Table 2: Summary of WHO Position Papers - Recommended Routine Immunizations for Children

Antigen		Age of 1st Dose	Doses in Primary Series	Interval Between Doses			Booster Dose	Considerations (see footnotes for details)
				1st to 2nd	2nd to 3rd	3rd to 4th		
Recommendations for all children								
BCG [1]		As soon as possible after birth	1					Exceptions HIV
Hepatitis B [2]	**Option 1**	As soon as possible after birth (<24h)	3	4 weeks (min) with DTP1	4 weeks (min) with DTP3			Premature and low birth weight Co-administration and combination vaccine High risk groups
	Option 2	As soon as possible after birth (<24h)	4	4 weeks (min) with DTP1	4 weeks (min) with DTP2	4 weeks (min),with DTP3		
Polio [3]	**OPV**	6 weeks (see footnote for birth dose)	3	4 weeks (min) with DTP2	4 weeks (min) with DTP3			OPV birth dose Transmission and importation risk criteria IPV booster needed for early schedule
	IPV / OPV Sequential	8 weeks (IPV 1st)	1-2 IPV 2 OPV	4-8 weeks	4-8 weeks	4-8 weeks		
	IPV	8 weeks	3	4-8 weeks	4-8 weeks		(see footnote)	
DTP [4]		6 weeks (min)	3	4 weeks (min) - 8 weeks	4 weeks (min) - 8 weeks		1-6 years of age (see footnote)	Delayed/ interrupted schedule Combination vaccine
***Haemophilus influenzae* type b** [5]		6 weeks (min) with DTP1, 24 months (max)	3	4 weeks (min) with DTP2	4 weeks (min) with DTP3		(see footnote)	Single dose if >12 months of age Delayed/ interrupted schedule Co-administration and combination vaccine
Pneumococcal (Conjugate) [6]	**Option 1**	6 weeks (min)	3	4 weeks (min)	4 weeks		(see footnote)	Vaccine options Initiate before 6 months of age Co-administration HIV+ and preterm neonates booster
	Option 2	6 weeks (min)	2	8 weeks (min)			9-15 months	
Rotavirus [7]	**Rotarix**	6 weeks (min) with DTP1	2	4 weeks (min) with DTP2				
	Rota Teq	6 weeks (min) with DTP1	3	4 weeks (min) - 10 weeks with DTP2	4 weeks (min) with DTP3			
Measles [8]		9 or 12 months (6 months min, see footnote)	2	4 weeks (min) (see footnote)				Combination vaccine; HIV early vaccination; Pregnancy
Rubella [9]		9 or 12 months with measles	1					Achieve and sustain 80% coverage Combination vaccine and Co-administration; Pregnancy
HPV [10]		Quadrivalent 9-13 years of age Bivalent 10-13 years of age	3	Quadrivalent - 2 mos (min 4 wks) Bivalent - 1 mos (max 2.5 mos)	Quadrivalent - 4 mos (min 12 wks) Bivalent - 5 mos			Vaccination of males for prevention of cervical cancer not recommended currently

Refer to http://www.who.int/immunization/documents/positionpapers/ for table & position paper updates.

This table summarizes the WHO vaccination recommendations for children.The ages/intervals cited are for the development of country specific schedules and are not for health workers.

National schedules should be based on local epidemiologic, programmatic, resource & policy considerations. While vaccines are universally recommended, some children may have contraindications to particular vaccines.

Table 2: Summary of WHO Position Papers - Recommended Routine Immunizations for Children

Antigen		Age of 1st Dose	Doses in Primary Series	Interval Between Doses			Booster Dose	Considerations (see footnotes for details)
				1st to 2nd	2nd to 3rd	3rd to 4th		
Recommendations for children residing in certain regions								
Japanese Encephalitis [11]	**Mouse-brain derived**	1 year	2	4 weeks (min)			After 1 year and every 3 years up to 10-15 years of age	Vaccine options
	Live attentuated	9-12 months	1				After 1 year	
Yellow Fever [12]		9-12 months with measles	1					Co-administration
Tick-Borne Encephalitis [13]		≥ 1 yr FSME-Immun and Encepur ≥ 3 yrs TBE_Moscow and EnceVir	3	1-3 months FSME-Immun and Encepur 1-7 months TBE-Moscow and EnceVir	5-12 months FSME-Immun and Encepur 12 months TBE-Moscow and EnceVir		At least 1 Every 3 years (see notes)	Definition of high-risk Vaccine options Timing of booster
Recommendations for children in some high-risk populations								
Typhoid [14]	**Vi PS**	2 years (min)	1				Every 3 years	Definition of high risk
	Ty21a	Capsules 5 years (min) (see footnote)	3 or 4	1 day	1 day	1 day	Every 3-7 years	Definition of high risk
Cholera [15]	**Dukoral (WC-rBS)**	2 years (min)	3 (2-5 years) 2 (≥6 years)	≥ 7 days (min) < 6 weeks (max)	≥ 7 days (min) < 6 weeks (max)		Every 6 months Every 2 years	Minimum age Definition of high risk
	Shanchol and mORCVAX	1 year (min)	2	14 days			After 2 years	
Meningococcal [16]	**MenA conjugate**	1-29 years	1				After 1 year	Definition of high risk; Vaccine options
	MenC conjugate	2-11 months	2	8 weeks				Definition of high risk; Vaccine options
		≥12 months	1					
	Quadrivalent conjugate	9-23 months	2	12 weeks				Definition of high risk; Vaccine options
		≥2 years	1					
Rabies [18]		As required	3	7 days	14-21 days		(see footnote)	Definition of high risk, booster
Recommendations for children receiving vaccinations from immunization programmes with certain characteristics								
Mumps [19]		12-18 months with measles	2	1 month (min) to school entry				Coverage criteria > 80%; Combo vaccine
Influenza (Inactivated) [20]		6 months (min)	2 (<9 years) 1 (>9 years)	1 month				Revaccinate annually: 1 dose only Priority targets

