

EXPANDED PROGRAMME ON IMMUNIZATION PROTOTYPE CURRICULUM FOR MEDICAL SCHOOLS IN THE WHO AFRICAN REGION

Update

December
2015



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ACRONYMS

AD	auto-disable (syringes)	HRD	human resource development
AEFI	adverse event following immunization	HRH	Human Resources for Health
AFP	acute flaccid paralysis	ICC	inter-agency coordinating committee
AFRO	WHO Regional Office for Africa	ICM	International Confederation of Midwives
AMP	Agence de Médecine Préventive	ICN	International Council of Nurses
ARI	acute respiratory infection	IDS	integrated disease surveillance
BCC	behavioural change communication	IDSR	integrated disease surveillance and response
BCG	bacille Calmette-Guérin	IEC	information, education and communication
CB	capacity building	IIP	<i>Immunization in Practice</i> (WHO training course for peripheral health workers)
CBO	capacity building officer	IMCI	integrated management of childhood illness
CC	cold chain	KAP	knowledge, attitude and practices
CD	compact disc	LCD	liquid crystal display
CHW	community health worker	MCH	maternal and child health
CIN	cervical intraepithelial neoplasia	MCHIP	Maternal and Child Health Integrated Programme
CRC	Convention on the Rights of the Child (United Nations)	MDGs	Millennium Development Goals
CRS	congenital rubella syndrome	MLM	Mid-Level Management (Course for EPI Managers)
CSF	cerebrospinal fluid	MM	Monovalent, bivalent measles-mumps
CT	content topic	MMR	trivalent measles-mumps-rubella
CVP	children's vaccine programme	MNT	maternal and neonatal tetanus
cMYP	comprehensive Multi-Year Planning	MNTE	maternal and neonatal tetanus elimination
DHMT	district health management team	MOH	ministry of health
DHP	district health package	NA	not available
DMO	district medical doctor	NESI	Network for Education and Support in Immunization
DOR	dropout rate	NGO	nongovernmental organization
DOTS	directly observed treatment short course	NID	national immunization day
DPT	diphtheria–pertussis–tetanus vaccine	NIP	national immunization programme
EHT	environmental health technician	NITAG	national immunization technical advisory group
EPI	Expanded Programme on Immunization	NRA	national regulatory authority
EVM	effective vaccine supply management	NT	neonatal tetanus
FIC	fully immunized child	OSCE	objective structured clinical examination
GAPPD	Global Action Plan for Pneumonia and Diarrhoea	OPV	oral polio vaccine
GAVI	Global Alliance for Vaccines and Immunization	PATH	Partnership for Appropriate Technology in Health
GIVS	Global Immunization Vision and Strategy	PCV	pneumococcal conjugate vaccine
GTN	Global Training Network	PH	public health
GVAP	Global Vaccine Action Plan	PHC	primary health care
HBV	Hepatitis B virus		
HepB	Hepatitis B (vaccine)		
Hib	<i>Haemophilus influenzae</i> type b (vaccine or infection)		
HMIS	health management information systems		

PHN	public health nurse	TT	tetanus-toxoid
PIRI	periodic Intensification of routine immunization	UCI	universal child immunization
REC	reaching every community	UHC	universal health coverage
RED	reaching every district	UNF	United Nations Foundation
SIA	supplementary immunization activities	UNICEF	United Nations Children’s Fund
SIAD	Short-interval additional dose	USAID	United States Agency for International Development
SNID	sub-national immunization day	UTH	university teaching hospital
STI	sexually transmitted disease	VAD	vitamin A deficiency
TFI	Task Force on Immunization	VPD	vaccine-preventable diseases
TNA	training needs assessment	VVM	vaccine vial monitor
TOR	terms of reference	WFME	World Federation for Medical Education
ToT	training of trainers	WHO	World Health Organization

GLOSSARY

Activity: Relevant intervention to implement each strategy distributed in time and space in the work plan. It is a task or a set of interrelated tasks aimed at generating a product or a result.

Assessment: Assessment is an examination of inputs, process and outputs of a project or programme conducted to measure performance and ascertain readiness and capacity to perform roles and responsibilities or achieve set objectives. It is linked to policies and systems under which the programme operates.

Checklist: A written list of key technical items to be evaluated during student assessment or during a supervisory visit.

Cold chain: A network of refrigerators, cold stores, freezers and cold boxes organized and maintained so that vaccines are kept at the right temperature to remain potent during vaccine orders and supplies, their transportation, storage and distribution from factory to the point of administration to the target population.

Combination vaccine: A vaccine consisting of several components or antigens (e.g. DPT or DPT-HepB).

Community surveillance: Surveillance where the starting point is a health event occurring in the community and reported by a community worker, or actively sought by investigators while interviewing community members. This is particularly useful during an outbreak when syndromic case definition can be used to obtain more information on the health event.

Coverage: A measure of the extent to which the services rendered cover the potential need for these services in the community.

Course facilitator: A person or an expert who has previous acquaintance with the course and who facilitates and guides the learning process during the training course.

Course participant: A person nominated by the government or any other organization or self to participate in the training course who has fulfilled the criteria of selection established by the course organizers.

Dropout rate: The number of individuals who start receiving immunization but do not receive later doses for full immunization.

Effectiveness: Capacity to produce desired results.

Efficiency: Capacity to produce desired results with a minimum expenditure of energy, time or resources.

