the throat and tonsils.	<p>Spread from person to person through close physical and respiratory contact (airborne droplets)</p>	<p>When diphtheria affects the throat and tonsils, the early symptoms are sore throat, loss of appetite, mild fever, and a bluish-white or grey membrane that forms in the throat and on the tonsils.</p> <p>Patients with severe diphtheria may develop a swollen neck and obstructed airway, severe weakness, and abnormal heartbeat and inflammation of the heart muscle and valves, which can lead to heart failure.</p> <p>Death can occur in six to 10 days.</p>	<p>Given as pentavalent vaccine containing five antigens (diphtheria, pertussis, tetanus, Hib, and Hep B). Pentavalent vaccine comes in single-dose vials in Ethiopia.</p> <p>Store vaccine between +2 °C and +8 °C, without being frozen.</p>	<p>Intramuscular injection in the outer left thigh</p> <p>3 doses needed – at 6 weeks, 10 weeks, and 14 weeks of age</p>

Disease	How it is transmitted	Signs, symptoms, and complications	Vaccine information	How vaccine is administered
Pertussis Bacterial infection of the respiratory tract, characterized by a whooping cough. It is estimated that 167,000 children die worldwide each year from pertussis.	<p>Spreads very easily from person to person by coughing or sneezing</p> <p>Untreated patients may be infectious and spread pertussis for up to three weeks after typical coughing starts</p>	<p>Symptoms are similar to the common cold, with a worsening cough. Coughing comes in rapid bursts, and typical patients take in air with a high-pitched “whoop” at the end of a burst. Vomiting and exhaustion follow coughing attacks, which are frequent at night.</p> <p>Pneumonia is the main complication. Children may experience complications such as convulsions & seizures due to fever or reduced oxygen supply to the brain during burst of coughing.</p>	<p>Given as pentavalent vaccine containing five antigens (diphtheria, pertussis, tetanus, Hib, and Hep B). Pentavalent vaccine comes in single-dose vials in Ethiopia.</p> <p>Store vaccine between +2 °C and +8 °C, without being frozen.</p>	<p>Intramuscular injection in the outer left thigh</p> <p>3 doses needed – at 6 weeks, 10 weeks, and 14 weeks of age</p>

Disease	How it is transmitted	Signs, symptoms, and complications	Vaccine information	How vaccine is administered
Haemophilus influenzae type B (Hib) Hib is responsible for severe pneumonia, meningitis, and other invasive disease in children under 5. Hib is the most common type of Haemophilus influenzae and is common in the nose and throats of children.	<p>Spread person to person in droplets released when coughing and sneezing</p> <p>Children can carry Hib without showing any signs or symptoms</p>	<p>Hib disease can affect different parts of the body. The most frequently seen serious diseases are pneumonia and meningitis.</p> <p>Children with pneumonia can have fever, chills, cough, rapid breathing and chest wall retractions. Children with meningitis can have fever, headache, sensitivity to light, and neck stiffness.</p> <p>Children who survive Hib meningitis may develop permanent brain damage, hearing loss, or mental retardation, in up to 40% of cases.</p>	<p>Given as pentavalent vaccine containing five antigens (diphtheria, pertussis, tetanus, Hib, and Hep B). Pentavalent vaccine comes in single-dose vials in Ethiopia.</p> <p>Store vaccine between +2 °C and +8 °C, without being frozen.</p>	<p>Intramuscular injection in the outer left thigh</p> <p>3 doses needed – at 6 weeks, 10 weeks, and 14 weeks of age</p>

Disease	How it is transmitted	Signs, symptoms, and complications	Vaccine information	How vaccine is administered
Hepatitis B (Hep B) Hep B is caused by a virus that infects the liver. Approximately 90% of infants who are infected with hepatitis B become carriers and develop chronic disease later in life. Chronic Hep B infection leads to cirrhosis, liver cancer, liver failure and death.	<p>Spread through contact with blood or other body fluids from an infected person.</p> <p>It is 50 to 100 times more infectious than HIV.</p>	<p>Chronic hepatitis B patients have signs related to liver failure (such as swelling of the abdomen, abnormal bleeding and changing mental status) as the disease progresses.</p> <p>Acute hepatitis B does not often cause symptoms and signs, but when it does, patients can have fatigue, nausea, vomiting, abdominal pain, and jaundice (yellowing of the skin and eyes).</p>	<p>Given as pentavalent vaccine containing five antigens (diphtheria, pertussis, tetanus, Hib, and Hep B).</p> <p>Stand-alone Hep B vaccine can be used to provide a birth dose to prevent mother-to-child transmission.</p> <p>Both vaccines should be stored between +2 °C and +8 °C, without being frozen.</p>	<p>Pentavalent: Intramuscular injection in the outer left thigh. 3 doses needed – at 6 weeks, 10 weeks, and 14 weeks of age</p> <p>Hepatitis B birth dose: Intramuscular injection in the outer left thigh. Should be given within the first 24 hours of life.</p>