Summary Table 2 - Notes

- Refer to http://www.who.int/immunization/documents/positionpapers/ for the most recent version of the tables and position papers.
- The attached table summarizes the recommendations for vaccine administration found in the WHO position papers which are published in the Weekly Epidemiological Review. Its purpose is to assist planners to develop an appropriate immunization schedule. Health care workers should refer to their national immunization schedules. While vaccines are universally recommended, some children may have contraindications to particular vaccines.
- Vaccines can generally be co-administered (i.e. more than one vaccine given at different sites during the same visit). Recommendations that explicitly endorse co-administration are indicated in the table, however, lack of an explicit co-administration recommendation does not imply that the vaccine cannot be co-administered; further, there are no recommendations against co-administration.
- Doses administered by campaign may or may not contribute to a child's routine immunization schedule depending on type and purpose of campaign (e.g. supplemental versus routine/pulse campaign for access reasons).
- For some antigens, recommendations for the age of initiation of primary immunization series and/or booster doses are not available. Instead, the criteria for age at first dose must be determined from local epidemiologic data.
- If a catch-up schedule for interrupted immunization is available, it is noted in the footnotes.
- Other vaccines, such as varicella and pneumococcal polysaccharide vaccines, may be of individual benefit but have not been generally recommended for routine immunization. See the specific position papers for more details.
- For further background on immunization schedules refer to "Immunological Basis for Immunization" series which is available at http://www.who.int/immunization/documents/immunological_basis_series/en/index.html

[1] BCG

- Position paper reference: Weekly Epid. Record (2004, 79: 27-38) [pdf 468kb]
- Recommended for children living in countries with a high-disease burden and for high-risk children living in countries with low-disease burden. See position paper for details.
- While BCG vaccination is especially important in countries with significant HIV prevalence, children who are HIV positive or unknown HIV status with symptoms consistent with HIV should not be vaccinated. Reference: Weekly Epid. Record (2007, 82: 193-196) [pdf 167kb]

[2] Hepatitis B

- Position paper reference: Weekly Epid. Record (2009, 84: 405-420) [pdf 830kb]
- Since perinatal or early postnatal transmission is an important cause of chronic infections globally, all infants should receive their first dose of hepatitis B vaccine as soon as possible (<24 hours) after birth even in low-endemicity countries.
- The primary hepatitis B immunization series conventionally consists of 3 doses of vaccine (1 monovalent birth dose followed by 2 monovalent or combined vaccine doses at the time of DTP1 and DTP3 vaccine doses). However, 4 doses may be given for programmatic reasons (e.g. 1 monovalent birth-dose followed by 3 monovalent or combined vaccine doses with DTP vaccine doses), according to the schedules of national routine immunization programmes.
- Premature low birth weight (<2000g) may not respond well to vaccination at birth. However, by 1 month of chronological age, premature infants, regardless of their initial weight or gestational age at birth, are likely to respond adequately. Therefore, doses given to infants <2000g should not be counted towards the primary series.
- Additional target groups for vaccination include people with risk factors for acquiring HBV infection, such as those who frequently require blood or blood products, dialysis patients, recipients of solid organ transplantations, people interned in prisons, injecting drug users, household and sexual contacts of people with chronic HBV infection, people with multiple sexual partners, as well as health-care workers and others who may be exposed to blood and blood products through their work.

