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Leave No One Behind: Guidance for Planning and Implementing Catch-up Vaccination

World Health Organization

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Purpose of this guidance

- To assist national immunization programmes to establish or refine a **catch-up vaccination policy** and **catch-up schedule,** as an essential component of a well-functioning immunization programme.
- To ensure eligible individuals who miss routine vaccine doses for any reason can be identified and vaccinated at the earliest opportunity.
- To lay out strategies for continuously implementing catch-up vaccination as a component of routine immunization and as an integrated part of the healthcare system, as well as describe intensified strategies to close "immunization gaps" following a significant disruption in immunization services.

This guidance consists of the following sections:

Section 1. Principles of catch-up vaccination

The first section of this guidance document outlines the key policy and programmatic considerations for implementing catch-up vaccination as an on-going or continuous component of routine immunization delivery. All immunization programmes should have a catch-up vaccination policy and catch-up vaccination schedule in place to ensure individuals are able to be vaccinated even if they miss one or more scheduled doses. This guidance covers the main considerations for catch-up vaccination across all aspects of the immunization programme.

Section 2. Special catch-up vaccination efforts following an interruption of services

The second half of this guidance addresses planning and implementing additional large-scale intensified and specialized efforts that may be required to identify and seek out groups who have missed vaccination, to close immunization gaps as quickly as possible following a significant period of interruption or reduction in services. These interruptions or reduction in services are often the result of emergency situations, where routine immunization services are diminished, mass vaccination campaigns are delayed, or vaccine shortages are prolonged. In most cases, a significant interruption in immunization services will be a consequence of a large-scale disruption in the overall health system, therefore any specialized efforts to restart and/or intensify immunization efforts should be part of an overall health system recovery plan.

These specialized efforts should be implemented *in addition to* providing year-round continuous catch-up vaccination through routine immunization services which is outlined in Section 1.

Key terms

Catch-up vaccination – refers to the action of vaccinating an individual, who for whatever reason (e.g. delays, stockouts, access, hesitancy, service interruptions, etc.), is missing/has not received doses of vaccines for which they are eligible, per the national immunization schedule.

- Catchup vaccination can be conducted through regular routine immunization service delivery (fixed, outreach, mobile, school-based), periodic intensification of routine immunization (PIRI) activities, or through innovative local strategies that ensure individuals have the opportunity to receive routine immunizations for which they are overdue and eligible.
- Catch-up vaccination as described in this document is not equivalent to other immunization activities that use the word 'catch-up' such as **'catch-up SIAs'** that are one-time campaigns to vaccinate the main target population responsible for disease transmission in order to rapidly reduce the number of susceptible individuals (see **SIAs** below), other **'catch-up campaigns'** that sometimes accompany new vaccine introductions, or from the strategy of **'catch-up, keep-up, follow-up, speed-up'** used for measles elimination in the Region of the Americas.[1]

Catch-up vaccination policy – as part of the national immunization policy, a catch-up policy should provide clear directives to all actors within the immunization programme on the importance of providing vaccinations for individuals who have missed one or more doses, how to determine eligibility and permissible age ranges, correct recording and reporting of late doses and the value of using every health contact as an opportunity to check vaccination history and provide catch-up as appropriate.

Catch-up vaccination schedule – along with a catch-up policy, every country should have a catch-up vaccination schedule that clearly indicates the age cohorts to whom the catch-up schedule applies, minimum and maximum ages (if applicable as per national policy) and directives on minimum intervals permissible between doses for each antigen, to assist health workers and individuals to complete the vaccination schedule if interrupted or delayed (see Box 1).

Delayed dose – refers to a vaccine dose given "late", or past the window of timeliness set for that vaccine, in the national immunization schedule.

Invalid dose – a vaccine dose is considered invalid if it is administered earlier than the minimum age recommended, or earlier than the minimum interval since the previous dose in the vaccine series. Invalid doses may not elicit an adequate immune response and therefore should be repeated once the individual has reached the minimum age and/or the appropriate minimum interval has passed.

Minimum interval – for vaccines requiring multiple doses, the shortest amount of time permissible between doses in order to provide an adequate immune response. If the interval between the doses is shorter than the minimum interval, the vaccine may not be effective and is considered invalid.

Periodic Intensification of Routine Immunization (PIRI) – an umbrella term to describe a spectrum of time-limited, intermittent activities used to administer routine vaccinations – including catch-up doses – to under-vaccinated populations and/or raise awareness of the benefits of vaccination. Examples include Child Health Days, National Vaccination Weeks, intensified social mobilization efforts, etc. PIRI activities are intended to augment routine immunization services by providing a catch-up opportunity for those who are the usual target for routine services but have been missed or not reached during the year. A key distinction between PIRI and SIAs (see below) is that PIRI doses are recorded on the home-based record/immunization card as routine immunization doses and included in the administrative routine immunization coverage data. In contrast, SIA doses are considered "supplemental" and not

[1] https://www.who.int/immunization/sage/FEASIBILITY_FULL_TEXT_y09_final_draft.pdf

included as part of the administrative routine immunization coverage.[2] (See **Annex F** for an overview of PIRI including benefits, challenges, and considerations)

Supplementary Immunization Activities (SIAs) – refers to vaccination campaigns that aim to quickly deliver vaccination of one (or multiple) antigens to a large target population with the objective of closing immunity gaps in the population. Achieving high population level immunity and speed are the priority, and typically there is no screening of vaccination history/status. The supplementary doses given are tallied but not included in the routine administrative national coverage data. It should be noted that as best practice, some countries use home-based records/immunization cards that include a special separate section for recording "supplementary" doses given.

An SIA should not be confused with a "selective" mass vaccination campaign; the latter does screen for eligibility and records the doses given to each individual on their home-based record/immunization card. In this way, "selective" mass vaccination campaigns are considered a PIRI approach and the doses should be reported in the routine administrative immunization coverage.

Timely dose – refers to a vaccine dose administered within a certain time since the recommended age of vaccination. There is no universal standard window of time within which a vaccine must be given to be considered timely, and the timeliness window may vary for different antigens.

[2] See WHO/UNICEF Guidance note on Criteria to determine if a given vaccination is a routine or supplemental dose: www.who.int/immunization/programmes_systems/policies_strategies/guidance_note_on_vaccination_doses_oct_10_2011.pdf

Overview

- Timely vaccination is key to maintaining population immunity against vaccine-preventable diseases (VPDs), ensuring populations are fully protected against life-threatening illnesses as early as possible, and preventing large outbreaks of VPDs. However, despite best efforts and intentions, individuals may not always receive all vaccinations in a timely manner as per the recommended age in a national immunization schedule.
- Regularly scheduled vaccinations may be missed for a variety of context-specific reasons (e.g. difficulty accessing health services and other health system barriers, health worker practices, stock outs, beliefs held by caregivers and community members about vaccination, etc.).
- No one should miss out on the right to the protection that vaccines offer, simply because they are not able to access services in time.
- **A catch-up vaccination strategy** (which includes a clearly defined catch-up vaccination policy and catch-up schedule) is an **essential part of a well-functioning national immunization programme** and should be implemented on a continuous basis.
- The importance of having a catch-up vaccination strategy is more pronounced when there is an extended interruption of routine immunization services or delay of mass vaccination campaigns (e.g., due to vaccine shortages or system disruptions caused by outbreak, natural disaster, acute conflict, population displacements, insecurity, etc.)
- While every effort must be made to keep immunization services functioning during an emergency, unavoidable disruptions can result in a significant accumulation of susceptible individuals and may require additional specially planned catch-up efforts to address large immunization gaps.

Opportunities for health systems strengthening

Establishing or strengthening policies and systems for catch-up vaccination provides the opportunity for immunization programmes to:

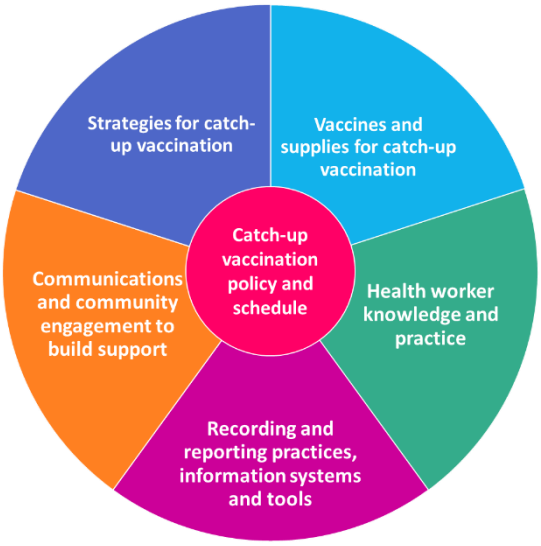
- review the immunization schedule and other technical guidelines, considering the epidemiological context and utilization of health services, including opportunities for optimization and integration with other services;
- identify, understand and modify immunization policy and practice issues that contribute to missed opportunities for vaccination (*e.g.* health worker hesitance to open multi-dose vials for a single child, restrictive target age groups or upper age limits for vaccination, misinformation on contraindications to vaccination and multiple injections, etc.);
- integrate immunization service delivery platforms with other essential health services to strengthen Primary Health Care and to help achieve Universal Health Coverage;
- strengthen collaborations with other sectors to engage or reach populations with immunization reminders or services, such as through daycare and school vaccination checks;
- identify and manage immunization gaps in migrant, internally displaced or refugee populations who may be missing vaccinations per the local immunization schedule;
- address gaps in the supply chain (*e.g.* procurement and distribution delays, suboptimal supply and stock management practices, insufficient cold chain capacity and equipment failure, etc.)
- introduce targeted communications and behavioural interventions to help minimize missed vaccinations;
- bridge immunity gaps through the routine immunization programme and ultimately reduce reliance on large-scale and costly supplemental immunization activities (SIAs).

Section 1. Principles of catch-up vaccination

Introduction

- Everyone should fully benefit from vaccination by receiving recommended vaccines as soon as they are eligible, and those who arrive "late" **should not be denied vaccination**.
- Most vaccines are safe and effective to administer with no upper age limit and while timely vaccination should always be the aim, it is almost always **better to vaccinate late than never**. There are a small number of vaccines for which upper age limits do apply for administration[3], but for most vaccine-preventable diseases (VPDs), providing vaccines late will still result in protection against morbidity and mortality.
- Providing catch-up vaccination for those who have missed doses can have a major impact on closing immunization gaps that would otherwise compound as populations increase in age. As these individuals age, it becomes harder to identify effective ways to reach them with the needed vaccines.
- Having a catch-up vaccination strategy in place is an **essential part of a well-functioning routine immunization programme and should be implemented on a continuous basis** to ensure an individual's right to be offered the benefit of vaccination, even if it is late (see Figure 1).
- All touchpoints with the health system should be used to reduce missed opportunities for vaccination[4], by assessing vaccination status and vaccinating or referring individuals for catch-up vaccination if they have missed any doses.
- A catch-up vaccination strategy relies on the availability of good record keeping of vaccination history – either in individual home-based records (HBRs), facility-based registers or electronic immunization registers (EIRs). Communication to caregivers and individuals on the importance of safeguarding the home-based record and making a habit of bringing it to every health contact can reinforce the value of vaccination and the concept that it is never too late to be immunized.

Figure 1. Elements of a strong catch-up vaccination strategy



[3] For example, rotavirus vaccine is not recommended >24 months, *Haemophilus influenza* type b (Hib) is not recommended >5 years as there is limited benefit beyond these ages due to disease epidemiology; DTP-containing vaccines should only be given with Td and aP if >7 years. For all WHO recommendations for routine immunization and ages of eligibility, see WHO position paper Summary Tables, available at: https://www.who.int/immunization/policy/immunization_tables/en/

[4] See WHO. Missed Opportunities for Vaccination (MOV) Strategy, at: https://www.who.int/immunization/programmes_systems/policies_strategies/MOV/en/

1.1 Establishing a catch-up vaccination policy and schedule

- Every country should have a clear catch-up vaccination policy and catch-up schedule designed in line with the national immunization schedule. **The catch-up policy should provide clarity to health workers on:**
    1) **The importance of providing vaccinations for those who have missed one or more doses within the national immunization schedule,**
    2) **How to determine eligibility including permissible age ranges,**
    3) **Correct recording and reporting of delayed doses,**
    4) **Leveraging every health contact as an opportunity to check vaccination history and catch up on vaccinations as appropriate.**

Decision-making

- WHO has published tables with recommendations for interrupted or delayed immunization, which summarize the recommendations from WHO vaccine position papers in one place.[5] These summary tables are not intended for direct use by health workers, but rather to aid and guide policy and decision-makers. A User's Guide to the Summary Tables [6] is also available, to help support the process of developing or revising immunization schedules.
- Although each country has its own mechanisms for an informed decision-making process on developing or revising immunization policy, it is important to ensure that all relevant stakeholders are consulted and the implications across all components of the immunization programme are considered.
- National immunization technical advisory groups (NITAGs) should be engaged to provide technical and programmatic advice on developing a catch-up vaccination policy and catch-up schedule (see **Box 1**). As part of this process, local disease epidemiology, current immunization coverage levels and programme performance, health system capacity, and implications on budget and logistics (see **Ensuring availability of vaccines and supplies for catch-up vaccination** below) should be taken into consideration. In addition, a review of relevant literature and discussions with countries with established catch-up vaccination policies could further guide this decision-making process.
- Existing policies should be reviewed for any provisions that may negatively impact catch-up vaccination and be revised, if needed. For example, remove restrictive target age groups or upper age limits; diminish restrictions on which cadre of health workers can vaccinate; expand which health workers can (and should) screen home-based records to determine vaccine eligibility, and increase flexibility on where and when immunization takes place.
- Establishing or strengthening policies that encourage presentation of home-based records at every health contact is also important to ensure that all touch points with the health system can be leveraged.
- Catch-up policies should also clearly indicate what to do if evidence of previous vaccination cannot be confirmed. If no vaccination records are available, it should be assumed that the person has not

[5] WHO Summary Table 3: Recommendations for Interrupted or Delayed Immunization. Last updated April 2019. Available at: https://www.who.int/immunization/policy/Immunization_routine_table3.pdf

[6] All WHO summary tables, along with the User's Guide are available in English and French, at: https://www.who.int/immunization/policy/immunization_tables/en/

received the vaccine(s) and vaccination should be offered. It is safe to revaccinate individuals who have been previously vaccinated.[7]

- All revised policies and operational guidance should be disseminated from national, to subnational, and service delivery levels. Revisions should be well-explained and reinforced at all available opportunities, including supportive supervision, academic and in-service trainings, information circulars, etc. Health workers should be trained on the importance and value of catch-up vaccination, and how to adopt these changes in policy into their practices.
- Non-government immunization providers (*e.g.* private, NGO, faith-based, etc.) also need to be informed about the catch-up vaccination policy and catch-up schedule and urged to provide delayed doses in line with national policy, including monitoring and reporting doses administered as per systems in place.