Disease	How it is transmitted	Signs, symptoms, and complications	Vaccine information	How vaccine is administered
Tetanus An acute, often fatal disease caused by the toxin of the bacterium <i>Clostridium tetani</i>, which is present in soil everywhere.	<p>Infection by a bacterium found in soil occurs when the bacterium enters a deep wound or cut.</p> <p>In newborns, infection can occur from dirty tools used during childbirth or dirty floors, mats, or hands.</p> <p>May also infect mothers by contamination through the vagina at birth.</p>	<p>In children and adults, muscular stiffness in the jaw (“lock-jaw”) is a common first sign of tetanus. This is followed by muscle spasms, stiffness in the neck, abdomen and/or back, difficulty swallowing, sweating and fever.</p> <p>Newborns with tetanus are normal at birth but stop feeding at three to 28 days of age. They then become stiff, severe muscle spasms occur, and most die.</p> <p>When muscles used in breathing are affected, respiratory failure and death can occur.</p>	<p>Given to infants as pentavalent vaccine containing five antigens (diphtheria, pertussis, tetanus, Hib, and Hep B).</p> <p>Given to pregnant women as tetanus toxoid (TT) vaccine.</p> <p>For both vaccines, store between +2 °C and +8 °C, without being frozen.</p>	<p>Pentavalent for infants: Intramuscular injection in the outer left thigh. 3 doses needed – at 6 weeks, 10 weeks, and 14 weeks of age.</p> <p>TT for pregnant women: Intramuscular injection in the upper arm. See table on following page for the recommended dosing schedule.</p>

For the routine immunization of pregnant women who were not previously vaccinated in childhood against tetanus, or whose vaccination history is unknown, the following schedule should be followed:

Dose of Tetanus toxoid (TT)	Schedule	Expected duration of protection*
1	At first contact or as early as possible in pregnancy	None
2	At least 4 weeks after TT1	1–3 years
3	At least 6 months after TT2 or during subsequent pregnancy	At least 5 years
4	At least 1 year after TT3 or during subsequent pregnancy	At least 10 years
5	At least 1 year after TT4 or during subsequent pregnancy	For all reproductive years and possibly longer

*Recent studies suggest that the duration of protection may be longer than indicated in the table. This matter is currently under review.

Disease	How it is transmitted	Signs, symptoms, and complications	Vaccine information	How vaccine is administered
<p>Polio</p> <p>Polio is a highly infectious viral disease that mainly affects young children.</p>	<p>Spread by the oral-fecal route</p> <p>Only about 1 in 200 infected people show serious symptoms, yet they can still spread the disease</p>	<p>25% of people infected develop minor illness, including fever, headache, and sore throat.</p> <p>Paralysis occurs in 1% of those infected. Death occurs in 5-10% of those paralyzed.</p>	<p>To protect against polio disease, both bivalent Oral Polio Vaccine (bOPV) and Inactivated Polio Vaccine (IPV) should be given.</p> <p>bOPV comes in 10-dose vials and is very heat-sensitive. Store between +2 °C and +8 °C.</p> <p>IPV comes in 10-dose vials and be used for 28 days after opening. Store vaccine between +2 °C and +8 °C, without being frozen.</p>	<p>OPV: oral drops. Given at birth, 6 weeks, 10 weeks, and 14 weeks. OPV birth dose ("OPV0") should only be given to a child between 0-14 days old.</p> <p>IPV: Intramuscular injection in the outer right thigh. One dose is needed at 14 weeks of age; the injection is given 2.5cm apart from PCV injection site.</p>