Elimination: Refers to reduction to zero of the incidence of a specified disease in a defined geographical area as a result of deliberate efforts; continued intervention measures are required. Example: neonatal tetanus.

Eradication: Refers to permanent reduction to zero of the worldwide incidence of infection caused by a specific agent as a result of deliberate efforts; intervention measures are no longer needed. Example: smallpox.

Evaluation: A periodic assessment of overall programme status: performance, effectiveness and efficiency. It is linked to policies, programme processes, systems under which the programme operates, strategic choices, outcomes and impact.

External environment: Geographic, political, socioeconomic and technological factors, trends and individuals who, even though they are outside the health system, have an impact on health. The stagnation and reduction in immunization coverage rates in some countries can be attributed to such external factors.

Job aid: A set of specific instructions for performing individual tasks, e.g. how to use safety boxes to dispose of auto-disposable (AD) syringes.

Job description: Description of a job as a result of job analysis, which includes the duties, responsibilities and organizational relationships that constitute a given job or position.

Health personnel: The number of individuals available for, or undergoing training in, the different health occupations; the demographic characteristics of these individuals; their social characteristics in terms of education, experience and values; and the changes required, both in numbers and qualification of personnel, to provide the health services needed and determined by a population.

Health problems: Malfunctions, anomalies, suffering of individuals and lapses in the health system. They are essentially divided into suffering or diseases, community problems and problems related to the operation of health services.

Health system: A set of individuals and organizations working for the improvement and protection of public health. In the African Region, decentralization, service integration and financing policies adopted under the health sector reform represent a challenge for the reorientation of immunization and other services.

Immunization coverage: The proportion of vaccinated individuals among the target population. It is usually expressed in percentages.

Implementation: The act of actually undertaking an intended and planned course of action.

Indicator: A variable used to measure progress towards the achievement of targets and objectives. It is used to compare performance in terms of efficiency, effectiveness and results. It is also used to measure impact of interventions.

In-service training: A planned, formal training programme given after completion of basic training.

Logistics: A group of operations that include procurement, delivery of vaccines and consumables to the place of their use, management and maintenance of transport and cold chain equipment.

Leadership: Ability to direct the operations, activities or performance of an organization or group of people (e.g. Expanded Programme on Immunization team) towards assigned goal and achieve definite results.

Learning objectives: The aim of any training process that provides new knowledge, skills and experiences that the course participant will acquire at the end of each module or entire course.

Lessons learned: An end product of experiences, discussions and exchanges of ideas or the outcome of an ended project that can facilitate decision-making when similar situations or problems occur.

Management: A science and an art that comprises a set of concepts, skills and tools for organizing an enterprise (e.g. institution or programme), improving its operation by rationally managing the resources to attain the objectives assigned.

Medical education: The process of imparting formal knowledge and skills that qualify an individual to practise medicine. A number of different stages can be distinguished:

Undergraduate education: period which begins when the student enters medical school and ends with the final examination for his/her basic medical qualification, or with the granting of his/her licence

to practise. It comprises a pre-clinical and a clinical period.

Graduate training: the phase of widening clinical experience and acquisition through practise of basic clinical skills and judgement normally used to cover the period of hospital internship. This stage normally leads to a full licence to practise.

Postgraduate or professional training: is a post-basic training period designed to lead to competence in a chosen branch of medical practice. It is roughly synonymous with vocational training.

Continuing medical education: educational programme/activity designed to strengthen and refresh the knowledge and awareness of the practising physician and to keep him/her in touch with new developments in medical theory and practice.

Medical school: Includes all higher education or university-level institutions (which vary from one country to another) offering a prescribed course of medicine: medical college, college of surgeons, medical institute, institute of medicine and pharmacy, faculty of medicine, academy of medicine, medical university, etc.

Micro-plan: Detailed operational plan usually at district (or health facility) level, indicating specific activities, implementation schedule, names of responsible people and needed human, material and financial resources and their source.

Missed opportunity: When a health worker fails to use a contact with women or caregivers to perform immunizations when children or women are eligible for immunization.

MLM course: Mid-level management course commonly conducted for programme managers at district or province level. This course is also beneficial as a refresher course for managers in service or for newly appointed managers at central level as it contains sufficient technical information on a specific programme.

Monitoring: A systematic and continuous process of examining data, procedures and practices to identify problems, develop solutions and guide interventions. Monitoring is conducted on a regular (daily, weekly, monthly and quarterly) basis. It is linked to implementation of programme activities. The information collected is used to direct programme activities on continuous basis.

Need: A lack of something desirable and useful, a discrepancy or gap between the present situation and the desired or ideal solution.

Norms: Expression of what is desired encompassing goals, objectives, policies and standards. They express the “scientifically” determined requirements in a given sector of health or programme. As a quantitative index, norms represent a middle point between extremes arrived at by research.

Objective: A quantifiable product or a positive change expected from implementation of a plan. It is the end result a programme, project or institution seeks to achieve.

On-the-job training: Planned informal learning during the period of employment.

Participatory training: Engagement of learners in creative problem solving and provides opportunities for new forms of self-expression. By involving participants in a variety of new ways of learning, learners discover talents and abilities they never knew they had. The discovery increases their self-confidence, which in turn increases participation and improves the quality of both participation and learning.

Performance: Level of fulfilment of operational capacity of a programme or a person.