Box 1. Designing a catch-up schedule

- All countries should have a catch-up schedule that includes:
  - Age cohorts to which the catch-up schedule applies (see below);
  - Minimum age and maximum/upper age limit (if applicable as per national policy); and
  - Clear directives on minimum intervals permissible between doses for each antigen.
- As national immunization programmes expand to include vaccination across the life course, multiple catch-up schedules for different target populations/age groups will be needed. This is because the vaccine presentations, number of doses required, and minimum intervals differ depending on an individuals' current age, as well as age at starting a vaccine series.
  - For example, a country may require one catch-up schedule for children <7 years, another catch-up schedule for individuals between 7-18 years, plus additional catch-up schedules applicable to adults over 18 years, as well as special populations (such as health care workers) where recommendations may differ.
  - This will vary by country and the target groups included in the routine immunization programme.
- Catch-up schedules can be designed in a variety of ways and because national immunization schedules vary considerably across countries (and sometimes within), it is not possible to recommend a 'generic' catch-up schedule.
- Examples of catch-up schedules illustrating the variation in design approaches are provided in **Annex A**.

1.2 Ensuring availability of vaccines and supplies for catch-up vaccination

- Planning to introduce a catch-up policy requires an assessment of the vaccine stock management and overall immunization supply chain (iSC) system performance to identify and address any gaps.[8]
- Immunization managers at all levels of the supply chain should closely monitor their actual vaccine stock, vaccine consumption, wastage, and target population in their respective catchment areas, and adjust vaccine forecasts and distribution accordingly, ensuring a buffer stock is maintained on top of any revised consumption.

[7] Moro PL, Arana J, Marquez PL, et al. Is there any harm in administering extra-doses of vaccine to a person? Excess doses of vaccine reported to the Vaccine Adverse Event Reporting System (VAERS), 2007-2017. Vaccine. 2019;37(28):3730-3734. doi:10.1016/j.vaccine.2019.04.088.

[8] The updated Effective Vaccine Management tool (EVM2.0) includes a targeted assessment function for this purpose. See https://extranet.who.int/evm2/web

- Often countries are concerned that implementing catch-up vaccination will lead to shortage of vaccines or stock-outs, as a result of increased demand from older age cohorts who missed vaccination at the recommended age. Health facilities may observe a temporary increase in consumption of certain antigens in the first few months of offering catch-up to an expanded age cohort, particularly if vaccine supply forecasting is done based on previous consumption rather than by target population. However, ensuring that the recommended buffer stock is available is generally sufficient to manage any temporary increase.
- As catch-up vaccination becomes standard practice and forecasting is revised based on updated consumption, vaccine and supply needs should stabilize, based on the following principles:
    - Catch-up vaccination is simply allowing for doses to be provided to individuals that should have already been included in the forecast of vaccines needed to protect that age cohort.
    - Delays between doses in a vaccine series (e.g. Penta1, 2, 3) does not require restarting the entire series, regardless of the length of time that has elapsed since the last dose was received. Therefore, catch-up vaccination should not require consumption of any *extra* vaccine per individual (except in some cases where vaccination history cannot be ascertained and re-vaccination with some vaccines may be needed).
    - Expanding eligibility and offering catch-up vaccination to older age cohorts who had missed doses may actually have the overall effect of *reducing* wastage for multi-dose vials of vaccines that must be discarded within six hours[9] (such as BCG, measles-containing vaccine or yellow fever), as more eligible individuals may be vaccinated during a given session.
- The use of electronic vaccine stock and supply management tools (such as the WHO Stock Management Tool (SMT)[10], web-based Vaccine Stock and Supply Management tool (wVSSM)[11], WHO Vaccine Wastage Rates Calculator[12] or other electronic Logistics Management Information System (eLMIS)) should be reinforced, to facilitate proper tracking and monitoring of vaccine supply, distribution, utilization and wastage.
- It is important to remember that providing catch-up vaccination to individuals who have missed doses will serve to raise population level immunity, lower the risk of outbreaks and ultimately lead to reduced doses needed in the long run for costly non-selective mass preventive and outbreak-response campaigns.

1.3 Building health worker knowledge and practice

- The success of any health intervention depends on competent front-line health workers and managers. For catch-up vaccination to be viewed as a priority, health workers' interpersonal skills, motivations and attitudes need to be addressed in training, supervision, and the feedback they are given. For programmes that historically limited routine immunization to children <1 year, or children <2 years, the expansion of catch-up to older age groups may be entirely new to health workers and require a shift in both attitude and practice.

[9] WHO Policy Statement: Multi-dose vial policy (MDVP), Revision 2014. www.who.int/immunization/documents/general/WHO_IVB_14.07/en/

[10] https://www.who.int/immunization/programmes_systems/supply_chain/resources/tools/en/index5.html; UNICEF forecasting tool: https://www.unicef.org/spanish/supply/index_55506.html

[11] https://www.who.int/immunization/programmes_systems/supply_chain/resources/tools/en/index1.html

[12] Web VSSM can be downloaded here: http://www.wvssm-demo.com/download/; job aid (PAHO) available here: https://www.paho.org/hq/dmdocuments/2013/IM-JobAids-2010-12eng.pdf

- Training, supervision, and other means of post-training support should reinforce the core principle that timely vaccination is ideal but (with few exceptions) late vaccination is preferable to no vaccination at all, as well as the practice of checking for vaccination history at **every** health contact.
- Catch-up schedules, no matter how comprehensive, will not be able to address all possible scenarios that a health worker may encounter. Health workers (if possible, both immunization and non-immunization health workers) should be trained on how to evaluate eligibility of individuals of any age and determine if any missed vaccinations need to be provided.
- For catch-up of vaccines requiring multiple doses in a series, the health worker will need to calculate the appropriate timing for subsequent doses, instruct the caregiver or individual when to return to complete the series, and write this down in their home-based record.
- Updated operational guidance and resource materials should be provided to help health workers understand and implement catch-up vaccination, including best practices for recording and reporting (see **Recording and reporting of catch-up vaccination doses**, below).
- Ideally, healthcare provider academic curricula should be updated to introduce catch-up vaccination policies and practice during academic medical training. Training should be reinforced through supportive supervision and any in-service training of new staff hires.
- See **Box 2** for a summary of instructions for health workers, which can be adapted into a job aid. Additional examples for job aids and tools for assisting health workers are found in **Annexes B-D**.[13]

Assessing vaccination status and determining eligibility

- Written documentation (e.g. home-based record, or immunization register) of vaccination should be used to confirm individual vaccination status/history.
- If evidence of previous vaccination cannot be confirmed, it should be assumed that the person has not received the vaccine(s) and vaccination should be offered. It is safe to revaccinate individuals who have been previously vaccinated.[14,15]
- It may be helpful to provide "catch-up worksheets" for health workers to illustrate the key information needed for calculating eligibility for different vaccine doses, on an individual basis. An example of this tool can be found in **Annex D**.
- Some countries have developed online, computer or mobile phone-based applications to help health workers calculate eligibility for catch-up and answer frequently asked questions about vaccination schedules and catch-up vaccination. Links to examples can be found in **Annex C**.

Minimum intervals between doses in a vaccine series

- The minimum interval is the shortest amount of time permissible between vaccines requiring multiple doses in order to provide an adequate immune response. If the interval between the doses is shorter than the minimum interval, the vaccine may not be effective and is considered invalid.
- For the primary series of most vaccines, the minimum interval between doses is 4 weeks (or approximately 1 month). See **Annex B** for a reference table on minimum intervals that can be

[13] See also WHO *Establishing and strengthening immunization in the second year of life: practices for vaccination beyond infancy* for training resources for health workers on catch-up vaccination.

[14] Moro PL, Arana J, Marquez PL, et al. Is there any harm in administering extra-doses of vaccine to a person? Excess doses of vaccine reported to the Vaccine Adverse Event Reporting System (VAERS), 2007-2017. Vaccine. 2019;37(28):3730-3734. doi:10.1016/j.vaccine.2019.04.088.

[15] Some countries use serological testing to assess immunity status for individuals where evidence of vaccination cannot be ascertained, to determine if revaccination is needed. This method is more costly than revaccination and should only occur in settings where quality testing and guaranteed follow up are feasible.

adapted into a job aid or printed on the back of a catch-up schedule and circulated to health workers.

- Vaccine doses administered earlier than the minimum age recommended in the national immunization schedule or minimum interval should not be counted as valid and should be repeated (as age-appropriate), following the minimum interval after the invalid dose.
- Should a vaccine dose be delayed, for any reason, in most cases it is not necessary to restart the vaccine series.[16] The next dose in the series should be administered as soon as possible and the individual should be told to return for any subsequent doses, after the appropriate time interval.

Managing Multiple injections

- Administering multiple vaccines at the same visit should be encouraged with health workers and individuals whenever possible. This facilitates catch-up as quickly as possible, reduces the number of follow up visits needed, and minimizes the risk of defaulting. However, more than one dose of a single antigen should not be provided on the same day (see **minimum intervals between doses**, above).
- Health workers should receive adequate training and supportive supervision on vaccine co-administration practices and interpersonal communications skills, to ensure they are comfortable and confident to communicate on the safety and acceptability of multiple injections, managing common side effects following vaccination and monitoring for adverse events following immunization (AEFI), and tips for reducing pain at the time of vaccination.
- Multiple injections given together are generally well tolerated and do not increase reactogenicity, as compared with spacing out vaccinations over multiple immunization visits. However, as with all vaccinations, the caregiver or individual should be informed about the possibility of minor side effects (e.g. fever, local tenderness at the injection sites) that may occur following vaccination and how to manage it.
- Separate auto-disable syringes and needles should be used for each injection and, wherever possible, different injection sites (limbs) should be used. Ideally, national guidelines should include instructions on which injectable vaccine should be given on which limb (so that in case of severe local reaction, the AEFI investigator can identify which vaccine may have caused the reaction), and guidance on appropriate injection sites for vaccines given to older children and adults.
- If two injections into the same limb are required, the injection sites should be separated by at least 2.5 cm.[17]
- Research and experience have shown that, in most settings, health workers are the most trusted source of information about vaccination and have the greatest influence over an individual's decision to vaccinate. If the health worker can confidently answer questions and address concerns about the safety and effectiveness of multiple injections, perform correct technique in administering the vaccine to minimize pain, and initiate the recommendation in a manner that presumes vaccination will take place (e.g. "we will have to give some vaccines today")[18] caregivers and individuals are usually willing to receive multiple injections during the same visit.

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[16] There are a few exceptions to this general principle: Some vaccines lacking long duration protection (such as cholera and typhoid vaccines) require restarting the series if a certain amount of time has passed since the last dose. Refer to WHO Summary Tables for details.

[17] WHO. Immunization in Practice: a practical guide for health staff – 2015 update. https://apps.who.int/iris/bitstream/handle/10665/193412/9789241549097_eng.pdf

[18] Opel et al., The Architecture of Provider-Parent Vaccine Discussions at Health Supervision Visits. Pediatrics. 2013 Dec; 132(6): 1037–1046. doi: 10.1542/peds.2013-2037

- However, if a caregiver or individual still has concerns about receiving multiple vaccine injections, they should not be pressured to receive all catch-up vaccination doses during one visit. The health worker should elicit the reasons for deferring vaccination and work together with the caregiver or individual to agree on when they should return to receive remaining vaccine doses required at earliest opportunity.
- Resources about multiple injections and minimizing pain during vaccination, including training modules and visual job aids, are available on the WHO website.[19, 20]

Spacing of inactivated vs. live vaccines

- *Inactivated vaccines*: any inactivated vaccine can be administered together (simultaneously), before or after any other inactivated vaccine or live vaccine.
- *Live attenuated vaccines:* as a general rule, live vaccines (for example, measles-containing vaccines, yellow fever, or Japanese Encephalitis) should be given either together at the same visit (simultaneously) or separated by an interval of 4 weeks; an exception to this rule is oral poliovirus vaccine (OPV), which can be given at any time before, simultaneously with, or after other live vaccines.
- Providing guidance in the catch-up schedule or other job aids for health workers on which vaccines are live and inactivated may be helpful as a quick reference.

Interchangeability of vaccine formulations or manufacturers products

- *Interchangeability of vaccines from different manufacturers:* In general, the same manufacturer's product should be used for all doses in a vaccine series. However, if a series cannot be completed with the same vaccine, the available alternative product should be used. Restarting a series is not recommended, even for the primary series.
    - If different vaccine products require different number of doses for series completion (e.g., *Haemophilus influenzae* b (Hib), rotavirus vaccines), administering the higher number of doses is recommended to complete the series.
- **Vaccine diluents are not interchangeable** across manufacturers nor formulations. Only the diluent assigned by the manufacturer for the specific vaccine and presentation should ever be used. [21]
- *Interchangeability of formulations:* If needed to continue completion of a vaccine series, combination vaccines may be used interchangeably with monovalent formulations and other combination products with similar component antigens if produced by the same manufacturer.