[3] Polio

- Reference: Weekly Epid. Record (2010, 85: 213-228) [pdf 815.1kb]
- The primary series of 3 OPV vaccinations should be administered according to the respective national immunization schedule, for example at 6, 10 and 14 weeks, or 2, 4, and 6 months of age. The interval between doses should be at least 4 weeks.
- Where the potential for poliovirus importation is very high (i.e. in countries bordering endemic countries or countries that have recurrent outbreaks) or high (i.e. country with a history of importation plus high traffic across the border), and the transmission potential high (e.g. <90% DTP3 coverage, low socio-economic status, majority of areas with open sewage) or moderate (e.g. <90% DTP3 coverage, all states/provinces with moderate socio-economic status, only secondary sewage treatment) an OPV birth dose should be given as soon as possible after birth.
- OPV alone, including a birth dose, is recommended in all polio-endemic countries and those at high risk for importation and subsequent spread. A birth dose is not considered necessary in countries where the risk of polio virus transmission is low, even if the potential for importation is high/very high.
- Where the risk of wild polio virus importation is high/very high, the transmission potential should be low (>90-95% DTP3 coverage, high socio-economic status, tertiary sewage treatment) before alternatives to OPV alone may be considered.
- In countries with very high risk of wild polio virus importation, a sequential IPV/OPV schedule should not be introduced unless immunization coverage is approximately 95%, or, with low importation risk, approximately 90%. Where sequential IPV/OPV is used, the initial administration of 1 or 2 doses of IPV should be followed by 2 or more doses of OPV to ensure both sufficient levels of protection in the intestinal mucosa and a decrease in the burden of vaccine-associated paralytic poliomyelitis (VAPP). For IPV/OPV sequential schedules WHO recommends that IPV be administered at 2 months of age (e.g. an IPV-OPV-OPV schedule) or at 2 months and 3-4 months of age (e.g. a 4-dose schedule of IPV-IPV-OPV-OPV). Each dose of the primary series, whether IPV or OPV, should be separated by an interval of 4-8 weeks, depending on the risk of exposure to polio in early childhood.
- IPV alone can be considered as an alternative to OPV alone (or an IPV/OPV sequential schedule) only in countries with the lowest risk of both wild polio importation and WPV transmission. IPV may be offered as a component of combination vaccines. A primary series of 3 IPV doses should be administered beginning at 2 months of age. If the primary series begins earlier (e.g. with a 6, 10, and 14 week schedule) then a booster dose should be administered with an interval of at least 6 months (4-dose IPV schedule).
- Switching from OPV to IPV for routine vaccination during the pre-eradication era is not cost-effective based on the existing economic analyses and current IPV costs.

[4] DTP (Diphtheria, Tetanus and Pertussis)

- Position paper reference: Diphtheria - Weekly Epid. Record (2006, 81: 24-32) [pdf 214kb]; Tetanus - Weekly Epid. Record (2006, 81: 198-208) [pdf 229kb]; Pertussis - Weekly Epid. Record (2010, 85: 385-400) [pdf 320kb]
- Recommended for three doses during the first year of life. In areas where pertussis is of particular risk to young infants, DTP should be started at 6 weeks with 2 subsequent doses at intervals of 4-8 weeks each. The last dose of the primary series should be completed by the

age of 6 months.

- The duration of immunological protection will be extended in many instances if an additional booster is given later.
- Diphtheria booster - to compensate for the loss of natural diphtheria boosting in some areas, childhood boosters should be given. The optimal timing of and number of diphtheria-containing booster doses should be based on epidemiological surveillance as well as on immunological and programmatic considerations.
- Tetanus toxoid containing booster - A childhood tetanus immunization schedule of 5 doses is recommended. Boosters are ideally administered in early childhood and during adolescence e.g. 12-15 years. Tetanus booster doses may use either DTP or Td vaccines depending on the child's age. Td should be used for tetanus and diphtheria booster doses after the age of 7 years.
- Pertussis vaccine: Neo-natal immunization, and vaccination of pregnant women and household contacts ("cocooning") against pertussis is not recommended by WHO.
- Both acellular (aP) and whole cell pertussis (wP) containing vaccines have excellent safety records, and protection against severe pertussis in infancy and early childhood can be obtained with wP or aP vaccine. Changing among or within the wP and aP vaccine groups is unlikely to interfere with the safety or immunogenicity of these vaccines.
- Only aP-containing vaccines should be used for vaccination of those >6 years.
- Pertussis containing booster - A booster dose is recommended for children age 1-6 years, preferably during the second year of life. The booster should be given > 6 months after the last primary dose. Completion of this schedule (primary series plus booster) is expected to ensure protection against pertussis for > 6 years.
- Delayed or interrupted DTP series - Children 1-7 years or older who have not previously been immunized should receive three doses of wP or aP vaccine, with an interval of 2 months between the first and second dose and an interval of 6-12 months between the second and third. Children whose vaccination series has been interrupted should have their series resumed, without repeating previous doses. For unvaccinated individuals 7 years of age and older, Td combination vaccine can be administered, 2 doses 1-2 months apart and a third dose after 6-12 months can be used with subsequent boosters at least 1 year apart for a total of 5 appropriately spaced doses to obtain same long term protection. See position paper for details of interrupted immunization schedules.