Programme: A coherent entity of related projects or services directed by a group of people to achieve specific objectives.

Project: A set of activities planned to achieve specific objectives by project staff within a given budget and with a definite beginning and end.

Review: A formative assessment of an ongoing programme at mid-term or at the end of the scheduled cycle.

Specialist: A doctor who has received specialized training in one branch of medicine and who limits his/her practice to particular disease categories or to certain age groups.

Standards: Values or conditions set up and established by an authority as a rule for measuring the quantity, weight or level to satisfy the norms. Standards may apply to the quantity and quality of the end product.

Strategy: A description of how the objectives of EPI will be achieved, namely the types of services or methods of intervention (e.g. fixed, outreach or mobile strategy to deliver immunization services).

Supervision: A process to guide, support and assist service providers to carry out their duties and assigned tasks so as to achieve planned organizational goals. The process is based on observations, interviews, inspections, review of documentation that helps supervisor to assess the situation, as well as health worker to improve performance.

Supportive supervision: A special type of supervision that is formative and involves on-the-job transfer of knowledge, attitudes and skills between supervisor and supervisee.

Targets: Categories expressed exclusively in measurable terms in relation to each objective. They are time bound and have a specific deadline for achieving the desirable level or result.

Target audience: In this curriculum, it is group of students earmarked for the training programme.

Task description: A documented instruction that gives technical details as to how the various steps of a job should be performed.

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PART 1

INTRODUCTORY COMMENTS AND TECHNICAL APPENDICES

1. INTRODUCTION

1.1 Training on immunization in the African Region

Human resources are central to managing and delivering health care, including immunization services, to the population. Policy-makers, managers and pre-service training institutions are essential to ensure that a health workforce, sufficient in numbers, well-educated and trained, adequately deployed and motivated, is available to provide immunization services of good quality. Another challenge is to ensure that health personnel training is relevant to national needs. Education and training, therefore, must be coordinated and integrated with the developing health system as it moves toward meeting the objectives of universal coverage in the 21st century included in the Millennium Development Goals (MDGs) and in the resolution on the Global Immunization Vision and Strategy (GIVS) 2006–2015 and Global Vaccine Action Plan (GVAP) 2011–2020, the Regional Expanded Programme on Immunization (EPI) Strategic Plan 2014–2020 and the Global Action Plan for Pneumonia and Diarrhoea (GAPPD) 2010–2025.

Available evidence shows that the performance of health workers improves after in-service training in EPI. However, several concerns have been expressed regarding the coverage, costs, long-term impact and sustainability of in-service training activities. Providing and sustaining in-service training for all health workers requires technical and financial inputs that are usually beyond the capabilities of most developing countries. Furthermore, in-service training tends to focus on health workers in public facilities with limited involvement of private providers. Experience in other fields also shows that the effectiveness of in-service training can be less than expected if there are inconsistencies or contradictions with what health workers have learned previously in pre-service training institutions.

The incorporation of EPI into undergraduate medical education and other health professional training programmes is, therefore, a logical step toward improving and strengthening immunization service delivery, logistics, surveillance, communication and management practice. It is an opportunity for teaching institutions to set clear priorities for learning and to improve co-ordination between different units and sub-units, and over different academic years, in order to achieve an integrated approach to child health problems. However, since EPI focuses on outpatient/client management, its principles may not be fully compatible with hospital-based diagnostic methods frequently used to teach paediatrics and child health. For these reasons, careful planning must ensure that EPI is incorporated into the overall paediatric and public health training agenda.

In the African Region, many health professional schools have revised their curricula during the past decade, making efforts to incorporate EPI into their teaching agendas. However, training needs assessments conducted during 2001–2013 pointed out that:

- Past EPI training activities were generally infrequent, underfunded and conducted on an ad hoc basis.
- Harmony between pre-service and in-service training was lacking.
- EPI content was either not outlined in the curricula or was incomplete or outdated.
- Reference materials and demonstration equipment were lacking.
- Some institutions have started to adapt MLM modules.
- Time allocated to EPI theory was inadequate and the practical sessions were not adequately supervised.
- Lecturers and tutors usually lacked modern EPI training, in terms of current knowledge, skills and teaching methodology.

These deficiencies call for a systematic revision of the EPI curriculum for the pre-service training institutions. To facilitate this exercise within countries, EPI curricula prototypes, one for medical and one for nursing/midwifery schools, were developed. The aim was to help identify “generic” EPI content to be covered, recommend how to incorporate EPI into pre-service training agendas, to provide information about the types of follow-up support needed by schools and also to identify operational problems that may require further research.

1.2 Justification and rationale for curriculum development and review

1.2.1 Immunization programme needs

Evidence from various health facility surveys and EPI reviews conducted in a few countries during the past decade shows that the most important barriers to reaching every child in every district with immunization services are still related to planning and management of human, material and financial resources at district and service delivery levels, rather than just physical barriers to access. To overcome these barriers, capacity building to improve managerial skills and to integrate the immunization services within the social and health infrastructure is the major operational strategy. All health workers are expected to have practical management skills to balance current collaborative efforts to achieve the goals of the immunization programme, which include maintaining coverage level and quality of routine immunizations as well as implementing immunization campaigns. EPI reviews and training needs assessments (TNAs) in many countries indicate gaps in planning and management at district and service delivery levels.