[19] Safety and acceptability of multiple vaccine injections.
https://www.who.int/immunization/programmes_systems/policies_strategies/multiple_injections/en/

[20] Reducing pain at the time of vaccination: WHO position paper – September 2015.
https://www.who.int/wer/2015/wer9039.pdf

[21] WHO Guidance Note: Vaccine Diluents – Revision 2015. The proper handling and use of vaccine diluents.
https://apps.who.int/iris/bitstream/handle/10665/192741/WHO_IVB_15.08_eng.pdf

Box 2. Summary Instructions for Health Workers on Catch-up Vaccination

1. At every health contact, review individual vaccination history (home-based record or immunization register) to determine whether any vaccine doses are missing or due. If there is no evidence or confirmation of vaccination history, assume the person has not been vaccinated. Do not blame the caregiver or individual if any doses are missing.
2. Always respect the **minimum age** of eligibility for each vaccine in the schedule.
3. For most vaccines, it is better to vaccinate late than never. Refer to the national catch-up vaccination policy and catch-up schedule for any exceptions to this general principle.
4. If more than one vaccine is due (or overdue) provide one dose of each vaccine at that visit. Do not unnecessarily defer giving vaccines that are due or overdue.
    - Example: if a child arrives at 9 months for MR vaccine, but has not yet received OPV3, Penta3, and IPV – the child is eligible for all four of these vaccines, and one dose of each antigen can be given at the same visit.
5. It is safe to give multiple vaccine injections at the same time, (this will allow the individual to be protected as soon as possible, reduce the number of return visits needed, and minimize the risk of defaulting).
    - Explain this to the caregiver or individual and address any concerns raised about the safety of multiple injections. If concerns remain, a caregiver or individual should not be pressured to receive all catch-up doses during one visit. Work together with the individual to agree when to return to receive remaining doses at earliest opportunity.
6. Observe **minimum intervals** permissible between doses – for most vaccines in the primary series, this is 4 weeks (1 month) between doses. For HPV, the minimum interval is 5 months.
    - Intervals recommended in the national immunization schedule may be reduced if a previous dose was delayed, as long as the **minimum interval** is respected.
    - Example: if MR is recommended at 9 months and 15 months, and a child does not receive MR1 until 12 months, they should still receive MR2 at 15 months.
    - Example: If a child receives MR1 at 15 months, they should receive MR2 at 16 months (4 weeks later).
    - Example: if the first dose of HPV is delayed, observe the minimum interval of 5 months before administering the second dose, irrespective of the recommended interval that may be 6 or 12 months.
7. If vaccination history shows that some but not all doses in a vaccine series were given, do not restart the series, regardless of the time that has passed between doses. Continue with the next dose required in the series.
    - Example: If the home-based record indicates the child has received 2 previous doses of pentavalent (Penta1 and Penta2), but it has been 6 months since the last visit, continue the series and record the dose given today as Penta3.
    - Example: If the home-based record or HPV vaccination card indicates more than the recommended 6 or 12 months has passed since the first dose of HPV, provide the second dose today, regardless of how long the interval and irrespective of the age of the girl. There is **no maximum interval** for HPV.

8. Record administered vaccine dose(s) according to the actual dose number in the series received (not based on what is due or expected at a certain age) (see more on **Recording and reporting of catch-up vaccination doses,** below):
    - Example: if a child is 5 months and is receiving pentavalent, oral polio vaccine (OPV), and pneumococcal vaccine (PCV) for the first time, record all of these as the first dose: Penta1, OPV1, PCV1.
    - Example: if a child is 15 months but has not yet received a first dose of measles-rubella (MR) vaccine, record it as MR1.
9. Schedule subsequent immunization visits, following the appropriate minimum interval, and communicate this schedule with the caregiver or individual so they know when to return.
10. Once the individual is back on track/caught up (having received all vaccines for which they are due), revert to using the national immunization schedule until they are fully vaccinated.
11. Remember to listen carefully to any questions from the caregiver or individual and respond in a caring manner. Remind the caregiver or individual of the importance of vaccination and need to bring the home-based record to every visit.

1.4 Recording and reporting of catch-up vaccination doses

- A major challenge for identifying eligibility, administering and monitoring catch-up vaccination is lack of reliable written record of vaccination history (i.e. individual home-based records, facility-based paper registers, or EIRs).
- Many immunization information systems are not currently designed to record, and report delayed doses. For example, administrative systems typically record vaccinations by yearly age range (e.g. 0-11m, 12-23m, etc.) or only for the exact age of eligibility (e.g. HPV at 10 years). However, these restrictive formats may lead to unintended consequences, such as vaccines being denied to children above the recommended age range if they are unable to be vaccinated on time (for a variety of reasons).
- Furthermore, dividing doses into 12 month calendar cycles buckets for monitoring coverage results in inconsistency amongst antigens in what constitutes an acceptable time frame for capturing coverage: for example, a vaccine due at birth such as BCG would have an acceptable delay of 12 months, while for MR1 it would only be 3 months (for schedules with MR1 at 9 months), or 12 months in programmes that schedule MR1 at 12 months.
- Recording and reporting tools, as well as the way administrative coverage is calculated[22], may therefore need to be redesigned to facilitate capturing delayed vaccine doses (see also a note about denominators in **Box 3**).
- The key point is that vaccinations given outside of the target age range should be recorded, reported and monitored; thus, **recording and reporting tools should never signal that vaccination beyond the target date is undesirable**:

[22] Both "timely coverage" (vaccines given within the recommended age range) and "total coverage" are useful data points, but for programmes truly interested in monitoring timeliness, coverage surveys offer a more nuanced picture than administrative systems, provided a high proportion of home-based records with vaccination dates are available.

- **Home-based records** should contain sufficient space for health workers to record all routine doses of vaccines, the dates they were administered, and the dates to return for the next vaccination visit (see **Box 4**);
- **Tally sheets** should be designed in a way that guides health workers to accurately record all vaccination doses administered at any age and doesn't cause unnecessary confusion or arbitrary restrictions on recording delayed doses (*e.g.* if tally sheets are disaggregated by age groups, there should also be an option for recording doses given above the target age). Examples of tally sheets for routine childhood immunization that allow for capturing delayed catch-up vaccination doses are available in **Annex E**;
- **Monthly summary reports** should capture and summarize all data collected on the tally sheets. (*e.g*. if the tally sheet contains space for reporting doses given above the target age, then the monthly summary report should also capture this so that health workers do not have to improvise their own solutions);
- **Immunization registers** should include space for individually recording dates that doses are administered without restricting the time-frame within which they must be given.

- The WHO Handbook on the use, collection, and improvement of immunization data[23] and WHO Establishing and strengthening immunization in the second year of life: practices for vaccination beyond infancy[24] include suggestions for modifications to monitoring tools and immunization data systems.
- Health workers should be trained how to accurately record and report catch-up vaccination doses:
  - All doses, regardless of when they are given, should be recorded on the home-based record, tally sheets, registers, electronic immunization records, and monthly reports, according to when the vaccine is *actually* administered, even if considered "late" or "delayed" according to the national immunization schedule.
  - All doses should be recorded in the order in which they are *actually* given (e.g. if a child is 15 months old and has never received a measles vaccine, the dose should be recorded as MCV1; and the caregiver should be asked to bring the child back for MCV2 in 4 weeks' time). A dose should never be recorded and reported as MCV2 if the child has not first received MCV1.

Box 3. A note about denominators

Reliable estimates of the target population are critical in order to effectively track and follow up with defaulters and also those individuals in the catchment area that are hard to reach or have difficulty accessing services. Target estimates can be obtained through several different sources including census data, Civil Registration and Vital Statistics (CRVS) systems, electronic immunization registers (EIRs), local enumerators and head counts, service data from the immunization or other programmes, and satellite imagery (sometimes in conjunction with mobile phone data).

For more detail on use of these sources for best estimates of target populations, see the WHO Handbook on the use, collection, and improvement of immunization data.

[23] *Link to be inserted when available*.

[24] Available at: https://apps.who.int/iris/bitstream/handle/10665/260556/9789241513678-eng.pdf

Box 4. The importance of Home-based Records (HBRs) as enablers of effective catch-up vaccination

Without reliable documentation of individual vaccination history, an individual or caregiver may not be aware that vaccines are due and health workers may be unable to ascertain eligibility for catch-up vaccination. The importance for the individual or caregiver to safely guard the HBR and bring it to every health contact should be stressed at every opportunity.

In some countries, it may not be common practice to recommend caregivers keep HBRs beyond early childhood. However, as programmes move towards a life course approach to vaccination, with additional vaccines introduced at older ages, maintaining an individual record of vaccination history is becoming increasingly important.

HBR stockouts continue to be a problem in many settings, contributing to missed opportunities for vaccination. Countries must ensure that an ample supply of HBRs are available for distribution, including sufficient buffer stock for replacement if a caregiver or individual has misplaced the HBR.

Where an individuals' vaccination status cannot be confirmed, it should be assumed that they are not vaccinated, and catch-up vaccination should be offered.

The *WHO Intervention Guidebook for implementing and monitoring activities to reduce Missed Opportunities for Vaccination*[25] offers guidance and solutions to common encounters where HBRs are unavailable or difficult for the health worker to interpret.

Problem	**Solution**
The HBR is not available.	• During supervision, remind health workers to use all available means to verify the vaccination status (checking health facility registers, contacting previous health centre visited, etc.). • Lack of documentation is not a valid reason for not vaccinating eligible individuals. • When in doubt, vaccinate and issue a new or temporary card; remind the caregiver or individual to keep the HBR safe but avoid criticism or humiliation as that may deter the individual from returning for future doses.
The HBR is in a different format, or language, to what the health worker is used to.	• Online resources are available to assist health workers in translating common foreign language terms found in immunization records. See examples below: https://www.cdc.gov/vaccines/pubs/pinkbook/downloads/appendices/B/foreign-products-tables.pdf http://www.immunize.org/izpractices/p5121.pdf
HBR is poorly designed/easily damaged.	*Immediate term*: conduct inquiry with health workers to identify specific areas of confusion in existing card to provide clarification through supportive supervision or training. *Medium term*: Revise and improve HBR.

For more on strengthening the implementation of HBRs, see WHO resources on Home-Based Records.[26]

[25] Available at: https://apps.who.int/iris/bitstream/handle/10665/330101/9789241516310-eng.pdf
[26] Available at: https://apps.who.int/iris/bitstream/handle/10665/175905/WHO_IVB_15.05_eng.pdf; and https://apps.who.int/iris/bitstream/handle/10665/274277/9789241550352-eng.pdf

1.5 Communication and community engagement

- Targeted communications should inform individuals, caregivers, and communities more broadly of the value of vaccination and the importance of being vaccinated in a timely manner.
- Communication with caregivers and individuals through phone calls, emails, and SMS text message reminders, as well as broader messaging through television, radio, social media, posters, etc. should aim to increase awareness that missing a scheduled vaccination does not necessarily mean that individuals are no longer eligible: vaccines given late are still safe and effective at providing protection against disease, and caregivers and individuals should feel empowered to seek vaccination, even if delayed.
- Local community and civil society groups, non-government organizations, faith-based groups and other stakeholders should be considered partners in the design and delivery of services. They can also help engage with vulnerable population groups, counter misinformation and rumours, and contribute to generating and using behavioural and social data to design successful strategies.
- Daycares and schools can also be used as effective channels for communication about catch-up vaccination, through messaging to both students and parents about the importance of vaccination and reminders to check that they are "up to date" with all vaccines.
- Communication to individuals, caregivers, and communities on the importance of safeguarding the home-based record and making a habit of bringing it to every health contact can also serve to reinforce the value of vaccination and the concept that it is never too late to be immunized.

1.6 Strategies for catch-up vaccination

Routine immunization services throughout the year

- The practice of catch-up vaccination should be integrated into routine immunization service delivery on a continuous basis. Every immunization contact, whether fixed or outreach (including school-based), should be used as an opportunity to review an individual's vaccination status and catch-up any antigens that have been missed before that visit.
- Every health facility should have a process in place for newborn and defaulter tracking and for identifying and reaching zero-dose children in their catchment area (see **Box 3**).
- Creative and innovative behavioral interventions should be explored, to encourage individuals to return for future vaccinations, and reinforce the message that it is never too late to be immunized.
- For certain mobile populations (e.g. refugees, asylum seekers, migrant populations), offering catch-up vaccination is critical to ensure they have the opportunity to be caught up to date according to the local recommended immunization schedule.

Reducing missed opportunities for vaccination through integration with other health services

- Beyond immunization services, every health contact should be used as an opportunity to review an individual's vaccination status and to administer doses for which they are eligible – or to refer them to an immunization provider for vaccination (i.e. "screen and refer"). This includes well-child visits, curative services, before being discharged from hospital, etc.
- This key principle for **reducing missed opportunities for vaccination**[27] relies on building and promoting a practice of safeguarding the individual's home-based record (HBR) and bringing it to every health contact for review (see **Box 4**).