[5] *Haemophilus influenzae* type b (Hib)

- Position paper reference: Weekly Epid. Record (2006, 81: 210-220) [pdf 209kb]
- Immunization should start as early as possible after the age of 6 weeks.
- The 3-dose primary series is given at the same time as the DTP primary series often in combination vaccines.
- The vaccine is not generally offered to children aged >24 months owing to the limited burden of Hib disease among children older than that age.
- Delayed series - if a child 12-24 months of age has not received their primary vaccination series, a single dose of the vaccine is sufficient.
- Booster dose may be administered to children aged between 12-18 months although there is no WHO recommendation on this yet.

[6] Pneumococcal (Conjugate)

- Position paper reference: Weekly Epid. Record (2012, 87: 129-143) [pdf 1.04 Mb]
- Pneumococcal conjugate vaccines (PCVs) are considered safe in all target groups for vaccination, also in immunocompromised individuals. The vaccines are not currently licensed for use in age groups that include women of childbearing age. Although theoretically highly unlikely to be harmful, there is no information on the safety of PCV10 and PCV13 during pregnancy.
- Except for very rare anaphylactic reactions that may follow the administration of any medicine, there are no contraindications to the use of these vaccines. However, it is advisable to defer vaccination until after an acute infection with temperature >39 °C.
- When injected at different sites, PCVs can be administered concurrently with any other vaccines in infant immunization programmes.
- When primary immunization is initiated with one of these vaccines, it is recommended that remaining doses are administered with the same product. Interchangeability between PCV10 and PCV13 has not yet been documented. However, if it is not possible to complete the series with the same type of vaccine, the other PCV product should be used.
- For infants, 3 primary doses (the 3p+0 schedule) or, as an alternative, 2 primary doses plus a booster (the 2p+1 schedule).
- In choosing between the 3p+0 and 2p+1 schedules, countries should consider locally relevant factors including the epidemiology of pneumococcal disease, the likely coverage, and the timeliness of the vaccine doses.
- If disease incidence peaks in young infants (<32 weeks of age), a 2p+1 schedule might not offer optimal individual protection for certain serotypes (e.g. 6B, 23F) compared to a 3p+0 schedule, particularly in the absence of herd protection.
- In contrast, higher antibody levels are induced by the third (booster) dose in a 2p+1 schedule compared to the third dose in a 3p+0 schedule. This may be important for duration of protection or effectiveness against some serotypes.
- If the 3p+0 schedule is used, vaccination can be initiated as early as 6 weeks of age with an interval between doses of 4–8 weeks, depending on programmatic convenience.
- If the 2p+1 schedule is selected, the 2 primary doses should ideally be completed by six months of age, starting as early as 6 weeks of age with a minimum interval of 8 weeks or more between the two doses (for infants aged ≥7 months a minimum interval of 4 weeks between doses is possible). One booster dose should be given between 9–15 months of age.
- Previously unvaccinated or incompletely vaccinated children (including those who had laboratory confirmed invasive pneumococcal disease) should be vaccinated using the recommended age-appropriate regimens. Interrupted schedules should be resumed without repeating the previous dose.
- HIV-positive infants and pre-term neonates who have received their 3 primary vaccine doses before reaching 12 months of age may benefit from a booster dose in the second year of life.
- Catch-up vaccination as part of introduction will accelerate herd protection and therefore the PCV impact on disease and carriage. Maximized protection at the time of introduction of PCV10 or PCV13 can be achieved by providing 2 catch-up dose(s) at an interval of at least 8 weeks to unvaccinated children aged 12–24 months and to children aged 2–5 years who are at high risk of pneumococcal infection.
- Further data are needed from different epidemiological settings on the impact of large-scale PCV vaccination of individuals >50 years of age in order to establish the relative priority of immunization programmes in that age group. However, given the documented effects of herd protection in adult age groups following routine infant immunization with PCV7, higher priority should normally be given to introducing and maintaining high coverage of infants with PCVs.
- The use of pneumococcal vaccine should be seen as complementary to the use of other

pneumonia control measures, such as appropriate case management, promotion of exclusive breastfeeding for first 6 months of life, and the reduction of known risk factors, such as indoor pollutants and tobacco smoke.

- For polysaccharide pneumococcal vaccine see position paper: Weekly Epid. Record (2008, 83: 373-384) [pdf 308kb]
- In resource-limited settings where there are many competing health priorities, evidence does not support routine immunization of the elderly and high-risk populations with PPV23. Also, because of the low level of evidence for benefit, routine PPV23 vaccination of HIV-infected adults is not recommended in such settings. In countries that do not routinely administer PPV23 to high-risk populations, data are insufficient to recommend introducing this vaccine to reduce the morbidity and mortality associated with influenza.