One reason for this situation has been the stagnation in EPI training in the past, especially management skills, since no MLM course was taught in the African Region between 1994 and 1999. This critical situation called for broader collaborative efforts from immunization partners to revamp MLM training.

In 2000, significant progress began in EPI MLM training at intercountry and country levels, providing a clear framework to public health managers, specifically those in the immunization programme, to improve their day-to-day managerial skills and resolve problems that arise during implementation of their national and district EPI plans. The rapid development of innovations and new technologies in immunization programmes requires that staff members be updated regularly if they are to cope with strategic changes and technical advancements.

The reaching every district (RED) strategy as adopted by GAVI partners and by the 10th Task Force on Immunization (TFI) in Africa (2003), and its current adaptation – reaching every community (REC) – provide a real opportunity to achieve the highest levels of coverage possibly beyond 90% DPT-3 coverage at national level and 80% in each district in all countries.

These are in line with the UN General Assembly Special Session recommendation and GIVS 2006–2015 and GVAP 2011–2020. To achieve this, intensive training of national staff in management, supportive supervision and programme monitoring is required.

Both GIVS and GVAP take immunization beyond infants into other age groups, while maintaining priority for early childhood vaccination. These strategic visions include six strategic objectives and 24 strategies for implementation. The introduction of new vaccines (such as malaria, HIV/AIDS, rotavirus, human papilloma virus, pneumococcal, meningococcal A, group A streptococcal, shigella and others) and technologies (jet injectors, vaccine patches, vaccine nasal sprays and aerosols, etc.), all of which will require intensive training of

health workers and managers for implementation, are anticipated. The vision further commits all concerned to unprecedented attention to reaching the “hard-to-reach” and promotes data-driven problem-solving to improve programme effectiveness.

1.2.2 Perceived needs in training on immunization based on training needs assessments

To enhance the performance of national immunization programmes the WHO African Region, in collaboration with other immunization partners (AMP, MCHIP, NESI, UNICEF), funded a project to conduct TNAs in 26 target countries during 2001–2013. The objectives of the TNAs were to:

- Analyse EPI training activities previously achieved.
- Describe the status of immunization training in the target countries.
- Identify new training needs in pre- as well in in-service settings.
- Make recommendations for actions to improve EPI training.

The assessment teams were composed of international and national experts, and the study populations included planners and managers at national and sub-national levels, EPI focal point persons at regional, district and hospital levels, supervisors and health workers, trainers and trainees in pre-and in-service training institutions. Data were collected from semi-structured interviews, focus group discussions, workshops, observations at service delivery points and a review of records, including EPI training curricula.

Previous EPI training initiatives targeted a wide range of personnel that varied by country but generally included staff at national (central), regional (intermediate), district and peripheral levels, including national programmes on immunization (NPI) managers, focal points, health workers at facility level, clerical and secretarial staff and, in some cases, drivers. Non-medical personnel such as school teachers and religious leaders also participated in previous EPI training, which included MLM courses, training of trainers (ToT) workshops, courses on RED, data management, logistics and new vaccine introduction as well as preparatory courses for measles, polio campaigns, social mobilization, and orientation on disease surveillance. Most facilitators at EPI training sessions were immunization partners, programme managers and local experts of district health management teams (DHMT).

For most of the pre-service and in-service training institutions reviewed during the TNA, EPI content was either not outlined in the curricula or the content was incomplete or outdated. Training schools generally lacked demonstration equipment for EPI practical lessons. Equipment such as vaccine carriers, ice packs, vaccine monitors, immunization monitoring charts and thermometers were generally not available. Current EPI reading and didactic teaching materials were often unavailable or the available materials were inadequate. In some cases, available reference materials were old editions without current information on EPI. Although some institutions adapted WHO MLM modules, others were not on the WHO mailing list for receiving updated information on EPI.

Time allocated for EPI theory topics varied widely depending on type of training programme and level of tuition, but generally was between two and 10 hours. Although practical sessions are an integral part of pre- and in-service programmes, their duration on immunization also varied widely, ranging between one and 12 weeks for in-service programmes and one to 20 weeks for pre-service programmes. Some training institutions lacked transport to facilitate outreach attachment for students or for supervision of the students on attachment.

A few tutors and lecturers had received recent EPI training, but most had not attended EPI workshops and, as a result, they lack knowledge on current EPI theory and practice.

The most common unmet training need was curricula review to incorporate modern EPI theory and practice. Operational areas for which training needed to be strengthened included vaccine needs assessment and forecasting, new vaccines and injection technology and immunization safety. The need for EPI reference materials was also universal, being a priority in pre-and in-service training institutions.

Specific recommendations based on the assessment findings targeted pre-service and in-service training institutions, health service delivery institutions, ministries of health and EPI units and partners. For training institutions, the main recommendations relate to a regular review of curricula to include key operational and supporting components of EPI and orientation and refresher courses for lecturers and tutors. For health service delivery institutions, the key recommendations relate to the need to strengthen the cascading of MLM and other EPI training and strengthening supportive supervision. The recommendations also highlighted the need to strengthen the coordination role of ministries of health. For partners, the key recommendation is to strengthen their support to ministries of health and to training institutions.