Disease	How it is transmitted	Signs, symptoms, and complications	Vaccine information	How vaccine is administered
<p>Tuberculosis</p> <p>Tuberculosis (TB) is an infectious bacterial disease caused by <i>Mycobacterium tuberculosis</i>, which most commonly affects the lungs.</p> <p>It is the world's leading cause of death from any infectious disease.</p>	<p>Spread from person to person through the air when an infected person coughs or sneezes.</p> <p>TB spreads rapidly, especially in areas where people live in crowded conditions.</p>	<p>Generally affects lungs, but can affect other parts of the body, like the bones, joints, and brain. Infection can persist for months or years before the disease develops.</p> <p>Symptoms general weakness, weight loss, fever, and night sweats are symptoms of TB. Pulmonary TB symptoms include persistent cough, chest pain, and coughing up of blood.</p> <p>Untreated pulmonary TB results in debility and death, which occurs more rapidly in people infected with HIV/AIDS.</p>	<p>Bacille Calmette-Guerin (BCG) vaccine comes in 20-dose vials in the form of freeze-dried powder ("lyophilized vaccine") and must be reconstituted with a diluent before use.</p> <p>Once opened, BCG vials must be discarded at the end of the immunization session, or within 6 hours of opening, whichever comes first.</p> <p>Store vaccine between +2 °C and +8 °C.</p>	<p>Intradermal injection in upper left arm or shoulder</p> <p>1 dose needed – should be given at birth or as soon as possible after birth</p>

Disease	How it is transmitted	Signs, symptoms, and complications	Vaccine information	How vaccine is administered
Pneumococcus Streptococcus pneumoniae, known as pneumococcus, is a common cause of serious diseases such as pneumonia, meningitis, and septicemia (bloodstream infection). It is a leading cause of death in children under 5 years of age.	<p>Spread from person to person by coughing, sneezing, or close contact.</p> <p>Healthy carriers as well as patients can spread pneumococcus.</p>	<p>Pneumococcal disease can affect many parts of the body, so signs, symptoms, and complications vary.</p> <p>Fever and shaking or chills can occur with all types of pneumococcal disease.</p> <p>Children with pneumonia can present with cough, rapid breathing and chest wall retractions. Patients with meningitis can present with headaches, sensitivity to light, neck stiffness, and convulsions.</p>	<p>Pneumococcal conjugate vaccine (PCV) in Ethiopia comes in 2-dose vials and protects against 10 serotypes of pneumococcus (PCV10).</p> <p>PCV10 should be part of a comprehensive strategy to prevent and treat pneumonia and meningitis.</p> <p>Store vaccine between +2 °C and +8 °C, without being frozen.</p>	<p>Intramuscular injection in the outer right thigh</p> <p>3 doses needed – at 6 weeks, 10 weeks, and 14 weeks of age</p>

Disease	How it is transmitted	Signs, symptoms, and complications	Vaccine information	How vaccine is administered
Rotavirus Rotavirus is a common cause of highly infectious gastroenteritis, a leading cause of severe diarrhea, in infants and young children. Death occurs mainly in children 3-12 months of age.	<p>Spread by the oral-fecal route.</p> <p>Found in the environment and is able to spread from contaminated food, water, and objects.</p>	<p>Rotavirus gastroenteritis can range from mild loose stools to severe watery diarrhea and vomiting, leading to dehydration.</p> <p>Symptoms usually begin one to three days after infection. Fever and vomiting can occur before diarrhea. The diarrhea lasts for three to seven days on average.</p> <p>Severe disease leads to rapid dehydration resulting in shock and death, if fluids are not replaced quickly by ORS and, if needed, intravenous infusion.</p>	<p>Rotavirus vaccine in Ethiopia comes in 1-dose liquid form and protects against rotavirus gastroenteritis, but not other causes of diarrhea. It should be included as part of a comprehensive strategy to prevent and control diarrhea.</p> <p>Store vaccine between +2 °C and +8 °C, without being frozen.</p>	<p>Oral drops</p> <p>2 doses needed – at 6 weeks and 10 weeks of age</p>