[7] Rotavirus

- Position paper reference: Weekly Epid. Record (2009, 84: 533-540) [pdf 764kb]] NOTE: This position paper is currently being revised in light of the vaccination schedule recommendations made by SAGE at their April 2012 meeting Weekly Epid Record (2012, 87; 201-216) [pdf 1.11Mb]
- Recommended to be included in all national immunization programmes.
- Rotarix vaccine is administered orally in a 2-dose schedule with the first and second doses of DTP.
- RotaTeq requires an oral 3-dose schedule with DTP1, DTP2, and DTP3 with an interval of 4-10 weeks between doses.
- First dose of either RotaTeq or Rotarix be administered as soon as possible from 6 weeks of age.
- The interchangeability of the current rotavirus vaccines is unknown.
- In various settings, rotavirus vaccines have been found not to interfere significantly with the immunogenicity or safety of OPV or other childhood vaccines.
- The use of rotavirus vaccines should be part of a comprehensive strategy to control diarrhoeal diseases and should include, among other interventions, improvements in hygiene and sanitation, zinc supplementation, community-based administration of oral rehydration solution and overall improvements in case management.

[8] Measles

- Position paper reference: Weekly Epid. Record (2009, 84: 349-360) [pdf 724kb]
- Reaching all children with two doses of measles vaccine should be the standard for all national immunization programmes.
- Delivery of the second dose (MCV2) may occur either at a scheduled age through routine services or periodically through mass campaigns, depending on which strategy achieves the higher coverage. A MCV2 dose may be added to the routine immunization schedule in countries that have achieved > 80% coverage of measles first dose (MCV1) at the national level for 3 consecutive years as determined by the most accurate means available (e.g. survey or WHO/UNICEF estimates). In general, countries that do not meet this criterion should prioritize improving MCV1 coverage and conducting high-quality follow-up SIAs, rather than adding MCV2 to their routine schedule.
- In countries with ongoing transmission in which the risk of measles mortality remains high, MCV1 should be given at age 9 months. MCV2 should be given between 15-18 months, as providing MCV2 in the 2nd year of life reduces the rate of accumulation of susceptible children and the risk of an outbreak.
- In countries with low rates of measles transmission (that is, those that are near elimination) and where there is a low risk of measles infection among infants, the first dose may be administered at age 12 months to take advantage of the higher seroconversion rates achieved at this age (>90% seroconversion). In these countries the optimal age for delivering a routine 2nd dose of measles is based on programmatic considerations that achieve the highest coverage and hence the highest population immunity. Administration of the second dose at age 15-18 months ensures early protection of the individual, slows accumulation of susceptible young children and may correspond with other routine immunizations (for example, DTP booster). If first dose coverage is high (>90%) and school enrolment is high (>95%), giving the second dose at school entry may be an effective strategy for achieving high coverage and preventing outbreaks in schools.
- Combined vaccines (Measles and Rubella or Measles, Mumps and Rubella) may not be optimal for use in countries where vaccine coverage for measles vaccine of at least 80% cannot be achieved or maintained.
- Measles vaccination should be routinely administered to potentially susceptible, asymptomatic HIV-positive children and adults. In areas where there is a high incidence of both HIV infection and measles, MCV1 may be offered as early as age 6 months. Two additional doses of measles vaccine should be administered to these children according to the national immunization schedule.
- Mild, concurrent infections are not considered a contraindication to vaccination, but it should be avoided if the patient has a high fever or other signs of serious disease. Theoretically, measles vaccine - alone or in combination with other vaccines - should also be avoided by pregnant women. Furthermore, measles vaccination is contraindicated in people who are severely immunocompromised due to congenital disease; severe HIV infection; advanced leukaemia or lymphoma, etc.

[9] Rubella

- Position paper reference: Weekly Epid. Record (2011, 86: 301-316) [pdf 413kb]
- All countries that have not yet introduced rubella vaccine, and are providing 2 doses of measles vaccine using routine immunization, or SIAs, or both, should consider including rubella containing vaccines (RCVs) in their immunization programme. Countries planning to introduce RCVs should review the epidemiology of rubella, including the susceptibility profile of the population; assess the burden of CRS; and establish rubella and CRS prevention as a public health priority.
- Because rubella is not as highly infectious as measles and because the effectiveness of 1 dose of an RCV is > 95% even at 9 months of age, only 1 dose of rubella vaccine is required to achieve rubella elimination if high coverage is achieved. However, when combined with measles vaccination, it may be easier to implement a second dose of RCV's using the same combined MR vaccine or MMR vaccine for both doses.
- There are two general approaches to the use of rubella vaccine: (i) exclusive focus on reducing CRS by immunizing adolescent girls or women of childbearing age, or both groups, to provide individual protection; (ii) focus on interrupting transmission of rubella virus and eliminating rubella and CRS, by introducing rubella vaccination into the routine childhood immunization schedule combined with the vaccination of older age groups who are susceptible to rubella.
- To avoid the potential of an increased risk of CRS, countries should achieve and maintain immunization coverage of 80% or greater with at least 1 dose of an RCV delivered through routine services or regular campaigns, or both.
- The first dose of RCV can be delivered at 9 or 12 months depending on the measles vaccination schedule.
- RCV's can be administered concurrently with inactivated vaccines. As a general rule, live vaccines should be given either simultaneously with RCV's, or at least 4 weeks apart. An exception to this is oral polio vaccine, which can be given at any time before or after RCV's without interfering in the response to either vaccine. Interference may occur between MMR and yellow fever vaccines