1.2.3 Evaluation of the Expanded Programme on Immunization curriculum implementation conducted in 2011

An evaluation of the EPI curriculum implementation within health training institutions in the WHO African Region was conducted in 2011 in nine countries. This evaluation revealed:

- Lack of interaction between the EPI programme and health training institutions.
- Teachers not updated on the most recent advances in EPI.
- Lack of updated training materials and outdated teaching curricula.
- Insufficient teaching on EPI issues in health training institutions (in some countries mainly due to the dichotomy between the ministry of health and the schools, which usually fall under the ministry of education).
- Inadequate funding resources in schools as compared with the ministries of health.
- Poor advocacy for EPI teaching in schools and little involvement of teachers in practical EPI activities.
- Lack of current reference materials and motivation for teachers, contributing to outdated curricula.

However, the study also showed that in some training institutions (47–71%) where teachers assigned to EPI teaching are trained in current immunization theory and practice, they start teaching the new developments using materials obtained during their training (MLM modules, handouts and CDs). They are also able to influence pre-service training curriculum change in their institutions.

In the majority of training institutions reviewed, the EPI teaching is integrated with related subjects such as maternal and child health (MCH), primary health care (PHC), integrated management of childhood illness (IMCI), infectious diseases, epidemiology, etc.). This is a reflection of overall policy by ministries of health which puts emphasis on integration of services to the population.

Challenges identified include lack of trained pre-service teachers, lack of reference materials and tools, lack of detailed lesson plans with objectives, content, teaching methods, etc., inadequate supervision by schools at field placement sites, and lack of updated curricula with current advancements in EPI.

1.2.4 Rationale for the curriculum review

To be effective, a national immunization programme (NIP) must have the enthusiastic support of well-informed medical, nursing and midwifery professions. This requires giving a high priority to both pre-service and in-service education. As a result of the many innovations in the programme and challenges related to implementation of the new strategies (GIVS, GVAP, MDG, RED, RED and integration with other child health interventions), medical education needs to respond to these new approaches and developments.

Most of the national programme reviews and training needs assessment reports indicate that serious bottlenecks exist in and between pre-service and in-service training; for instance, teachers are not trained in modern EPI theory and practice and updated reference materials are lacking.

Indeed, in many countries, national institutions have begun asking medical, nursing, midwifery and other health professional schools to increase the amount of time in their curricula for clinical training in outpatient settings, because these settings provide experience that is particularly relevant to future professional practice. International organizations, including the World Federation for Medical Education (WFME), health training institutions and the main partners for nursing and midwifery services – International Council of Nurses (ICN) and International Confederation of Midwives (ICM) – have advocated for:

- Widening the settings in which education takes place.
- Coordinating education with health services delivery.
- Using national health priorities to set the context for education integrating science and clinical practice.
- Harmonizing training curricula.

Clinical and public health training that incorporates the learning objectives of EPI will enable students to develop a firm foundation of core knowledge and skills. To guide students' learning and reduce factual overload from the vast and exponentially growing knowledge in preventive health care, the core or critical knowledge, experience and skills that students must acquire need to be clearly defined.

Various EPI reference materials and guidelines have been used in the preparation of this document to define the scope and depth of knowledge and requisite skills, such as the MLM modules and *Immunization in Practice*.

1.3 Objectives of the curriculum review

1.3.1 General objective

To strengthen the teaching and learning of immunization within the existing curriculum for basic (pre-service) education programmes for doctors, nurses/midwives and other health professionals.

1.3.2 Specific objectives

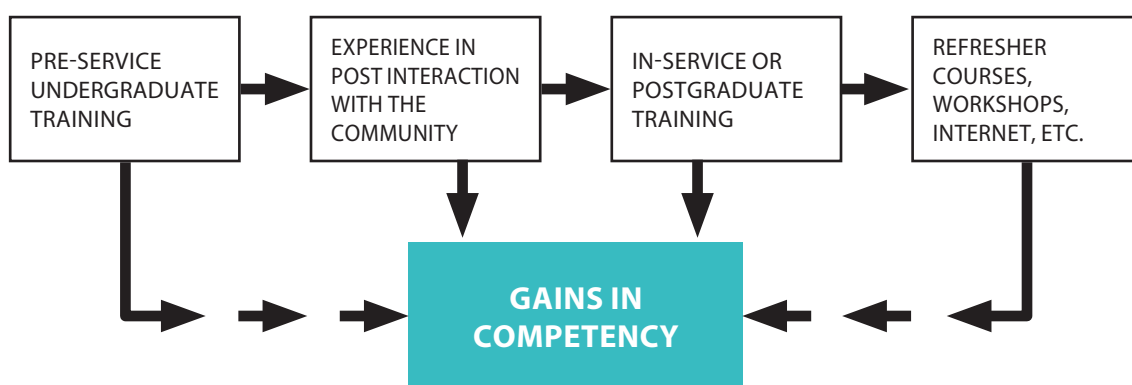
- To revise/outline the technical content of the immunization course based on:
 - New developments in the programme.
 - Immunization programme norms and procedures.
 - Competency profile of the graduates in immunization.

- To provide updated guidelines on technical content and skills to faculty/teachers responsible for teaching EPI topics.
- To ensure that:
 - Relevant learning objectives are formulated.
 - Active methods and techniques are used for teaching/learning.
 - Appropriate time is allocated to the course topics.
 - A sound balance exists between theoretical and practical sessions.
 - Appropriate training materials in sufficient quantities are available in educational institutions.
 - Appropriate supplies and demonstration equipment are available in educational institutions.
 - Adequate learning and programme evaluation is conducted.