[27] See more on the WHO Missed Opportunities for Vaccination (MOV) Strategy, at: https://www.who.int/immunization/programmes_systems/policies_strategies/MOV/en/

- Provide simple reminders to both health workers and caregivers to review the HBR: stickers or designs on the cover of the HBR, fridge magnets, posters in health facilities, table top display/sign, computer screensaver, caregiver-owned prompt cards, etc.
- Reinforce the message that checking vaccination status and/or offering catch-up vaccination can also be integrated with other health delivery platforms across the life-course.[28]

Periodic intensification of routine immunization (PIRI)

- Periodic intensification of routine immunization (PIRI) is an umbrella term to describe a spectrum of time-limited, intermittent activities used to deliver routine vaccinations – including catch-up doses – to under-vaccinated populations and raise awareness of the benefits of vaccination.
- PIRI is used either in focused areas with poor access to immunization services or low coverage, or to target certain population groups (e.g. refugees, migrants or mobile communities), or as a broader strategy to boost overall uptake nationally. Examples of PIRIs include Child Health Days, Child Health Weeks, and National Vaccination Weeks.
- One of the main distinctions between PIRIs and supplementary immunization activities (SIAs) is that doses in a PIRI activity are provided after reviewing an individual's vaccination status and are considered routine vaccinations and recorded as such in the immunization register and on the home-based record.[29]
- PIRIs will usually target a specific age cohort such as children under two years, under five years, or up to adolescence (although this varies by country). Therefore, PIRIs provide a catch-up opportunity for anyone in that age cohort that has been missed or not reached during the year. Sometimes in order to complete a vaccination series, PIRI activities are planned to repeat at 4-week intervals (e.g. once a month for 3 months) to ensure the full vaccine series can be offered (e.g. Penta1, 2, and 3).
- PIRIs may also include delivery of other maternal and child health interventions such as vitamin A supplementation, insecticide-treated bed nets, and de-worming tablets.
- In addition to provision of preventative health services, there is usually a focus on community-wide social mobilization activities about the benefits of routine immunization and other general health messaging and increasing awareness of the availability of immunization services.
- Recording and reporting vaccine doses administered during PIRIs is challenging, often hampered by the high volume of individuals attending the activity, number of service delivery points, delivery of multiple interventions, and limited availability or use of home-based records during the PIRI activity. For these reasons, recording and reporting for vaccine doses administered during PIRI requires careful planning in advance and greater attention during and following the PIRI activity.
- For more on PIRI, including considerations for improving recording and reporting practices, see **Annex F**, and WHO Periodic Intensification of Routine Immunization: Lessons learned and implications for action.[30]

[28] See WHO. Working Together: An integration resource guide for planning and strengthening immunization services throughout the life course, available at: https://www.who.int/immunization/documents/ISBN_9789241514736/en/
[29] See WHO/UNICEF Guidance note on Criteria to determine if a given vaccination is a routine or supplemental dose: www.who.int/immunization/programmes_systems/policies_strategies/guidance_note_on_vaccination_doses_oct_10_2011.pdf. Also Annex F for a comparison of the characteristics of PIRI vs SIAs.
[30] Available at: https://www.who.int/immunization/programmes_systems/policies_strategies/piri_020909.pdf

School vaccination checks[31]

- School settings provide excellent opportunities to integrate interventions aimed at reducing vaccine preventable diseases along improving overall mental, physical and social health of children.
- Implementing school vaccination checks (either as part of the entry/enrollment process each year or during school along with other school health services) is also an important catch-up vaccination strategy.
- If school-based immunization or school-based health screening platform already exists, this can be an opportunity to check for missed vaccine doses and facilitate catch-up vaccination (either by providing doses of missed vaccines along with the school-based immunization programme, or by referral to a health facility).
- Prior to implementing a strategy of school vaccination checks, countries should assess the capacity of their school and health systems[32] to support such an activity.
- In addition to a well-defined and enabling catch-up vaccination policy, some key facilitating factors that have been identified in countries that have successfully implemented a practice of school vaccination checks include:
    - strong collaboration between ministries of health and ministries of education;
    - existence of legislation or written policy requiring the collection of vaccination history at entry to, or during school;
    - clear implementation guidance and standard operating procedures outlining how individual vaccination records are collected, screened, recorded, and reported, as well as how and where the catch-up vaccination will take place;
    - widespread availability of up-to-date home-based records or electronic register that summarize the individual's vaccination history on one page for easy reference;
    - availability of funding and staff (health workers and/or education staff) time to carry out checking of vaccination history on an annual basis;
    - advocacy, communication and sensitization to promote cooperation and acceptance from the community.
- School vaccination checks **do not** need to be accompanied by a mandate requiring proof of vaccination for entry into school. School vaccination checks can be implemented simply as another touchpoint for encouraging catch-up of children that may have been missed earlier, without the intent to exclude students who do not have documented vaccinations.
- Vaccination checks can be implemented as part of the enrollment process, or during session, at all levels of the education system, including early education centres, daycares, kindergartens, primary and secondary schools, post-secondary institutions, etc.

[31] For more information on checking vaccination status at entry to, or during school, including considerations for implementation and country case studies, see: https://www.who.int/immunization/programmes_systems/policies_strategies/school_vaccination_checks/en/

[32] WHO has developed a School Vaccination Readiness Assessment Tool that can be adapted for this purpose, available at: https://www.who.int/immunization/programmes_systems/policies_strategies/school_assessment_tool/en/

Section 2. Special catch-up vaccination efforts following an interruption of services

- Immunization is an essential health service that should continue without interruption to the maximum extent possible under all circumstances. However, in exceptional emergency or disaster situations there may be an interruption or significant drop in routine immunization services, delay or temporary suspension of mass vaccination campaigns, and/or prolonged vaccine shortages, leading to an accumulation of individuals susceptible to one or more VPDs.
- If not already in place, **catch-up vaccination practices should be integrated into ongoing routine immunization service delivery as soon as services are restored (see Section 1), and should continue as an essential component of the routine immunization programme.**
- Offering catch-up vaccination on an ongoing basis through the routine immunization system is the least resource intensive and most sustainable strategy for ensuring individuals are able to receive the vaccines they are due, especially if the service interruption is relatively short.
- However, planning for catch-up vaccination following a significant period of interruption or reduction in services may also require additional large-scale intensified and specialized efforts to identify and seek out groups who have missed vaccination, to close immunity gaps as quickly as possible.
- Monitoring the situation as closely as possible throughout the period of disruption and tracking of individuals or cohorts who missed vaccination is important to inform catch-up strategies.

2.1 Policy and advocacy

- During, or in the aftermath of a catastrophic event, whether it be an outbreak, epidemic or pandemic, natural disaster, acute conflict, or other disruption, health systems are likely to be overburdened.[33] Finances and human resources may be limited due to reallocation. Supply chains may be disrupted leading to stock-outs of vaccines and supplies. Surveillance systems may have been stopped or diverted. There may be decreased demand for immunization services (due to misinformation, fear, inaccessibility, limitation in mobility, competing priorities, previous disruptions in services, etc.)
- Efforts to restart and/or intensify immunization should be part of an overall coordinated health system recovery plan.
- In the context of several competing pressures and resource constraints (both financial and human), it will be important to advocate for the importance of immunization with a view to resuming services and closing gaps at the earliest opportunity. The consequences of inaction, including quantification of the increased morbidity and mortality expected as a result of suspending immunization, should be made to emphasize these points.
- If catch-up vaccination is not already an ongoing component of the routine immunization programme, restoration of services following a disruption is an opportunity to begin implementing this practice (See Section 1).
- NITAGs should be engaged at the earliest opportunity for a rapid review of any policies that may impact catch-up vaccination (e.g. restrictive target age groups, upper age limits, or maximum dose intervals; restrictions on which health workers can vaccinate, and where and when immunization takes place).

[33] For example, evidence showed a 25% decline in measles vaccine coverage in both Liberia and Guinea during the 2014-2015 Ebola outbreak in West Africa. See: Masresha BG, et al. The impact of a prolonged ebola outbreak on measles elimination activities in Guinea, Liberia and Sierra Leone, 2014-2015. Pan African Medical Journal. 2020;35(1):8.

- Where policy development or revision can be a lengthy process, interim guidance for catch-up vaccination should be issued (e.g. temporary removal of upper age limits to ensure those missed as a result of service interruption are able to receive the vaccines for which they were due). Once the situation resumes to normal, a policy review should be conducted to decide if the removal of age-cutoffs should be permanently adopted.
- Any interim guidance on catch-up vaccination should be coordinated closely with other related programmes (e.g. WHO Health Emergencies (WHE) programme, other local or international NGOs, etc.) to ensure that it is reflected in the immunization component of any emergency guidance issued.
- Catch-up schedules and job aids for health workers will need to be developed and rapidly disseminated down to subnational, and service delivery levels, including to non-government providers (*e.g.* private, NGO, faith-based).

2.2 Managing vaccines and supplies

- During an interruption in services, supply chains at local, regional, national, and possibly international levels may be affected. Stock out of key supplies may be a challenge, requiring a remapping of inventory, at all levels, and a coordinated redistribution of supplies once delivery channels are reopened.
- The situation can be mitigated by the following actions:
    - Establish and implement procedures for safeguarding and maximizing in-country stocks of vaccines through robust management of temperature records, VVM indicators and expiry dates.
    - Account for any expired or damaged vaccine, delayed deliveries, etc.
    - Closely monitor stocks of vaccine and related supplies, including the recommended buffer stock at all levels.
    - Adopt multi-dose vial policy[34], if not already in place.
    - Forecast and procure vaccines and related supplies including any anticipated surge stock required for catch-up vaccination of missed cohorts (see Monitoring below)
    - Review cold chain capacity using existing tools (*e.g.* Effective Vaccine Management Tool 2.0 targeted assessment functionality) to ensure sufficient storage space for vaccines supplied for major catch-up strategies, especially when targeting a wider age cohort.
    - Modify distribution schedules to avoid strain on the cold chain.
    - In the context of a major delay in vaccine delivery from international or national stores, consider accepting delivery of vaccine with shelf-life reduced to 1/3 (e.g. 12 months remaining shelf life) and prioritizing the use of these vaccines following the "first expiry, first out" (FEFO) principle.
- To alleviate challenges with cold chain, consider the use of Controlled Temperature Chain (CTC) or Extended Controlled Temperature Conditions (ECTC) for vaccines licensed for use under these conditions.[35]

[34] WHO Policy Statement: Multi-dose vial policy (MDVP), Revision 2014, available at: www.who.int/immunization/documents/general/WHO_IVB_14.07/en/

[35] https://www.who.int/immunization/programmes_systems/supply_chain/ctc/en/index3.html

2.3 Monitoring the extent of the interruption

- It is important to monitor the situation as closely as possible throughout the period of disruption and track individuals or cohorts missing vaccination as best as possible to inform catch-up strategies. This can be done by:
    - Continuing to monitor vaccination coverage, VPD surveillance, AEFIs, and vaccine safety concerns in order to identify gaps, inequalities and vulnerable groups and communities.
    - Maintaining a logbook of the population with pending vaccines, including newborns during the period of disruption, based on individual records (facility-based paper immunization register, tickler files, EIR, etc.)
    - Monitoring, on a monthly basis and by district/municipality, the impending buildup of susceptible persons to estimate a target population for intensified catch-up vaccination efforts (see **Box 5** – **Estimating target for catch-up vaccination efforts**)
- Rapid coverage assessments in areas known to be particularly affected by the disruption may be necessary to identify communities for prioritization of catch-up efforts.
- In addition to coverage data, triangulation with surveillance data is needed to conduct a comprehensive risk assessment to help map out the needs for catch-up efforts, particularly in deciding on the scale and type of catch-up strategies needed (see Strategies for catch-up vaccination after a disruption of services, below)
- Known high-risk and low coverage communities (e.g. displaced populations, urban poor, remote/ rural, conflict-affected, etc.) should remain a high priority for catch-up, given existing inequalities and higher risk for outbreaks.

Box 5. Estimating target population for catch-up vaccination efforts

In addition to compiling a list based on individual vaccination records, the target population for an intensified catch-up effort should be monitored throughout the period of disrupted services.

Based on a monitoring chart or other monthly numerator data, compare (A) the difference in cumulative doses administered, year-to-date, to one of the following (B):

- the cumulative target, year-to-date, if it is credible, or
- *if the target cannot be used:* the equivalent cumulative number of administered doses by year-to-date on last year's monitoring chart/tabulation, or
- *if last year's performance data is not deemed representative:* the average numbers of administered doses for the months pre-disruption.

The **difference** between (A) and (B) can be used as an **estimated target requiring catch-up**, to be added to the regular monthly target population (see below).

Note that this method of estimation assumes a relatively stable target population size which may not be the case, especially depending on the type, extent, and cause of the disruption. Using various sources of data available to estimate and update denominators is therefore also extremely important (see **Box 3** in Section 1).

Modifying target population

- If the disruption took place over an extended period, catching up of all missed doses will take several sessions and months following resumption of services (for example, a child that missed Penta2 and Penta3 visits will require two catch up visits, spaced 4 weeks apart).
- The estimate of individuals who have missed vaccinations should be added to the combined monthly target population for the months where intensified catch-up is expected.

- These higher target populations should be used to forecast needs for vaccine orders and to plan the number and frequency of immunization sessions.

Monitoring the success of the catch-up vaccination efforts

- All doses administered during catch-up (whether through delivery of routine immunization services, or through a PIRI activity) should be compared against the modified target population (i.e. original target for that period + catch-up target).
- Recording delayed doses may be a challenge for programmes that do not already have monitoring systems set up to capture doses given outside the recommended target age range (see Section 1).
- As the immediate period following a significant interruption in immunization services is likely not the time to introduce major changes to country immunization information systems, in the interim it will be necessary to emphasize the importance of **recording all doses administered and dates they are given** in the HBR and immunization register, even if there is not currently a designated place to record doses given outside the age range on the national immunization schedule.
    - A suggested standard practice for the interim solution should be documented and shared widely at all levels.
    - In some cases, documentation of these doses on individual home-based records and validated later through a coverage survey may be the only reliable way to enable estimation of vaccine coverage for the period of immunization service interruption.