Disease	How it is transmitted	Signs, symptoms, and complications	Vaccine information	How vaccine is administered
<p>Measles</p> <p>Measles is one of the most contagious viral diseases of humans.</p> <p>It is an important cause of death among young children globally.</p> <p>Very high (90–95%) coverage with two doses is required to prevent measles outbreaks.</p>	<p>Measles is spread through contact with nose and throat secretions of infected people and in airborne droplets when an infected person sneezes or coughs.</p>	<p>The first sign of infection is a high fever lasting 1-7 days. A generalized rash develops 7-18 days after exposure to the virus.</p> <p>Pneumonia is the most common cause of death associated with measles. It is also a major cause of blindness among children in Africa and other endemic places.</p> <p>Severe measles is more likely in poorly nourished children, especially those who do not receive enough vitamin A, live in crowded conditions, or immunocompromised children.</p>	<p>Measles-containing vaccine (MCV) in Ethiopia protects against measles only, and comes in freeze-dried, 10-dose vials.</p> <p>Vials must be discarded within 6 hours of opening or at the end of the vaccination session, whichever comes first. Vials should be opened whenever an eligible child is seen. Every child should be vaccinated as soon as they are old enough to be eligible, but not before. No eligible child should ever be turned away from receiving measles vaccination.</p> <p>Store between +2 °C and +8 °C; vaccine is sensitive to both heat and light.</p>	<p>Subcutaneous injection in the upper left arm</p> <p>2 doses needed – at 9 months and 15 months of age</p>

Disease	How it is transmitted	Signs, symptoms, and complications	Vaccine information	How vaccine is administered
<p>Human papillomavirus (HPV)</p> <p>HPV is a common sexually transmitted virus. 90% of infections clear within 2 years, but HPV infection that continues can progress to cervical cancer with specific types of HPV (70% comes from types 16 & 18).</p> <p>Cervical cancer is the leading cause of cancer death among women in developing countries.</p>	<p>HPV spreads easily by skin-to-skin contact.</p> <p>Almost all sexually active individuals become infected with HPV, usually early in their sexual lives.</p>	<p>Most HPV infections do not cause symptoms or disease and usually clear on their own. Progression from HPV infection to cervical cancer takes about 20 years and tends to cause symptoms only after the cancer has advanced.</p> <p>Symptoms and signs of cervical cancer include abnormal vaginal bleeding; pelvic, back and/or leg pain; vaginal discharge; fatigue and weight loss. Anemia, renal failure, and fistula can also occur in advanced stages of cervical cancer.</p>	<p>HPV vaccine in Ethiopia comes in single-use vials and protects against four HPV types (6 and 11 which cause genital warts, and 16 and 18 which cause cervical cancer).</p> <p>Store vaccine between +2 °C and +8 °C, without being frozen.</p>	<p>Intramuscular injection in the upper left arm</p> <p>Girls 9-14 years of age; 2 doses are needed, with the 2nd dose occurring 6 months after the 1st dose.</p>

It is important that the vaccines detailed in the prior tables are given according to the Ethiopian national immunization schedule, which is currently as follows:

Birth	6 weeks	10 weeks	14 weeks	9 months	15 months	9 to 14 years (girls)	Pregnancy
BCG	<u>First dose of:</u>	<u>Second dose of:</u>	IPV				
OPV birth dose ("OPV0")	Pentavalent	Pentavalent	<u>And third dose of:</u>	<u>First dose of:</u>	<u>Second dose of:</u>	<u>Two doses of:</u>	
	OPV	OPV	Pentavalent	Measles	Measles	HPV*	Tetanus toxoid**
Hep B birth dose	PCV	PCV	OPV			(2 nd dose 6 mo. after 1 st dose)	
	Rota	Rota	PCV				

* Ethiopia will introduce HPV vaccine in 2018 only to 14-year-old girls, and depending on availability of the vaccine to multi-age cohorts (9-13 years) in 2019. In subsequent years, all girls aged 9 years will be targeted.

** Doses needed dependent on number and timing of prior pregnancies. See table on page 11 for dosing schedule.

See the table on the following pages for a vaccine reference table.

Vaccine/ Antigen	Target Disease	Doses	Schedule	Dose and route of administration	Site of administration	Contraindications	Special precaution
BCG	Tuberculosis	1	At birth or soon after	0.05 ml; ID	Right upper arm (deltoid)	Symptomatic HIV infection or other immune deficiencies	Correct intradermal administration is essential; a specific syringe and needle are used for BCG
Hep B	Hepatitis B	1	Within 24 hrs of birth	0.5ml; IM	Left (outer) thigh	Anaphylactic reaction to any constituent	None
OPV	Poliomyelitis	3-4	At birth, 6,10 & 14 weeks	Two drops	Oral	Anaphylactic reaction to previous dose or to any constituent	Birth dose “OPV0” should be given to child 0-14 days after birth
IPV	Poliomyelitis	1	At 14 weeks (with penta, OPV, and PCV)	0.5 ml; IM	Right (outer) mid-thigh	Anaphylactic reaction to previous dose or to any constituent	Postpone vaccination if the child has moderate to severe illness (temp. $\geq 39^{\circ}\text{C}$)