2. COMPETENCY PROFILE OF IMMUNIZATION SERVICE PROVIDERS

The competencies of immunization service providers are based on skills necessary to provide quality and safe immunization services to the target population. The core competencies delineate the fundamental skills and behaviours expected from a new graduate or from a health worker in post. Building competency encompasses several components: pre-service training, experience gained in post, in-service training, participation in workshops, meetings, refresher courses, professional debates, exposure to best practices, etc. as shown below:

FIGURE 2.1
DESIGN OF CURRICULUM ON IMMUNIZATION TRAINING



Chapter 2 discusses the expected competencies of various cadres involved in immunization activities at district, health centre and community levels.

2.1 Exit profile of a medical doctor for immunization activities at district level

The DHMT team is responsible for all health activities in the district, including planning, organizing, implementing, monitoring, supervising and evaluating immunization services. For this to be done successfully, the district medical officer (DMO) at DHMT or fresh medical graduate (doctor) should have the following competencies as summarized in Table 2.1

TABLE 2.1

ASSESSMENT OF THE EXPECTED KNOWLEDGE, ATTITUDES AND SKILLS IN IMMUNIZATION OF NEW GRADUATE MEDICAL DOCTORS AND MEDICAL OFFICERS IN POST

KNOWLEDGE, ATTITUDES AND SKILLS IN IMMUNIZATION	COMPETENCIES	
	NEW GRADUATE MEDICAL DOCTOR	DISTRICT MEDICAL OFFICER (AT DHMT)
Knowledge in immunization		
• Theoretical basis of immunization (natural history of diseases, causative agents, immune response, types of immunity, vaccines)	H	H
• Disease surveillance, case/outbreak investigations, reporting system	H	H
• Vaccine-preventable diseases; eradication/elimination initiatives	H	H
• Immunization policy and strategies (routine, campaign, static, outreach, integrated with other programmes)	H	H
• EPI vaccines, safety of vaccines including AEFI, contraindications	H	H
• Cold chain to keep vaccines safe, equipment, maintenance	H	H
• Vaccine management (ordering, delivery, stock control, wastage)	H	H
• Waste management	H	H
• Target population, immunization schedules, missed opportunities	H	H
• Immunization coverage, target setting, dropout rates	H	H
• New vaccines and technologies; new strategies (GAPPD, GIVS, GVAP, MDGs, RED)	H	H
• Planning (multi-year and annual plans)	H	H
• Budgeting and managing finances	H	H
• Monitoring and evaluating implementation of the plans	H	H
• Supervisory skills (especially in supportive supervision)	H	H
• Training skills; training methods and tools	H	H
• Coordinating programme activities with other health interventions	H	H
• Communicating and resource mobilization skills	H	H
• Skills in mobilizing communities	H	H
• Conducting operational research	C	C
The medical doctor as a team leader		
• Ensuring proper administration of his/her team (task assignments, appraisal reports, feedback on performance, etc.)	C	H
• Decisions to be ethical and cost-effective	C	H
• Making appropriate management decisions that match the available resources and timing	C	H
• Applying team approach and promoting interpersonal relationships	C	H
• Using self-assessment and peer-assessment principles in work performance	H	H
• Caring for the service user; counselling rather than instructing immunization seekers	H	H
• Being a communicator who is able to promote immunizations by effective health talks and advocacy	H	H
• Being a community leader who gains local respect and trust	H	H
• Being able to organize/conduct knowledge, attitude and practices (KAP) surveys on immunization	C	H

Note: B basic or introductory competencies; C core or essential competencies; H high competencies (advanced).

Table 2.1 shows the dynamics and extent of expected competencies. Furthermore, it underlines elements of the exit profile of newly graduated medical doctors with a few areas of work where they are highly competent (theoretical basis of immunization, vaccine-preventable diseases, EPI vaccines), and areas where more competence is needed (such as vaccine management, planning, budgeting, supervisory skills, etc.). The table also shows the progression of the incumbent's competence after exposure to practical work or in-service training as a DHMT leader (district medical doctor). The latter is expected to have good knowledge of immunization and be competent or highly competent in all areas of work detailed in the table.

The conclusions from this analysis may help human resources managers apply different training approaches to these individuals; for example, the training of young doctors with emphasis on weak areas of work and refresher training for other groups to sustain their competence. Table 2.1 also indicates the limitations of immunization components in training institution's curriculum evidenced by less emphasis on EPI key areas (e.g. vaccine management, budgeting, advocacy, etc.) or as a result of time allocation to other competing priority programmes.

The results of this analysis on exit profiles must be considered when preparing curricula for various categories of medical students: e.g. general, specialized or public health medicine. These three categories may need various levels of intensity in training regards various content topics (CT) of the curriculum.

2.2 Exit profile of a nurse/midwife for immunization activities at district level

A similar approach to the competency content is applied to nurses/midwives who will be fully involved in immunization activities. This is an important pillar of the programme. The results of this assessment are shown in Table 2.2.