2.4 Communication and community engagement

- Even if routine immunization services have continued at reduced capacity or once they resume, demand and accessibility may remain low and intermittent interruptions may continue to occur for some time.
- Engagement with communities (including local civil society, non-governmental and faith-based organizations, professional associations, etc.) to help design and implement tailored and targeted communication strategies will be essential to restore and rebuild community confidence in vaccines and/or immunization services.
- If possible, formative research should be conducted to learn about the needs and characteristics of the target population and identify the major drivers and barriers to immunization faced, in order to design the most appropriate strategies to respond.
- Monitoring of traditional media and digital listening across social media platforms may offer insights on local rumours and misinformation that can help to inform the development and targeting of key messages.
- Communication about catch-up vaccination should aim to:
    - increase awareness that individuals are still eligible for any vaccinations that have been missed during the service interruption and should not be denied vaccination,
    - emphasize that vaccinations given late are still safe and effective at providing protection against disease,
    - ensure individuals know where and when immunization services are currently being provided and are informed about any new or additional safety precautions in place for safe delivery of services.
- See **Annex G** for a job aid with key considerations for strengthening **community acceptance and demand for vaccination.**
- For more on building and restoring confidence in vaccines and vaccination, both in ongoing work and during/following crises, see WHO guidance on Vaccine and trust.[36]

[36] Available at: https://www.euro.who.int/__data/assets/pdf_file/0004/329647/Vaccines-and-trust.PDF

2.5 Strategies for catch-up vaccination after an interruption of services

- Offering catch-up vaccination on an ongoing basis through the routine immunization system is the least resource intensive and most sustainable strategy for ensuring individuals are able to receive the vaccines they are due, especially if the service interruption is relatively short.
- If immunization services have been impacted for a prolonged period of time, additional strategies to accelerate catch-up vaccination efforts will likely be needed, to reach larger groups and close immunization gaps as quickly as possible.
- Depending on the extent and duration of the disruption in immunization services, as well as pre-existing coverage levels, it is likely that multiple strategies will be needed, either in combination or in sequence (see **Box 6**).
- Additional catch-up vaccination strategies may include:
    - **Intensified catch-up through routine immunization services** – e.g. mass call backs, intensified defaulter tracking, expanded outreach, etc.
    - **Targeted and selective (PIRI approach) vaccination campaigns** that screen for eligibility and record individual doses
    - **Supplementary immunization activities (SIAs)**
- The decision on strategy, or combination of strategies, to use for catch-up will depend on many factors and will be very context specific.
- Countries should undertake a risk assessment, particularly with respect to the local epidemiology of outbreak-prone VPDs, current population immunity levels and the extent and localization of pre-existing immunity gaps, to determine the highest priority strategies and target areas for specialized catch-up activities (See **Box 7**)
- WHO guidance document on Vaccination in Acute Humanitarian Emergencies: a Framework for Decision Making[37] can help countries follow an evidence based approach to prioritize delivery of routine immunizations during and following a protracted crisis situation.

Box 6. Choice of a catch-up vaccination strategy or strategies will depend on many factors:

- Duration and extent of disrupted immunization services
- Local epidemiology of outbreak-prone VPDs (*e.g.* measles, polio, diphtheria, yellow fever)
- Size and extent of pre-existing immunity gaps in under-served communities or assessment of overall population-level immunity in low coverage contexts
- Dates and age ranges of last planned preventive campaigns for various outbreak-prone VPDs
- Target population (*e.g.* age, geography) needing to be caught up
- Human resources available
- Vaccine stocks and supplies available
- Financial resources available
- Availability of home-based records and/or nominal immunization registers
- Local contextual considerations (*e.g.* rainy season, security, major political events)
- Other specifics related to cause of disruption (*e.g.* pandemic transmission risks, physical distancing measures required, etc.)

Additional considerations:

- **Timing –** The timeframe for resuming immunization services may be difficult to define and may vary across settings. Guidance and strategies may need to be revised and reprioritized as the

[37] Available at: https://apps.who.int/iris/bitstream/handle/10665/255575/WHO-IVB-17.03-eng.pdf

situation evolves. Different strategies may be needed for different geographical regions (tailored approach).

- **Coordination and integration –** Identify opportunities to collaborate with other disease control programmes such as polio, malaria, yellow fever, other NTDs, etc., as well as opportunistic linkage with other sectors of health services (curative/treatment, antenatal, family planning, etc.)
- **Demand and acceptance –** Health-seeking behaviors will be influenced by the cause of the disruption (e.g. pandemic fears and social distancing measures, acute violence/insecurity, etc.), and may negatively impact demand and acceptance for vaccines. These concerns should be considered when planning activities and during training. To succeed, the selected strategy or strategies must be convenient and acceptable to the local community.

Box 7. A framework for decision-making on prioritization of strategies for vaccine delivery

Adapted from the WHO Vaccination in Acute Humanitarian Emergencies: a Framework for Decision Making,[38] the following framework can help countries follow an evidence based approach to prioritize delivery of vaccines during and following a protracted crisis situation. Refer to the full Framework document for details on how to conduct and adapt each step as well as specific factors to consider for each VPD.

Step 1: Conduct an epidemiological risk assessment for each VPD based on general risk factors (e.g., population immunity, burden of disease, etc.), as well as risk factors associated with the cause of the service interruption (e.g., acute conflict, pandemic, etc.).

- Risk assessment worksheets for each VPD are available in the Framework. Example worksheets for measles and polio are provided in **Annex H**.

Step 2: Consider each vaccine and its amenability for various delivery strategies based on vaccine characteristics (e.g. availability in sufficient quantities, cold chain requirements, etc.) and operational factors for delivery.

Step 3: Assess contextual factors and competing needs (e.g., ethical, political, security, economic, logistic, and other considerations and constraints)

An e-Tool based on the Framework has been developed and is available for download here: https://www.who.int/immunization/programmes_systems/policies_strategies/vaccination_humanitarian_emergencies/en/

An e-Learning course is also available, in collaboration with UNICEF, and can be accessed here: https://agora.unicef.org/course/info.php?id=13019

Intensified catch-up efforts through routine immunization services

- Microplans will need to be reviewed and revised, including intensified efforts to identify missed individuals, issuing reminders and working with the community to encourage returning to the health facility for missed doses.
- Innovative strategies such as issuing **mass callbacks** for all cohorts missed during the period of disruption can assist in these efforts.

[38] Available at: https://apps.who.int/iris/bitstream/handle/10665/255575/WHO-IVB-17.03-eng.pdf

  - Mass callbacks can be an effective strategy in the event of a prolonged stockout of one or more vaccines (for example, implementing a mass callback for a distinct cohort that was unable to be vaccinated due to a national stockout of a particular vaccine during a defined period).
  - This strategy requires a wide-reaching and effective communication campaign and active engagement with local communities and civil society organizations to develop communication strategies (e.g. phone calls, SMS text messages, television, radio, social media, posters) to increase awareness about catch-up vaccination.
- Service hours may need to be extended or modified to accommodate potential increases in flow of individuals once services resume. Considerations to manage this include:
  - Scheduling appointments to avoid overcrowding (but important to still allow those arriving without prior appointment to be vaccinated).
  - Assigning specific times for certain population groups (e.g. older persons, people with underlying health conditions, adolescents[39], etc.).
- **Outreach immunization activities should be expanded** to include wider age ranges to catch-up individuals who might not be within the typical target groups for outreach activities.
- If possible, outreach activities should be planned in collaboration with other health programmes, in order to catch-up individuals with a package of priority health interventions at once.
- If **school-based immunization** was interrupted, planning with the Ministry of Education and school teams should be initiated to restart the activities as soon as possible, and caregivers should be notified.
  - If a vaccine series is interrupted, it is still safe and efficacious to deliver these vaccines to children and adolescents, as needed, even if the interval between doses is longer than indicated in the national immunization schedule.
  - School-based immunization can also be used as an opportunity to check for any other missed doses and facilitate catch-up vaccination (either by providing doses of other missed antigens along with the vaccines routinely delivered at school, or by referral back to a health facility).
- If no school-based immunization platform or school vaccination checks currently exist, consider whether such a platform can be implemented as a strategy to quickly close immunity gaps in these age groups (See Section 1):
  - E.g. upon resumption of school, local health facilities and schools should arrange specific days where pupils bring their home-based records to school so that health workers can determine vaccine eligibility. Health workers can either vaccinate the pupils at the school or refer them to the local health facility for follow-up.

Targeted and selective (PIRI approach) vaccination campaigns that screen for vaccination history and record doses given as routine immunization

- If resources are available, countries may choose to conduct targeted and selective mass vaccination (similar to a PIRI approach) to provide more intensive and large-scale opportunities for catch-up of missed vaccinations.
- The number of intensified activities to be conducted should be based on the duration and extent of the immunization service interruption. For example, multiple rounds of intensified outreaches may

[39] Lessons from delivering adolescent-friendly health services indicate that service uptake is lower if they are expected to cue with mothers and babies; also during outbreaks this age group may be a high-risk vector to other age groups.

be required at 4-week intervals in order to provide opportunities to catch-up on multiple doses in a vaccine series.

- See **Section 1** and **Annex F** for more detail on PIRI, including a comparison of key characteristics of PIRI vs SIAs.

Supplementary Immunization Activities (SIAs)

- If there's greater urgency to vaccinate a large number of susceptible individuals with specific antigens, non-selective SIAs may be considered.[40]
- SIAs enable the vaccination of a large number of individuals regardless of their vaccination history by vaccinating all within a target age group. Given their scope and speed SIAs often limit the number of antigens and additional interventions provided.
- The vaccine doses that are administered during SIAs are considered "supplemental" rather than "routine" and are not recorded and reported as part of the routine immunization administrative coverage.[41] They may, however, still be recorded on individual home-based records or on SIA-specific cards as a supplemental dose.
- In countries where preventive campaigns are already planned and conducted at regular intervals, these opportunities should be leveraged to assist with catch-up to the extent possible (for example, adjusting the age ranges as necessary due to the extent of the disruption, integrating multiple antigens, and/or other health interventions, such as vitamin A, deworming and insecticide-treated bed nets, etc.)
- While integration should be promoted where possible, the feasibility must be carefully assessed as additional interventions may significantly increase crowd size, extend implementation time and require additional training and resources.
- In addition, consideration must be given to the programmatic feasibility of delivering multiple antigens in a non-selective SIA vs conducting a selective mass campaign (PIRI-style) as described above, including recording doses as routine or supplementary doses.
- With any large-scale vaccination campaign, proper attention must be paid to waste management. WHO has issued new guidance on technologies for the appropriate treatment of infectious and sharp waste from health care facilities[42] which emphasizes the preferred use of treatment technologies (high temperature incineration, autoclaving, microwaving) over uncontrolled combustion (only to be used as a last resort).

[40] For more on planning and implementing SIAs, see WHO. Planning and implementing high-quality Supplementary Immunization Activities for injectable vaccines, available at: https://www.who.int/immunization/diseases/measles/SIA-Field-Guide.pdf

[41] See WHO/UNICEF Guidance note on Criteria to determine if a given vaccination is a routine or supplemental dose: https://www.who.int/immunization/programmes_systems/policies_strategies/guidance_note_on_vaccination_doses_oct_10_2011.pdf

[42] WHO. Overview of technologies for the treatment of infectious and sharp waste from health care facilities. Available at: https://apps.who.int/iris/bitstream/handle/10665/328146/9789241516228-eng.pdf

Box 8. Special considerations in the context of COVID-19:

- WHO has issued Guiding principles for immunization activities during the COVID-19 pandemic[43] to support decision-making on the provision of immunization services while the pandemic continues.
- It is likely that physical distancing and protective measures to reduce transmission and ensure the health and safety of both health workers and individuals will remain in place for some time, including the possibility of periodic lockdowns. This must be considered in addition to the other contextual factors listed in **Box 6** when deciding on appropriate catch-up strategies.
- Availability of health workers to deliver essential services, including immunization, may be limited. Refer to WHO guidance on Maintaining essential health services: operational guidance for the COVID-19 context[44] for more information on rapid assessment and optimization of health workforce capacity.
- Special considerations for setting up the vaccination site, spacing clients (e.g. through scheduling), extending duration of activity, and maintaining good infection, prevention and control (IPC) practices including screening to exclude potentially infected clients/caregivers and the use of recommended personal protective equipment (PPE), should be followed as detailed in existing related WHO guidance.[45]
- Outreach activities may need to be expanded or modified, in order to take services somewhere communities may feel more comfortable or safe, and away from the health facility:
    - Alternative locations such as pharmacies, grocery stores, open-air markets, sports halls or grounds, banks, schools and daycares, churches and mosques, etc.
    - innovative strategies such as "drive-thru" immunization stations,[46] and
    - Door-to-door immunization activities may be possible (if appropriate safety measures can be maintained).
- WHO has also published a Framework for decision-making: Implementation of mass vaccination campaigns in the context of the COVID-19 pandemic.[47] This technical guidance outlines a framework for decision-making for the conduct of mass vaccination campaigns, offers principles to consider when deliberating the implementation of mass vaccination campaigns; and details the risks and benefits of conducting vaccination campaigns in the COVID-19 setting.
- Precautionary measures necessary for routine immunization outreach, as well as for the operation of campaigns during COVID-19 will add additional costs per dose delivered: analyses estimate that protective measures and operational changes combined could increase the

[43] WHO. Guiding principles for immunization activities during the COVID-19 pandemic. Interim Guidance. 26 March 2020: https://apps.who.int/iris/bitstream/handle/10665/331590/WHO-2019-nCoV-immunization_services-2020.1-eng.pdf; Immunization in the context of Covid-19 pandemic, Frequently Asked Questions: https://apps.who.int/iris/bitstream/handle/10665/331818/WHO-2019-nCoV-immunization_services-FAQ-2020.1-eng.pdf

[44] Available at: https://www.who.int/publications/i/item/covid-19-operational-guidance-for-maintaining-essential-health-services-during-an-outbreak

[45] The latest WHO COVID-19 technical guidance on Infection prevention and control / WASH is available at: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/infection-prevention-and-control

[46] For example, many countries in the Region of the Americas have implemented creative solutions to continue to vaccinate at-risk populations during the COVID-19 pandemic: https://www.paho.org/bra/index.php?option=com_content&view=article&id=6152:opas-pede-que-paises-mantenham-programas-de-vacinacao-durante-pandemia-de-covid-19&Itemid=820

[47] https://www.who.int/publications-detail/framework-for-decision-making-implementation-of-mass-vaccination-campaigns-in-the-context-of-covid-19

operational cost of delivering immunization through outreach by between **20 - 129%**[48] and operational campaign costs by between **49 - 154%**.[49] See footnote for details.