if they are simultaneously administered to children < 2 years of age.

- Because of a theoretical, but never demonstrated, teratogenic risk rubella vaccination in pregnant women should be avoided in principle, and those planning a pregnancy are advised to avoid pregnancy for 1 month following vaccination.
- Administration of blood or blood products before or shortly after vaccination may interfere with vaccine efficacy. If using only rubella vaccines persons who received blood products should wait at least 3 months before vaccination and, if possible, blood products should be avoided for up to 2 weeks postvaccination. Vaccinated persons are not eligible to donate blood for 1 month after vaccination

[10] Human Papillomavirus (HPV)

- Position paper reference: Weekly Epid. Record (2009, 84; 118-131) [pdf 267kb]
- Two vaccines are currently available. Quadrivalent (HPV types 6,11,16 and 18) licensed for use in females as young as 9 years of age to prevent cervical precancers and cancers. In addition, the quadrivalent vaccine is licensed for prevention of vulvar and vaginal precancers and cancers as well as anogenital warts in females. In some countries, the vaccine is also licensed for the prevention of anogenital warts in males. Bilvalent (HPV types 16 and 18) has been licensed for use in females as young as 10 years of age to prevent cervical precancers and cancers.
- Both vaccines are intended for females before the onset of sexual activity, i.e. before first exposure to HPV infection. A three-dose schedule is recommended. The quadrivalent is given at baseline and after 2 and 6 months. A minimum interval of 4 weeks between the first and second dose, and a minimum interval between the second and third does of 12 weeks is recommended by the manufacturer. The bivalent vaccine is given at baseline and after 1 and 6 months. If flexibility in the schedule is necessary the manufacturer recommends that the second dose is administered between 1 and 2.5 months after the first dose.
- For both vaccines alternative schedules are being explored. Restarting the 3-dose series is not necessary if interrupted, but remaining doses should be administered as close to the schedule intervals as possible.
- Currently, the manufacturers do not recommend any booster dose following completion of the primary series.
- HPV vaccination of males for prevention of cervical cancer is not recommended at this time because vaccination strategies that achieve high coverage (>70%) in the primary target population of young adolescent girls are expected to be more cost-effective in reducing cervical cancer than including vaccination of males.

[11] Japanese Encephalitis (JE)

- Position paper reference: Weekly Epid. Record (2006, 81: 331-340) [pdf 192kb]
- JE vaccine should be given in all areas where JE constitutes a public health problem.
- Vaccine options - Three types of vaccines are available: (1) a cell culture-based live attenuated, (2) a cell culture-based inactivated and (3) an inactivated mouse brain-derived. The WHO position paper provides recommendations for the mouse brain-derived and live attenuated vaccines.
- Booster - If administering cell culture-based live-attenuated vaccine, a booster dose is currently recommended after an interval of one year, even though observational studies suggest long-term protection after a single dose. If using mouse brain-derived vaccine, a booster dose should be administered after an interval of one year then every 3 years until 10-15 years of age.

[12] Yellow Fever

- Position paper reference: Weekly Epid. Record (2003, 78: 349-359) [pdf 339kb]
- Recommended for use in countries at risk of Yellow Fever.
- For convenience and improved coverage, Yellow Fever vaccine should be administered simultaneously with the measles vaccine, but in a separate syringe and at a different injection site.
- Yellow Fever vaccine should be offered to all travellers to and from at-risk areas, unless they belong to the group of individuals for whom Yellow Fever vaccination is contraindicated.