TABLE 2.2
ASSESSMENT OF THE EXPECTED COMPETENCIES AND SKILLS IN IMMUNIZATION OF NEW GRADUATES AND IN POST NURSES/MIDWIVES

KNOWLEDGE, ATTITUDES AND SKILLS IN IMMUNIZATION	COMPETENCIES	
	NEWLY QUALIFIED NURSE/MIDWIFE	DISTRICT EPI NURSE
Knowledge in immunization		
• Theoretical basis of immunization (natural history of diseases, causative agents, immune response, types of immunity, vaccines)	C	C
• Disease surveillance, case/outbreak investigations, reporting system	C	C
• Vaccine-preventable diseases; eradication/elimination initiatives	C	H
• Immunization policy and strategies (routine, campaign, static, outreach, integrated with other programmes)	C	H
• EPI vaccines, safety of vaccines including AEFI, contraindications	C	H
• Cold chain to keep vaccines safe, equipment, maintenance	C	H
• Vaccine management (ordering, delivery, stock control, wastage)	C	H
• Waste management	C	H

	COMPETENCIES	
	NEWLY QUALIFIED NURSE/MIDWIFE	DISTRICT EPI NURSE
KNOWLEDGE, ATTITUDES AND SKILLS IN IMMUNIZATION		
• Target population, immunization schedules, missed opportunities	C	H
• Immunization coverage, target setting, dropout rates	C	H
• New vaccines and technologies; new strategies (GAPPD, GIVS, GVAP, MDGs, RED)	C	H
• Planning (multi-year and annual plans)	B	C
• Budgeting and managing finances	B	C
• Monitoring and evaluating implementation of the plans	B	C
• Supervisory skills (especially in supportive supervision)	C	H
• Training skills; training methods and tools	B	C
• Coordinating programme activities with other health interventions	B	C
• Communicating and resource mobilization skills	B	C
• Skills in mobilizing communities	C	H
• Conducting operational research	B	C
Competencies in management This should include the ability to:		
• Define catchment area and target populations (mapping, calculating proportions of eligible populations, etc.)	H	H
• Prepare a plan for routine and outreach immunization services	C	H
• Make regular, supportive supervision to verify whether immunization norms and standards are correctly applied in the field	H	H
• Establish targets for immunization for the catchment area and monitor monthly, quarterly and yearly	C	H
• Identify available resources for immunization and request additional resources when needed	C	H
• Monitor morbidity and mortality trends of target diseases by maintaining up-to-date graphs and maps	C	H
• Monitor vaccine usage, as well as dropout rates	C	H
• Ensure that all immunization records are properly maintained and forwarded to the district headquarters on time	C	H
• Organize monthly staff meetings to discuss matters related to immunization activities	C	H
• Maintain discipline, teamwork and motivation among the staff	H	H
• Allocate the duties to the staff and make a weekly/monthly roster	C	H
• Evaluate immunization achievement in the catchment area	C	H
Competencies in performing immunizations This should include ability to:		
• Organize immunizations sessions, both static and outreach/mobile	C	H
• Explain to mothers the importance of immunizations, which immunizations are needed, their intervals, date and place of next vaccination, expected reactions, possible side-effects and what to do about them	H	H
• Ensure that all injection materials used for immunization are available and sterile	H	H
• Ensure that vaccines and diluents to be used are not damaged or expired	H	H
• Administer immunizations using the correct schedule and technique	H	H
• Ensure good maintenance and daily monitoring (twice) of the cold chain	C	H
• Keep an inventory of all immunization equipment and their repair status	H	H

KNOWLEDGE, ATTITUDES AND SKILLS IN IMMUNIZATION	COMPETENCIES	
	NEWLY QUALIFIED NURSE/MIDWIFE	DISTRICT EPI NURSE
• Keep mother and child's permanent registers accurately	C	H
• Establish a tracking system to immunize defaulters	C	H
• Keep accurate records of performed immunizations and vaccines received from the district – those administered and wasted	C	C
• Ensure that all immunization records are properly prepared and forwarded to the district on time	C	H
Attitudes and community work This should include the ability to:		
• Educate the community about the target diseases and the role of immunizations in preventing them	H	H
• Liaise with village development committee on health matters and chair the sub-committee on health. Include immunization in the sub-committee's plan	C	H
• Be a communicator who is able to promote immunizations by effective health talks and advocacy	C	H
• Identify and interact with women's groups, church leaders, administrators etc. who contribute to the promotion of the programme	C	H
• Identify and work with local NGOs active in health matters	C	H
• Involve communities in planning routine immunization activities and immunization campaigns (NID, SNID, SIA, etc.)	C	H
• Care for the service users; counselling, rather than instructing immunization seekers	C	H
• Treat the rumours on immunization seriously and give feedback to communities on your findings	C	C
• Use self-assessment and peer-assessment principles in work performance	H	H
• Participate in KAP surveys on immunization	C	C

Notes: B basic or introductory competencies; C core or essential competencies; H high competencies (advanced). The Abidjan consensus workshop identified two main groups with a different intensity of training on EPI content topics: state certified nurses, and enrolled nurses and midwives.