- Additional costs to be budgeted for may include:
  - Handwashing stations, hand sanitizer
  - PPE (masks, gloves, goggles)
  - Crowd controllers
  - Thermometers and temperature screening
  - Additional per diems for extending dates and times
  - Increased social mobilization and transport.

[48] An analysis assessing changes in the cost of delivering immunization through outreach in Tanzania and Indonesia estimated that adding handwashing stations and hand sanitizer at outreach sites could increase the delivery cost per dose by 11-14%, by 45-61% when adding PPE (mask, gloves, goggles), an additional 9% if adding a crowd controller, and up to 42% for additional staff with infrared thermometers. If facility-based coverage drops by 50%, the cost of increasing outreach to compensate could add up to another 11% per dose. See Thinkwell. The cost of routine immunization outreach in the context of COVID-19: estimates from Tanzania and Indonesia. Available at: https://thinkwell.global/wp-content/uploads/2020/07/Cost-of-outreach-vaccination-in-the-context-of-COVID-19-20-July-2020.pdf

[49] An analysis using data from 10 campaign costing studies to calculate the additional cost of potential operational changes due to COVID-19 estimated that the operational costs of a campaign could increase by 5% when adding handwashing stations, 9-20% when adding PPE, by 10-26% when adding crowd controllers to manage physical distancing and triaging, by 8-32% due to additional per diems associated with campaign extension, and by 10-40% when certain operational aspects of the campaign (such as social mobilization and transport) are increased. See Thinkwell. Immunization campaigns during the COVID-19 pandemic: a rapid analysis of the additional operational cost. Available at: https://thinkwell.global/wp-content/uploads/2020/05/COVID-19-impact-on-campaigns-9-June-2020.pdf

Annex A. Designing Catch-up Vaccination Schedules

Every country should have a catch-up vaccination schedule designed in line with the national immunization schedule, that adhere to any upper or lower age requirements as determined by the national immunization policy. NITAGs should be involved in the process of developing a catch-up vaccination schedule at the earliest opportunity.

Catch-up vaccination schedules can be designed in a variety of ways and, as immunization programmes and schedules vary considerably across countries (and sometimes within), it is not possible to recommend a 'generic' catch-up schedule.

See **Table A2** for a simplified version of the WHO Recommendations for Interrupted or Delayed Routine Immunization.

Examples of catch-up schedules illustrating the variation in design approaches can be found below.[50]

- Australia
- Canada (Ontario, Manitoba)
- United Arab Emirates (Dubai)
- India (schedule, job aid)
- Malaysia
- South Africa (private sector)
- Thailand
- United States of America - Centers for Disease Control and Prevention

Catch-up schedules can also be designed for specific antigens. See example in Table 1. Other examples of antigen-specific catch-up schedules here: Ontario, USA - CDC.

Catch-up schedules can also be created to address the needs of specific target populations (for example, refugees or migrant populations) that may be missing one or more vaccines on the local immunization schedule. See, for example, Australia's Guidelines for Catch-up Immunization in Refugees.

Table A1. Catch-up vaccination schedule for Tetanus-toxoid-containing vaccine (TTCV) for previously unvaccinated individuals >1 year of age[51]

Minimum interval from the most recent dose administered					
Vaccine (age-appropriate) / No. of dose	1st dose	2nd dose	3rd dose	4th dose	5th dose
1–4 years: DTwP, DTaP, or DT	As early as possible	At least 4 weeks after the 1st dose	At least 6 months after the 2nd dose	At least 1 year after the 3rd dose	At least 1 year after the 4th dose
4–7 years: DTwP, DTaP, Td, or DT					
>7 years: Td or TdaP					

[50] *These and additional examples are also available on Tech-net – link to be inserted*

[51] WHO. Protecting all against tetanus: Guide to sustaining maternal and neonatal tetanus elimination (MNTE) and broadening tetanus protection for all populations.

Table A2. WHO recommendations for Interrupted or Delayed Routine Immunization – simplified table[a]

Antigen		Minimum age of first dose	Doses in primary series (minimum interval between doses)	Interrupted primary series	Doses for those who start vaccination late		Booster
					If ≤ 12 months of age	If > 12 months of age	
BCG		As soon as possible after birth	1 dose	NA	1 dose	1 dose	Not recommended
Hepatitis B		As soon as possible after birth (<24h)	Birth dose <24 hrs plus 2-3 doses with DTPCV (4 weeks)	Resume without repeating previous dose	3 doses	3 doses	Not recommended
Polio	bOPV + IPV	6 weeks (see footnote for birth dose)[b]	4 doses (IPV dose to be given with bOPV dose from 14 weeks of age) (4 weeks)	Resume without repeating previous dose	4 doses (IPV to be given with 1st dose of bOPV)	4 doses (IPV to be given with 1st dose of bOPV)	Not recommended
	IPV / bOPV Sequential	8 weeks (IPV 1st)	1-2 doses IPV and 2 doses bOPV (4 weeks)	Resume without repeating previous dose	1-2 doses IPV and 2 doses bOPV	1-2 doses IPV and 2 doses bOPV	Not recommended
	IPV	8 weeks	3 doses (4 weeks)	Resume without repeating previous dose	3 doses	3 doses	If primary series begins < 2 months of age, booster to be given at least 6 months after the last dose
DTP-containing vaccine (DTPCV)		6 weeks	3 doses (4 weeks)	Resume without repeating previous dose	3 doses	3 doses with interval of at least 4 weeks between 1st & 2nd dose, and at least 6 months between 2nd & 3rd dose. (if > 7 yrs use only aP containing vaccine	3 boosters: 12-23 months (DTP-containing vaccine); 4-7 years (Td/DT containing vaccine; and 9-15 yrs (Td containing) (if > 7 yrs use only aP containing vaccine).
Pneumococcal (Conjugate) (PCV)		6 weeks	3 doses (3p+0) with DTPCV (4 weeks) or 2 doses (2p+1) (8 weeks)	Resume without repeating previous dose	2-3 doses	1-5 yrs at high-risk: 2 doses	Booster at 9-18 months if following a 2-dose schedule. Another booster if HIV+ or preterm neonate.
Rotavirus		6 weeks	2 or 3 depending on product	Resume without repeating previous dose	2 or 3 depending on product	>24 months limited benefit	Not recommended
Measles-containing vaccine (MCV)		9 or 12 months (6 months min, see footnote)[c]	2 doses (4 weeks)	Resume without repeating previous dose	2 doses	2 doses	Not recommended
Rubella		9 or 12 months	1 dose with MCV	NA	1 dose	1 dose	Not recommended
Human Papillomavirus vaccine (HPV)		As soon as possible from 9 years of age	If started <15 years, 2 doses (5 months)	Resume without repeating previous dose No maximum interval.	NA	9-14 years: 2 doses	Not recommended
			If started ≥15 years, 3 doses (1 month for 2nd dose, 4 months for 3rd dose)	Resume without repeating previous dose No maximum interval.		≥15 years: 3 doses	

[a] See full version of Table 3 for addition al details, and recommendations for certain regions and high-risk populations: https://www.who.int/immunization/policy/Immunization_routine_table3.pdf

[b] In polio-endemic countries and in countries at high risk for importation and subsequent spread of poliovirus, WHO recommends a birth dose of bOPV ("bOPV0"), followed by a primary series of 3 bOPV doses and at least 1 dose of IPV.

[c] In certain situations, MCV can be given from 6 months of age. This dose should be considered a zero dose ("MCV0") and two subsequent doses (MCV1 and MCV2) should still be provided according to the national schedule.

Annex B. Minimum Intervals between Doses in a Vaccine Series

For vaccines requiring multiple doses, the minimum interval is the shortest amount of time permissible between doses in order to provide an adequate immune response. If the interval between the doses is shorter than the minimum interval, the second dose received may not be effective.

Refer to WHO recommendations for interrupted or delayed immunization to design an catch-up vaccination schedule and job aids to assist health workers in assessing eligibility for vaccination when an individual has missed or delayed doses.

Antigen	**Minimum age at first dose**	**Minimum interval** between doses 1 and 2	**Minimum interval** between doses 2 and 3	**Minimum interval** between doses 3 and 4	**Comments**
BCG	Birth				Give at earliest opportunity after birth
Hepatitis B birth dose	Birth				Give at earliest opportunity after birth, up until eligible for the first dose of HepB1 or combination vaccine
Hepatitis B (excluding birth dose)	6 weeks	4 weeks	4 weeks		
DTP-containing vaccine	6 weeks	4 weeks	4 weeks (If >1 year, leave at least 6 months between dose 2 and 3)	6 months (and >1 year of age)	If >7 years, use only aP containing vaccine; if >7 years, use Td-containing vaccine A total of **6 doses** of Td/DT-containing vaccine are recommended, minimum interval of 6 months. If Td vaccination is started during adolescence or adulthood, only 5 doses are required.
Hib*	6 weeks	4 weeks	4 weeks		If >1 year, only 1 dose is needed. Not recommended for >5 years, if healthy.
Polio OPV (excluding birth dose)*	6 weeks	4 weeks	4 weeks	4 weeks	
Polio IPV*	8 weeks	4 weeks	4 weeks		For IPV-only schedules, if the first dose is given <2 months, a booster should be given at least 6 months after the last dose.
Rotavirus	6 weeks	4 weeks	4 weeks (if using a 3-dose schedule)		Not recommended >2 years.
PCV*	6 weeks	4 weeks	4 weeks		If 1-5 years, only 2 doses needed.
MR or MMR	9 months (6 months, see comments)	4 weeks (and >1 year of age, for 2nd dose)			In certain cases, a supplementary dose of measles vaccine can be given as early as 6 months of age. Any dose given <9 months should be recorded as MCV0. Two subsequent doses are required.
HPV	9 years (if started ≥15 years, see comments)	5 months			If series is started ≥15 years old, 3 doses are needed (minimum interval 1 month between 1st and 2nd dose; 4 months between 2nd and 3rd dose)

*Alternative schedules available. See WHO recommendations for interrupted or delayed immunization for additional detail and for other antigens not shown above.

Annex C. Sample job aids for catch-up vaccination

The job aids below are illustrative examples, to be adapted in line with national immunization schedules and catch-up vaccination policies. Additional examples of job aids for adaptation are available on Tech-net (link to be inserted)

Some countries have developed online, computer or mobile phone-based applications to help health workers calculate eligibility for catch-up and answer frequently asked questions about vaccination schedules and catch-up vaccination.

Examples of such web-based tools include:

- The National Immunisation Catch-up Calculator (NICC) developed by the Australian Government Department of Health, available here: https://immunisationhandbook.health.gov.au/catch-up-calculator/calculator
- Catchup Ghana, an app to assist with building catch-up vaccination schedules, available here: https://play.google.com/store/apps/details?id=com.ghs.catchupgh
- The Childhood Vaccine Assessment Tool, developed by the US CDC, available here: https://www2a.cdc.gov/vaccines/childquiz/

Which vaccines can be given today?

Available at:
www.who.int/immunization/programmes_systems/policies_strategies/2YL_Catchup_Job_Aid.pdf

Instructions:

Step 1: Praise the parent or caregiver for bringing their child for vaccination today. Find out from the child's immunization record or the caregiver:

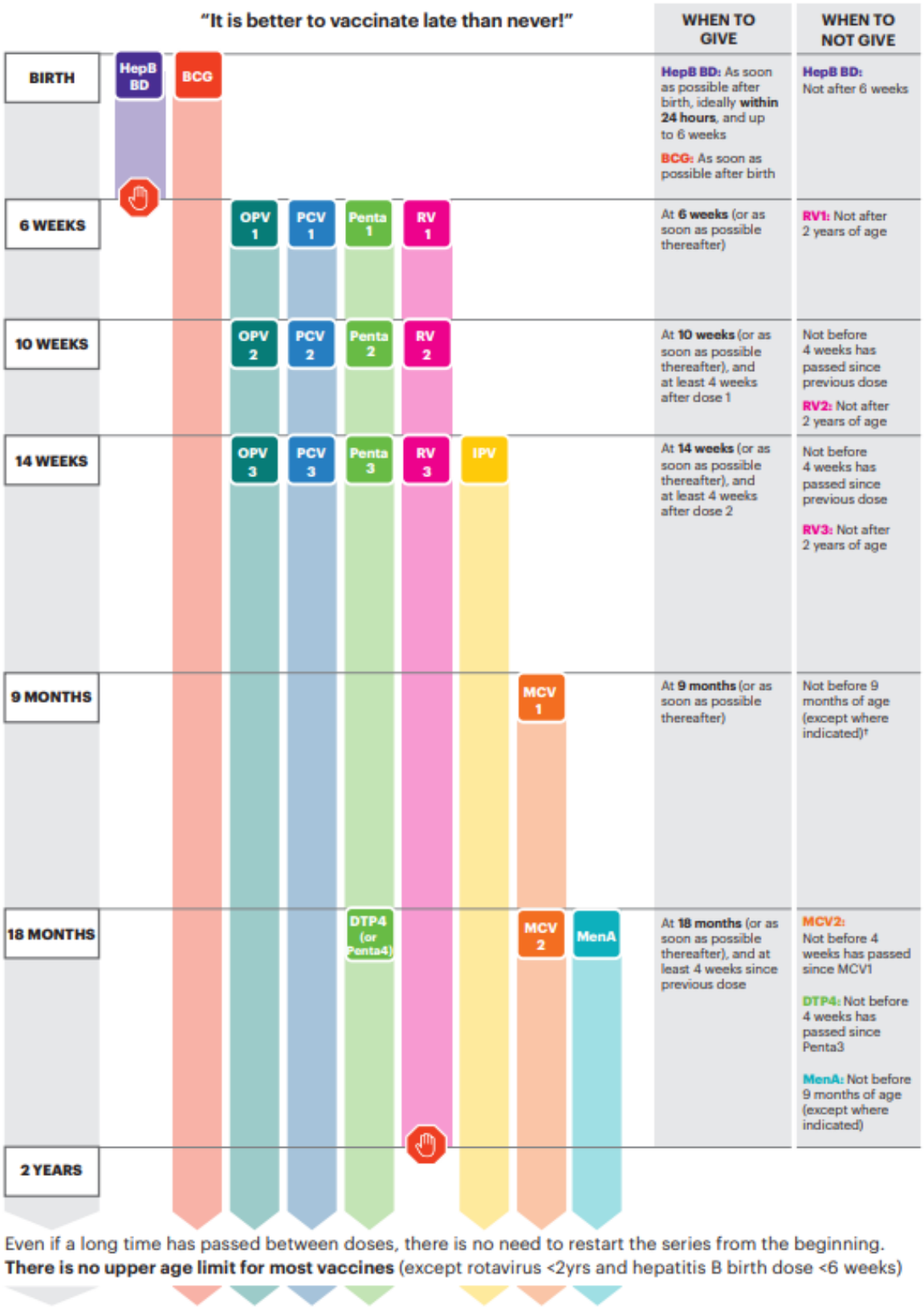
1. How old is the child today?
2. Which vaccines has the child already received? (Check the home-based record or child register)