[13] Tick-Borne Encephalitis (TBE)

- Position paper reference: Weekly Epid. Record (2011, 86: 241-256) [pdf 318kb]
- Since the incidence of tick-borne encephalitis may vary considerably between and even within geographical regions, public immunization strategies should be based on risk assessments conducted at country, regional or district level, and they should be appropriate to the local endemic situation. Therefore, establishing case reporting of the disease is essential before deciding on the most appropriate preventive measures to be taken.
- In areas where the disease is highly endemic (that is, where the average prevaccination incidence of clinical disease is ≥5 cases/100 000 population per year), implying that there is a high individual risk of infection, WHO recommends that vaccination be offered to all age groups, including children.
- Because the disease tends to be more serious in individuals aged >50–60 years this age group constitutes an important target for immunization.
- Where the prevaccination incidence of the disease is moderate or low (that is, the annual average during a 5-year period is <5/100 000) or is limited to particular geographical locations or certain outdoor activities, immunization should target individuals in the most severely affected cohorts.
- People travelling from non-endemic areas to endemic areas should be offered vaccination if their visits will include extensive outdoor activities.
- Vaccination against the disease requires a primary series of 3 doses; those who will continue to be at risk should probably have ≥1 booster doses.
- Within the considerable range of acceptable dose intervals, the relevant national authorities should select the most rational primary schedule for their national, regional or district immunization programmes.
- Although there is a strong indication that the spacing of boosters could be expanded considerably from the intervals currently recommended by the manufacturers (every 3-5 years), the evidence is still insufficient for a definitive recommendation on the optimal frequency and number of booster doses. Countries should therefore continue to recommend the use of vaccines in accordance with local disease epidemiology and current schedules until more definitive information becomes available.
- For the vaccines manufactured in Austria and Germany (FSME-Immun and Encepur;) that can be given starting from > 1year of age an interval of 1–3 months is recommended between the first 2 doses, and 5–12 months between the second and third doses. When rapid protection is required, for example for people who will be travelling to endemic areas, the interval between the first 2 doses may be reduced to 1–2 weeks.
- With the vaccines manufactured in the Russian Federation (TBE-Moscow and EnceVir) the recommended intervals are 1–7 months between the first 2 doses, and 12 months between the second and third doses. Booster doses are recommended every 3 years for those at continued risk of exposure.

- The currently recommended booster interval should be maintained until more data have been obtained on the duration of protection induced by the Russian vaccines.
- Regardless of the duration of the delay, interrupted schedules should be resumed without repeating previous doses.

[14] Typhoid

- Position paper reference: Weekly Epid. Record (2008, 83: 49-59) [pdf 297kb]
- Recommended for school-age and/or preschool-age children in areas where typhoid fever in these age groups is shown to be a significant public health problem, particularly where antibiotic-resistant *S. Typhi* is prevalent.
- Vaccine options - Vi polysaccharide typhoid vaccine requires one parenterally administered dose which may be given after the age of 2 years; the liquid form of Ty21a live oral vaccine (for use in individuals from the age of 2 years) is no longer available; the capsule form of Ty21a (for use in individuals from the age of 5 years) requires 3 or 4 orally administered doses. See position paper for further details.
- Booster - In most endemic settings, a booster dose of the concerned vaccine 3 to 7 years after the primary immunization seems appropriate.

[15] Cholera

- Position paper reference: Weekly Epid. Record (2010, 85, 117-128) [pdf 283kb]
- In cholera-endemic countries, vaccinating the entire population is not warranted. Rather, vaccination should be targeted at high-risk areas and population groups. The primary targets for cholera vaccination in many endemic areas are preschool-aged and school aged children. Other groups that are especially vulnerable to severe disease and for which the vaccines are not contraindicated may also be targeted, such as pregnant women and HIV-infected individuals. Consider vaccinating older age groups if funding is available.
- Two types of oral cholera vaccines are available: (i) Dukoral (WC-rBS) and (ii) Sanchol and mORCVAX. The live attenuated single-dose vaccine (CVD 103-HgR) is no longer produced. The injectable vaccine is still manufactured in a few countries but its use is not recommended mainly because of its limited efficacy and short duration of protection.
- Dukoral is not licensed for children < 2 years. Children aged 2-5 years should receive 3 doses ≥7 days apart (but not more than 6 weeks). Intake of food and drink should be avoided for 1 hour before and after vaccination. If the interval between doses is delayed >6 weeks, primary vaccination should be restarted. One booster dose is recommended every 6 months, and if the interval between primary immunization, and the booster is >6 months, primary immunization must be restarted.
- Adults and children ≥6 years should receive 2 doses of Dukoral ≥7 days apart (but not more than 6 weeks). Intake of food and drink should be avoided for 1 hour before and after vaccination. If the interval between doses is delayed >6 weeks, primary vaccination should be restarted. A booster dose every 2 years is recommended. If the interval between the primary series and booster immunization is > 2 years, primary immunization must be repeated.
- Shanchol and mORCVAX: two liquid doses orally 14 days apart for individuals ≥1 year. A booster dose is recommended after 2 years.