Vaccine/ Antigen	Target Disease	Doses	Schedule	Dose and route of administration	Site of administration	Contraindications	Special precaution
DTP- HepB-Hib (Penta)	Diphtheria, Tetanus, Pertussis, H. influenza pneumonia & meningitis, Hepatitis B	3	At 6,10 & 14 weeks	0.5 ml; IM	Left (outer) mid-thigh	Anaphylactic reaction to previous dose or to any constituent	Use only stand- alone Hep B vaccine for Hep B birth dose (Do not use pentavalent for birth dose Hep B)
PCV 10	Pneumonia and others caused by S. pneumoniae	3	6,10 & 14 weeks	0.5 ml; IM	Right (outer) mid-thigh (2.5cm away from IPV injection)	Anaphylactic reaction to previous dose or to any constituent	Postpone vaccination if the child has moderate to severe illness (temp. $\geq 39^{\circ}\text{C}$)

Vaccine/ Antigen	Target Disease	Doses	Schedule	Dose and route of administration	Site of administration	Contraindications	Special precaution
Rotarix®	Rotavirus gastroenteritis	2	At 6 and 10 weeks	1.5ml; Oral	Oral only	Severe allergic reaction to previous dose; severe immunodeficiency (but not HIV infection)	Should be postponed for acute gastroenteritis, fever with moderate to severe illness. Not routinely recommended for history of intussusception or intestinal malformations possibly predisposing to intussusception.

Vaccine/ Antigen	Target Disease	Doses	Schedule	Dose and route of administration	Site of administration	Contraindications	Special precaution
Measles	Measles	2	At 9 and 15 months	0.5 ml; SC	Left upper arm	Known allergy to vaccine; pregnancy; severe congenital or acquired immune disorders, including advanced HIV infection/AIDS	None
HPV	Cervical cancer (type 16 & 18) Genital warts (Type 6 & 11)	2	9-14 years of age (girls only); second dose is 6 months after 1 st dose	0.5 ml; IM	Left upper arm (deltoid)	Anaphylactic reaction to previous dose or to any constituent	Postpone vaccination for pregnancy; Adolescents should be seated during injections and for 15 minutes afterwards since they sometimes faint

Vaccine/ Antigen	Target Disease	Doses	Schedule	Dose and route of administration	Site of administration	Contraindications	Special precaution
TT	Tetanus	1-5	During pregnancy; See page 11	0.5 ml; IM	Upper arm (deltoid)	Known hypersensitivity (allergy) or anaphylaxis to a previous dose	None

To handle multi-dose vials, WHO recommends the following Multi-Dose Vial Policy:

All opened WHO-prequalified multi-dose vials of vaccines should be discarded at the end of the immunization session, or within six hours of opening, whichever comes first, unless the vaccine meets all four of the criteria listed below. If the vaccine meets the four criteria, the opened vial can be kept and used for up to 28 days after opening. The criteria are as follows:

1. The vaccine is currently prequalified by WHO.
2. The vaccine is approved for use for up to 28 days after opening the vial, as determined by WHO.
3. The expiry date of the vaccine has not passed.
4. The vaccine vial has been, and will continue to be, stored at WHO- or manufacturer-recommended temperatures; furthermore, the vaccine vial monitor, if one is attached, is visible on the vaccine label and is not past its discard point, and the vaccine has not been damaged by freezing.

If ALL of the criteria cited above are present, the vaccine vial may be kept and used for up to 28 days after opening, or until all the doses are administered.

In Ethiopia, OPV, IPV, TT, Hep B, BCG, measles, and PCV vaccines come in multi-dose containers. Only OPV, IPV, TT, and Hep B vaccines contain preservatives. If health workers check the vials of OPV, IPV, TT, and Hep B vaccine and find that they meet the four criteria above, then those vials may be kept and used for up to 28 days after they are opened. In contrast, BCG and measles vaccines can only be used for up to six hours after reconstituting them, or the end of the immunization session, whichever comes first. Vials of PCV vaccine can only be used for up to six hours of opening them, or at the end of the session, whichever comes first. After that point, the vials of BCG, measles, and PCV must be discarded.