Step 2: Use the chart to the right to decide what to give. The child should already have received all vaccines due up until their current age. If they are missing doses, it is not too late. Administer the vaccines for which they are eligible, respecting the necessary spacing (see far right column).

Step 3: Remind the caregiver when to bring the child back for the subsequent doses due. Take this opportunity to emphasize the importance of receiving the complete series of vaccines for the child to be fully protected.

WHICH VACCINES CAN BE GIVEN TODAY?

Use this chart to determine which vaccines should be given to a child at or after a specific age.



Even if a long time has passed between doses, there is no need to restart the series from the beginning.
There is no upper age limit for most vaccines (except rotavirus <2yrs and hepatitis B birth dose <6 weeks)

Annex D. Catch-up vaccination worksheet for determining eligibility[a]

Worksheets like this can be a useful tool to help health workers assess which doses an individual is eligible for at the time of a visit, and when subsequent doses will be needed (to communicate this to the caregiver or individual).

Name:

Date of this assessment:

Date of birth:

Age at this assessment:

Vaccine	Number of doses received and date for each	Number of doses needed at current age	Dose number due now	Additional doses required (interval or date)	Comments
To be completed based on national immunization schedule					*Note here if any upper age limits apply (e.g. Rotavirus)*

Photocopy or take a photo of the section below and provide to individual (hard copy or send via SMS/chat/email):

Catch-up vaccination appointments

Date	Vaccines and dose numbers	Interval to next dose (if needed)	Comments

[a] Adapted from the Australian Immunisation Handbook, developed by the Australian Government Department of Health, available online: https://immunisationhandbook.health.gov.au/resources/handbook-tables/resource-catch-up-worksheet-for-children

Annex E. Tally sheet for routine childhood vaccinations – example 1

The tally sheet below provides an example of a design which allows health workers to record catch-up vaccinations administered without restricting recording within an upper age limit.

Depending on the programme objectives for calculating coverage, alternative designs may remove age groupings entirely.

Date: _____ Region: _____ District: _____ Health Facility: _____

Service Delivery Strategy: ○ fixed ○ outreach ○ mobile Location: _____

ANTIGENS/ ITEMS	0-11 MONTHS	TOTAL	12 MONTHS OR OLDER	TOTAL	TOTAL VACCINATED
BCG	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		
Hep B BD	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○				
OPV 0	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○				
OPV 1	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		
OPV 2	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		
OPV 3	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		
IPV	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		
Penta 1	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		
Penta 2	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		
Penta 3	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		
Rota 1	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		
Rota 2	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		
Rota 3*	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		
PCV 1	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		
PCV 2	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		
PCV 3	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		
M/MR 1	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		
M/MR 2			○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		
DTP4/ Other*			○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		
Vitamin A	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		
Long lasting insecticidal net*			○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		

**depending on national health priorities and schedule of services*

Tally sheet for routine childhood vaccinations – example 2

The tally sheet below provides an example of a design which allows health workers to record catch-up vaccinations administered without restricting recording within an upper age limit.

Depending on the programme objectives for calculating coverage, alternative designs may remove age groupings entirely

Date: _____ Region: _____ District: _____ Health Facility: _____

Service Delivery Strategy: ◯ fixed ◯ outreach ◯ mobile Location: _____

ANTIGENS/ ITEMS	0-11 MONTHS	TOTAL	12-23 MONTHS	TOTAL	24 MONTHS OR OLDER	TOTAL	TOTAL vaccinated
BCG	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○		
Hep B BD	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○						
OPV 0	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○						
OPV 1	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○		
OPV 2	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○		
OPV 3	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○		
IPV	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○		
Penta 1	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○		
Penta 2	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○		
Penta 3	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○ ○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○		
Rota 1	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○				
Rota 2	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○				
Rota 3*	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○				
PCV 1	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○		
PCV 2	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○		
PCV 3	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○		
M/MR 1	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○		
M/MR 2			○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○		
DTP4/Other*			○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○		
Vitamin A	○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○		
Long lasting insecticidal net*			○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○ ○○○○○		○○○○○ ○○○○○ ○○○○○ ○○○○○		

*depending on national health priorities and schedule of services

Annex F. Periodic Intensification of Routine Immunization: An Overview

The note below was developed in October 2018 by an ad-hoc workgroup on PIRI.[a]

About

Periodic intensification of routine immunization (PIRI) is an umbrella term to describe a spectrum of time-limited, intermittent activities used to administer routine vaccinations to under-vaccinated populations and/or raise awareness of the benefits of vaccination. Example activities include Child Health Days, Child Health Weeks, and National Vaccination Weeks (Table F1). Historically, a PIRI that included delivery of vaccinations also included delivery of other key maternal and child health (MCH) interventions such as vitamin A supplementation, bed nets, and de-worming tablets. PIRIs gained popularity in the 2000s, often taking advantage of widespread vitamin A supplementation activities, to improve vaccination coverage in under-vaccinated populations and increase the awareness of and support for vaccination services. Typically, targets for vaccination through PIRI were not set and its contribution to routine immunization coverage was not assessed. PIRIs are generally not designed to address or solve the underlying causes of under-vaccination but complement efforts in reaching the unreached population.

By definition, the vaccine doses provided during a PIRI activity are considered routine, rather than supplemental. This means that health workers must screen children for eligibility based on age and immunization history and that the doses administered must be recorded on vaccination cards and registers, reported as part of annual coverage estimates generated by countries, and submitted as part of the WHO/UNICEF Joint Reporting Form process.

General Aims & Activities

A PIRI generally includes one or both of the following key vaccination-specific aims and activities:

1. Targeted delivery of all or selected routinely-recommended vaccinations to under-vaccinated populations within the usual target age range stipulated by the national immunization program for routine vaccination services. In essence, it is a catch-up opportunity for children or eligible targeted population who are the usual target group for routine immunization services but have been missed or underserved during the year.

2. Community-wide social mobilization and advocacy activities on the benefits of routine immunization and the availability of routine immunization services. These activities typically aim to reach the parents of young children, the general public to broadly increase positive awareness about vaccination services, and decision makers to raise the visibility of routine immunization and advocate for resources.

General Approach[b]

Targeted delivery activity

Ideally, in the first step of the targeted PIRI activity that involves service delivery, health system staff review recent vaccination performance and surveillance data to identify communities which would benefit from a routine immunization catch-up activity. Communities with low vaccination coverage

[a] Drafting led by Fields R, Kretsinger K, Mirza I, Sodha S, Wallace A.

[b] As described in *WHO. Periodic Intensification of Routine Immunization: Lessons Learned and Implications for Action*, available at: http://www.who.int/immunization/programmes_systems/policies_strategies/piri_020909.pdf

or recurrent outbreaks of vaccine preventable diseases are targeted for the PIRI activity. Staff then estimate the numbers of under-vaccinated children in order to forecast vaccine needs to ensure that sufficient vaccine is available for the PIRI activity. The target age range for this exercise is generally the same as for routine immunization. Health system staff then identify the vaccination delivery sites that are most convenient and appropriate for reaching the low-coverage or marginalized communities to be served by the PIRI activity. The PIRI activity occurs over the course of a short, multi-day period, largely organized and administered by the health system staff and volunteers.

Social mobilization and advocacy activities

Social mobilization and advocacy activities are generally high profile, taking place at community, district, regional and national-levels. They aim to raise awareness among certain target populations and the general public about the benefits of vaccination and to advocate to high-level decision makers for support and resources for immunization. Specific events can be carried out with national and subnational government officials and other key community stakeholders who are engaged to discuss and promote the benefits of vaccination.

When to use each activity

In several countries with high vaccination coverage, use of only a social mobilization activity (for instance, Vaccination Week in the Americas) is deemed sufficient because the health system is capable of reaching the entire target population with routine vaccinations throughout the year. However, these efforts may be augmented with very specific, targeted service delivery activities, e.g., expanded service delivery to cross-border populations traditionally missed through routine services. **Use of the targeted delivery activity is considered expensive and may interfere with the normal, routine health system operations, so sufficient value and need must be present before supporting the use of a targeted delivery activity.** In many countries that use targeted service delivery activities, social mobilization is also conducted in order to mobilize the community in question to participate in the PIRI targeted delivery activity.

Table F1: PIRI goals, general strategies, and activities

PIRI goal	General strategy	Type of activity
Expand access and provide vaccination plus other health interventions that are not routinely available to a ***wide range of population***	Deliver routine immunization doses (and possibly other selected child health interventions) during a multi-day period	Child Health Day/Week
	Deliver routine immunization doses (and possibly other maternal and child health interventions) during a multi-day period	Maternal & Child Health Day/Week
Expand access and provide vaccination to ***specifically-defined vaccination-eligible populations*** that have not received recommended vaccines	Deliver routine immunization doses (and other selected health interventions) during a multi-day period, targeted at specifically defined, under-vaccinated communities	Targeted CHW/MCHW
Improve demand: Promote the benefits of routine vaccination	High visibility communication, advocacy, and social mobilization events	Global/Regional/ National Immunization Week

PIRI Targeted Delivery Activities, Supplemental Immunization Activities (SIA), and Routine Immunization Services

A PIRI service delivery activity differs from an SIA and routine immunization in some key ways (summarized in Table F2):

1. Vaccine doses provided during the PIRI activity are considered as routine immunization doses and must be recorded and reported so that they are captured in annual estimates of coverage. In operational terms, this means that all children must be screened for eligibility for each dose provided through PIRI.
2. A PIRI will use the same target population as routine immunization whereas an SIA will often target an expanded age range. In practical terms, PIRIs are usually limited to children 24 months of age or younger, due to the challenges of documentation with older
3. A PIRI will generally include all doses of all vaccines used in routine immunization whereas an SIA often provides just one or two vaccines (usually measles and/or polio vaccine).
4. A PIRI targeted service delivery activity, to be of strategic value, is planned such that it targets only those communities known to be recently underserved with routine immunization. By contrast, the geographic scope of an SIA is usually region-wide or nationwide. The PIRI activity also differs from routine immunization services in that it is typically carried out only in a selected number of communities to increase coverage and reach unreached populations as identified through microplanning and prioritization. By contrast, routine immunization services are intended to serve all communities.

Table F2: Comparison of features of SIAs, PIRI targeted service delivery, and routine immunization service delivery

	SIA	PIRI targeted service delivery	Routine immunization service delivery
Purpose	Rapidly increase population immunity by providing vaccine doses to a target geographic and age-range, regardless of prior vaccination status	Rapidly reach underserved populations or catch up children who are overdue for vaccination	Provide timely vaccination to all intended beneficiaries as soon as they become eligible, in accordance with national vaccination schedule
Geographic scope	Large geographic areas, based on epidemiologic data	Selected geographic areas	Nationwide
Age of target population	Often an expanded target age group, based on epidemiologic needs	Corresponds to target age group in national vaccination schedule. May be temporarily expanded to catch up children who are overdue for doses	Corresponds to target age group in national vaccination schedule.
Screening	Required to determine child's age	Required to determine child's age and eligibility for each vaccine dose to be given	Required to determine child's age and eligibility for each vaccine dose to be given
Recording of doses	Each dose is considered supplemental and is recorded on tally sheet	Each dose is considered routine and must be recorded on home-based	Each dose is considered routine and must be recorded on home-based

	for the SIA, and ideally should be recorded as a supplemental dose on home-based record or SIA card	record, clinic-based register, and tally sheet	record, clinic-based register, and tally sheet
Reporting of doses	All doses are captured in report for the SIA	All doses are captured in annual administrative estimates of coverage and Joint Reporting Form	All doses are captured in annual administrative estimates of coverage and Joint Reporting Form
Communication on next doses	Inform caregiver of need for routine immunization	Inform caregiver on when to return for next dose	Inform caregiver on when to return for next dose

Potential PIRI Benefits

- Identifies, prioritizes, and vaccinates populations that are underserved by routine immunization services.
- If the target age group is expanded for PIRI, can rapidly vaccinate children who are overdue for vaccination.
- Has potential to rapidly raise demand for measles first and second doses and other routine immunization services.
- May strengthen microplanning skills to ensure inclusion of populations at high risk of under-vaccination.
- In locations with very little or no functioning health system, may be the only recourse for reaching certain populations (pulse immunization).