[16] Meningococcal

- Position paper reference: Weekly Epid. Record (2011, 86: 521-540) [pdf 1.1Mb] (Note: Updated position paper will be available in 2011).
- Conjugate vaccines are preferred over polysaccharide vaccines due to their potential for herd protection and their increased immunogenicity, particularly in children <2 years of age.
- Both conjugate and polysaccharide vaccines are efficacious and safe when used in pregnant women.
- Monovalent MenA conjugate vaccine should be given as one single intramuscular dose to individuals 1-29 years of age. The possible need for a booster is not yet established.
- For monovalent MenC conjugate vaccine one single intramuscular dose is recommended for children aged >12 months, teenagers and adults. Children 2-11 months require 2 doses administered at an interval of a least 2 months and a booster about 1 year after. If the primary series is interrupted, vaccination should be resumed without repeating the previous dose.
- Quadrivalent conjugate vaccines (A,C,W135,Y-D and A,C,W135,Y-CRM) should be administered as one single intramuscular dose to individuals > 2 years. A,C,W135,Y-D is also licensed for children 9-23 months of age, and given as a 2-dose series, 3 months apart beginning at age 9 months. If the primary series is interrupted, vaccination should be resumed without repeating the previous dose.
- Meningococcal polysaccharide vaccines are less, or not, immunogenic in children under 2 years of age.
- Meningococcal polysaccharide vaccines can be used for those > 2 years of age to control outbreaks in countries where limited economic resources or insufficient supply restrict the use of meningococcal conjugate vaccines. Polysaccharide vaccines should be administered to individuals > 2 years old as one single dose. One booster 3-5 years after the primary dose may be given to persons considered to be a continued high risk of exposure, including some health workers. See position paper for details.

[17] Hepatitis A

- Position paper reference: Weekly Epid. Record (2000, 75: 38-44) [pdf 193kb]
- Minimum age of administration is specified by the manufacturer and found on the product label.
- Suggested for persons at high-risk in countries with low endemicity of hepatitis A as well as those populations living in countries of intermediate endemicity. High-risk groups include injection drug users, homosexual men, persons travelling to high-risk areas, and certain ethnic or religious groups. See position paper for details.

[18] Rabies

- Position paper reference: Weekly Epid. Record (2010, 85: 309-320) [pdf 370]
- Production and use of nerve-tissue rabies vaccines should be discontinued and replaced with cell-culture-based vaccines (CCVs).
- Recommended for anyone who will be at continual, frequent or increased risk of exposure to the rabies virus, either as a result of their residence or occupation. Travellers with extensive outdoor exposure in rural high-risk areas where immediate access to appropriate medical care may be limited should also be vaccinated regardless of the duration of stay. Where canine rabies is a public health problem, WHO encourages studies on the feasibility, cost-effectiveness, and long-term impact of incorporating rabies vaccination into the immunization programme for infants and children.
- The series is given by intramuscular or intradermal injection at 0, 7 and 21 or 28 days.
- Intramuscular administration: For adults and children aged ≥2 years, the vaccine should always be administered in the deltoid area of the arm; for children aged < 2 years, the anterolateral area of the thigh is recommended. Rabies vaccine should not be administered in the gluteal area, as the induction of an adequate immune response may be less reliable.

- Booster doses of rabies vaccines are not required for individuals living in or travelling to high-risk areas who have received a complete primary series of pre-exposure or post-exposure prophylaxis with a cell-culture-based rabies vaccine (CCV).
- Periodic booster injections are recommended only for people whose occupation puts them at continual or frequent risk of exposure. If available, antibody monitoring is preferred to the administration of routine boosters.
- Because vaccine-induced immunity persists in most cases for years, a booster is recommended only if rabies-virus neutralizing antibody titres fall to <0.5 IU/ml.
- Antibody testing should be done every 6 months for people at risk of laboratory exposure to high concentrations of live rabies virus, and every 2 years for professionals who are not at continual risk of exposure through their activities, such as certain categories of veterinarians and animal health officers.

[19] Mumps

- Position paper reference: Weekly Epid. Record (2007, 82: 49-60) [pdf 311kb]
- Recommended for use in high performing immunization programs with the capacity to maintain coverage over 80% and where mumps reduction is a public health priority.
- If implemented, a combination vaccine of measles, mumps and rubella is recommended.

[20] Seasonal Influenza (Inactivated Vaccine)

- Position paper reference: Weekly Epid. Record (2005, 33: 279-287) [pdf 220kb]
- The World Health Assembly recommended increased immunization coverage of high-risk groups including the elderly, in those countries where influenza vaccination policies exist (Reference: WHA56.19, 2003). See position paper for detailed description of high-risk groups.
- Dose - If a child under 9 years of age requires vaccination and has not previously received influenza vaccine, a two-dose series with doses one-month apart should be administered. Annual re-vaccination in all individuals and initial vaccination in individuals 9 years of age or older require only a single dose. Children aged 6-36 months should receive half the adult dose.