Potential PIRI Challenges

- PIRI does not address systemic, root causes for the failure of routine immunization services (fixed or outreach) to reach all populations and instead provides a time-limited solution.
- PIRI does not have the same ability as SIAs to rapidly increase population immunity to prevent outbreaks. Typically, the target age for PIRIs is narrower than that of SIAs. In addition, operational challenges of eligibility screening and immunization documentation may lead to lower coverage within a given target age than would be achieved in a non-selective SIA, even among zero and one dose children.
- Accurately defining target population size, eligibility criteria and service delivery sites for PIRI is challenging as data quality is likely low for underserved populations.
- The ability to set targets for PIRI and assess its contribution to annual routine immunization coverage is complex and imprecise.
- Screening requires name-based information from child health registers and home-based records (HBRs) whose availability is likely limited among underserved populations. Doses given during PIRI must be captured in registers and HBRs as routine doses. Moreover, if the PIRI makes use of an expanded number of sites for service delivery, the child register cannot be broken up to go to all of them and thus the information needed for screening relies heavily on the availability of the HBR.
- There is need to ensure that there is a sufficient supply of vaccines and other commodities for both routine immunization services and PIRI so that future stock-outs do not occur.
- Service delivery through PIRI entails additional workload to create special microplans for PIRI and harmonize them with microplans for routine immunization services.

- If used too widely or frequently, PIRI may distract caregivers from using routine immunization services when their children become eligible and thereby reduce timeliness of vaccination.
- PIRI may divert resources away from ongoing routine immunization services or from addressing the causes of long-standing obstacles to routine immunization.

Considerations for Using PIRI

PIRI service delivery activities are basically targeted campaigns to catch up children (and sometimes adults) on missed vaccinations or to reach populations that are traditionally underserved by routine services. Ideally, PIRIs should be part of a bigger immunization program strategy that also includes efforts to simultaneously strengthen routine immunization services for the long term. PIRIs would then serve as a bridge of providing immunity until route immunization services are strengthened enough to sustainably provide routine services for the targeted communities.

Whether a PIRI should be conducted depends largely on whether investing resources into the PIRI activity to rapidly raise coverage among certain target groups outweighs the potential benefits of using those resources to support routine operational activities (e.g., ensuring that planned outreach sessions occur, routine supportive supervision takes place, routine microplanning happens at all levels).

Alternatively, such resources could be used to address the root causes of long-standing obstacles to sustainable, high, and equitable routine coverage. If PIRI is used widely and regularly in circumstances where there is not specific need, it risks diverting community attention away from timely use of routine immunization services, particularly if vaccinations are made more convenient during PIRI. Table 3 outlines considerations based on the country performance context and the likely PIRI activities that would occur within each context:

Table F3: Potential PIRI design based on country setting

Vaccination coverage level	Operational issues for PIRI		
	Service delivery	**IEC /social mobilization**	**Considerations**
High coverage nationally and subnationally	May not be appropriate	Optional social mobilization event to maintain high and positive vaccination awareness	Identify if impact of social mobilization event outweighs cost, particularly compared with other strategies that could be used to improve/ maintain coverage
Medium/high nationally, with multiple low coverage subnational areas	Consider targeted, time-limited outreach sessions 1-2 times per year in communities with identified low vaccination coverage	If needed, social mobilization to improve demand and use; combine with expanded service delivery (if included in the PIRI activity)	Analyze whether investments into routine outreach or ensuring that all fixed health facilities conduct vaccination sessions is a better use of funds than PIRI activity
Low nationally, with several low coverage subnational areas	Consider wide-scale Child Health Week twice per year, particularly in locations with poor infrastructure	Social mobilization event coupled with Child Health Week	Identify if investments into routine outreach or ensuring all fixed health facilities conduct vaccination sessions is a better use of funds than PIRI activity

Annex G. Actions to enhance acceptance and demand for vaccination

KEY POINTS

- Vaccination uptake is affected by both individual, social and practical factors. This includes the convenience and experience of immunization services, as well as community trust in vaccines and local or national authorities.
- Building acceptance and demand for vaccination not only contributes to closing immunity gaps but strengthens resilience in the face of vaccine-related events (e.g. outbreaks, AEFIs, rumours / misinformation), to minimise the negative impact of such events.
- Intensified efforts are needed to support vaccine demand in the context of service disruption due to social and practical pressures that can exacerbate barriers to vaccination.

Communication about immunization

- It is always important to reinforce the value of vaccination to build public awareness.
- In the event of service disruptions, communication must address public concerns and convey clear messages about the extent of the disruption.
- Programmes should communicate regularly during and even after disruptions to reinforce two key messages:
  - ✓ Importance and benefits of vaccines
  - ✓ Where, when and how the public can continue to access vaccination services.

Engaging with local civil society organizations

- Trust is critical to resilience of immunization services in the face of disruptions.
- An unknown disease or an epidemic that spreads quickly and widely can raise the levels of fear, anxiety, stigma and discrimination amongst affected populations. Therefore, it is important to consider not just what messages to deliver, but also how and from whom.
- Building and maintaining trust requires dialogue – listening and responding to community needs. Within this context, it is widely recognised that Civil Society Organisations (CSOs) – including non-governmental organisations (NGOs), advocacy organisations, professional and community associations, faith-based organisations and academia – can support immunization programmes to understand and address demand related barriers. They can also play a key role in implementation of immunization and encourage transparency and accountability.
- To build acceptance and demand for vaccination, programmes must:
  - Harness local alliances – especially any structures that may have emerged during emergency/exceptional situations.
  - Coordinate with CSOs to facilitate community engagement to build support for vaccination, listen and respond to community concerns regarding vaccination, and promote the value of vaccination, and where and when to seek vaccination.

Behaviourally informed interventions

- To design and evaluate effective immunization programmes and services, including catch-up vaccination strategies, immunization professionals must first identify the root causes for low coverage.
- Assessing the drivers and barriers of immunization does not need to be a resource and time intensive activity. Effective data collection:
  - Makes use of established partnerships with communities, CSOs and other listening networks to gather insights into why vaccination coverage rates are low.
  - Focusses on the target population; those most vulnerable to un/under-vaccination.
  - Acknowledges that collecting *some* data is better than collecting no data all.

- Immunization programme managers and planners should generate insights on context-specific drivers and barriers to uptake, and tailor services and interventions to help individuals overcome any lack of motivation or competing priorities.
- For detailed guidance on tailoring interventions, please see the Tailoring Immunization Programmes[c] (2019) approach.
- Important behaviourally informed interventions for addressing known drivers and barriers to immunization include:
  - Ensure clean workstations and simple/easy workflows for vaccination health workers to encourage safe, effective and prompt service.
  - Make use of prescheduled appointments or dedicated appointment times wherever possible to control the total number of individuals at the health facility and reduce waiting times.
  - Ensure comfortable waiting spaces: clean, well ventilated, not overcrowded, and allowing for respectful physical distances, if necessary.
  - Where possible, provide: seating, access to water and restrooms, and nursing spaces.
  - To try to reduce anxiety of individuals kept waiting for vaccination, facilitate a steady flow of individuals coming and going by dedicating distinct entrances and exits to the vaccination area and reduce unnecessary physical contact between individuals, where possible.

Considerations for supportive supervision and motivation of health workers

- As the bridge between communities and immunization, it is equally important to address the needs and concerns of health workers. To sustainably build acceptance and demand, programmes must invest in adequate training and support for front-line vaccination health workers.
- **Supportive supervision** is intended to help health workers to enhance the quality of service delivery, which includes:
  - Improving lines of communication between health workers and supervisors.
  - Using feedback mechanisms to gather and address any health worker concerns.
  - Using tools for supervision, including job descriptions and performance reviews.
  - Providing written feedback for reference and evidence-based action planning.
- **Training and capacity building** also contribute to the delivery of quality services that shape positive service experiences, and in turn grow community demand:
  - All staff should be trained in key areas of immunization, per the WHO Standard Immunization Competencies Framework,[d] and offered 'refreshers' where feasible.
  - All staff should receive training in inter-personal communications and related community engagement. This should include guidance on how to address rumours and concerns about vaccines, and communicate about AEFIs, and the benefits of vaccines.

[c] http://www.euro.who.int/en/health-topics/communicable-diseases/poliomyelitis/publications/2019/tip-tailoring-immunization-programmes-2019

[d] https://www.who.int/immunization/programmes_systems/workforce/standard_competencies_framework/en/

Annex H. Example VPD risk-assessment worksheets

The risk-assessment worksheets below are examples, taken from the WHO Vaccination in Acute Humanitarian Emergencies: a Framework for Decision Making.[e] Worksheets to assist in risk-assessments for the following VPDs can be found in Annex 2 of that document:

- cholera
- diphtheria
- hepatitis A
- hepatitis B
- hepatitis E
- *Haemophilus influenza* type b (Hib)
- human papillomavirus (HPV)
- influenza (seasonal)
- Japanese encephalitis
- measles
- meningitis
- mumps
- pertussis
- pneumococcal
- poliomyelitis
- rabies
- rotavirus
- rubella
- tetanus
- tuberculosis
- typhoid
- varicella
- yellow fever

[e] Available at: https://apps.who.int/iris/bitstream/handle/10665/255575/WHO-IVB-17.03-eng.pdf

Table H1. Measles disease-specific risk factors

Factor	Risk level			Comments
	High	**Medium**	**Low**	
Risk level for the setting: geography, climate and season	• Sub-Saharan Africa • South and South-East Asia • High transmission season occurring currently or within the next 3 months	• High transmission season within the next 3-6 months	• Low transmission season • The Americas, Europe and the Middle East	Likely that seasonal climate patterns influence population density that, in turn, increases the transmission of measles. Strongest seasonal effect is in the Sahel, where cases peak in the dry season as people congregate in villages and towns. In other parts of Africa, cases peak in the cool rainy season. Local experts should be consulted on local seasonal changes.
Population immunity	Routine vaccination coverage for children <18 months is <70%	Routine vaccination coverage for children <18 months is 70-89%	Routine vaccination coverage for children <18 months is >95% and routine immunization can be maintained	Reaching all children with 2 doses of measles-containing vaccine should be the standard for all national immunization programmes. Infection is thought to provide long-lasting/lifelong immunity. Acute malnutrition and vitamin A deficiency increases measles mortality. Case management is very important in an outbreak.
Burden of disease	• The area has experienced one or more large outbreaks in the past 3 years, *and/or* • An outbreak is currently ongoing	• The area has experienced one or more large outbreaks in the past 5 years, but none of them large	• The country has achieved elimination status	A large outbreak could consist of >100 cases or >10 deaths. Case-fatality ratio can range from <1% to 5-6% (higher in Africa, SE Asia); CFR >10% have occurred in refugee camps.

Risk characterization

Type of threat: Epidemics occur in population groups where the number of susceptibles becomes higher than the number of the birth cohort. Measles outbreaks can result in many deaths in unvaccinated individuals, especially among young, malnourished children. The risk of death is greatly reduced in people who are vaccinated; therefore, in areas with high vaccination coverage, the risk of death is also lower as most cases are in vaccinated individuals.

Time frame: Incubation period of 10–14 days. Measles is highly infectious. Outbreaks can occur rapidly (<1 month) in crowded settings with a high proportion of non-immune population.

Age-specific burden: Children <5 years are especially vulnerable; children 5–14 generally have lower rates of complications or death but should also be vaccinated. The risk of complications and death increases with age beginning around 15 years, and recent epidemics have featured considerable transmission in young adults, warranting consideration of these age groups for vaccination. Special efforts may be needed to mobilize older children and adolescents for vaccination.

Table H2. Poliomyelitis disease-specific risk factors

Factor	Risk level			Comments
	High	Medium	Low	
Population immunity	• Reported routine vaccination coverage for children <23 months is <80% • In endemic or countries at high risk of outbreaks following importation: the last SIA was done >6 months ago; or within the last 6 months but with coverage <80%	• Reported routine vaccination coverage for children <23 months is 80-89% • In endemic or countries at high risk of outbreaks following importation: the last SIA was done within the last 6 months but with coverage <90%	• Reported routine vaccination coverage for children <23 months is >89%	Many polio-free countries at high risk of outbreaks following virus importation or emergence of circulating vaccine-derived poliovirus (cVDPV) also carry out regular SIAs
Burden of disease	The country experiencing the emergency (or from which refugees have fled) has ongoing virus transmission, i.e. is either endemic for polio, is currently affected by transmission, or shares borders with an infected country or area.	The country experiencing the emergency (or from which refugees have fled) was recently infected (endemic or outbreak-related transmission), but no polio case has been reported for at least 12 months.	No polio case for at least 3 years, with good surveillance.	About <1% of poliovirus infections in children <5 years of age, varying with serotype and age, results in paralysis. The case-fatality rates among paralytic cases range from 5 to 10% in children and from 15 to 30% in adolescents and adults. All polio-free areas remain at risk as long as any country remains endemic.

Risk characterization

Type of threat: Main threats are: renewed polio outbreaks in polio-free countries; in areas affected by emergencies, and in areas with low performing immunization systems following wild poliovirus importation from infected areas or emergence of circulating vaccine-derived poliovirus. New outbreaks in polio-free countries represent a major setback for the Global Polio Eradication Initiative.

Time frame: Reintroduction and/or a large outbreak could occur within weeks of the emergency's onset. The incubation period is 7–10 days; infectiousness lasts 3–6 weeks.

Age-specific burden: Cases usually occur in children <5 years, with highest burden among those <36 months; however, epidemics affecting adults have recently occurred where virus was imported into populations with past immunity gaps.