2.3 Job descriptions of national immunization programme core staff

2.3.1 National Expanded Programme on Immunization manager

TITLE	National EPI manager
RANK	As per national personnel nomenclature.
IDENTIFICATION OF THE POST	As per national personnel coding system.
RESPONSIBLE TO	As per national health system organizational infrastructure.
OBJECTIVE OF THE POST	To plan, organize, coordinate and ensure implementation, monitoring and evaluation of national immunization programme.
RESPONSIBILITIES/FUNCTIONS	Under the supervision of the supervisor (head of unit, director or coordinator), the incumbent will be responsible for the following: <ul style="list-style-type: none"> • Analyse and make decisions based on plans and programme development processes. • Monitor implementation and evolution of the programme adopting to innovations and best practices. • Ensure quality and safety of immunizations performed. • Advise, orient, inspire and supervise the staff. • Communicate with the communities, stakeholders and partners to maximize resources for immunization and provide them with feedback on programme achievements.
QUALIFICATIONS AND EXPERIENCE	Degree in public health or equivalent; extensive professional experience in managing public health programmes. Diploma in health management would be an advantage.

MAIN DUTIES/TASKS	PERCENTAGE OF WORK-TIME NEEDED (example)
Periodic (sequential) tasks	
• Developing strategic and annual plans for immunization and budgeting for human, material and financial resources in line with national immunization policies/strategies.	10%
• Monitoring and supervising the programme to ensure targets are achieved and the quality and safety of immunization delivery ensured.	20%
• Arranging quarterly or semi-annual meetings of the inter-agency coordinating committee (ICC) – secretariat of the ICC.	5%
• Conducting mid-term and end of planning cycle evaluation of the programme.	5%
• Submitting annual, quarterly, monthly or any other regular reports as required by the health management information system (HMIS).	5%
Continuous tasks	
• Analyse incoming immunization coverage and surveillance data and make decisions on programmatic issues.	10%
• Act as a technical advisor to the ministry or board of health on resources, recruitment, deployment of staff working in immunization programme.	5%
• Provide leadership for and optimize the performance of work through enhanced interpersonal relationships within EPI team.	10%
• Ensure day-to-day administration of the EPI unit.	15%
• Arrange training and professional development of the staff directly engaged in programme activities in order to improve the quality and safety of immunizations.	5%
• Communicate with stakeholders and partners and mobilize resources for immunization.	5%
• Evaluate end-of day results and programming activities for the next day/period.	5%

2.3.2 Disease surveillance officer/epidemiologist

TITLE	Disease surveillance officer/epidemiologist
RANK	As per national personnel nomenclature.
IDENTIFICATION OF THE POST	As per national personnel coding system.
RESPONSIBLE TO	As per national health system organizational infrastructure. If working within the EPI, he/she is responsible to national EPI manager.
OBJECTIVE OF THE POST	To plan, organize, coordinate and ensure implementation of disease surveillance activities according to strategic and annual plan of action on immunization.
RESPONSIBILITIES/FUNCTIONS	Under the supervision of the supervisor (head of unit, director or coordinator, national EPI manager), the incumbent will be responsible for the following: <ul style="list-style-type: none"> • Ensure the collection, collation and analysis of disease surveillance data. • Ensure the smooth functioning of the reporting system on target diseases and immunization coverage rates. • Ensure timely response to target diseases cases and outbreaks. • Train health workers on principles of disease surveillance.
QUALIFICATIONS AND EXPERIENCE	University degree or equivalent. Excellent computer skills and extensive experience in public health and disease surveillance would be an advantage.

MAIN DUTIES/TASKS	PERCENTAGE OF WORK-TIME NEEDED (example)
• Analyse incoming immunization coverage and surveillance data in liaison with the epidemiological department and HMIS.	10%
• Act as a technical advisor to the national EPI manager in matters concerning disease surveillance.	-
• Establish a disease surveillance system of notifiable target diseases for epidemic preparedness, outbreak investigation and response. The system should also include AEFIs.	20%
• Disseminate case definitions of target diseases among health workers to facilitate their early and accurate recognition and case management.	5%
• Establish monitoring and evaluation systems with special emphasis on diseases targeted for eradication/ elimination or control (e.g. poliomyelitis, neonatal tetanus, measles etc.). This system should include: <ul style="list-style-type: none"> - Selection of programme indicators. - Planned or ad hoc field supervision according to pre-prepared supervisory visit schedule and checklist. - Monitoring and regular review of progress to verify achievement of targets. 	15%
• Develop epidemic forecasting system that will include identification of the following essential elements or risk factors: <ul style="list-style-type: none"> - Seasonal or climatic factors. - Epidemiological (past epidemics and changing trends of disease occurrence). - High-risk population groups and areas. 	10%
• Supervise the computerized data entry and analysis of disease surveillance data and produce periodic feedback for management, districts and sentinel sites.	10%
• Monitor overall immunization coverage rates of target population and assist in organizing mass immunization campaigns (NID, SIA).	-
• Identify national and international reference laboratories for sending specimens and confirmation of laboratory diagnosis.	-
• Create stockpiles of vaccines, specimen collection and case management kits and ensure their timely distribution to intermediate level.	5%
• Arrange training of personnel on case/outbreak recognition and AEFI investigation, specimen collection and dispatch, routine and sentinel reporting, of target diseases.	5%
• Provide feedback on disease occurrence and trends to data providers through regular meetings, supervision and epidemiological bulletin.	5%
• Detect, investigate and provide adequate response to epidemics.	15%

2.3.3 Cold chain officer

TITLE	Cold chain officer
RANK	As per national personnel nomenclature.
IDENTIFICATION OF THE POST	As per national personnel coding system.
RESPONSIBLE TO	National EPI manager.
OBJECTIVE OF THE POST	To plan, organize, coordinate and ensure smooth functioning of the cold chain system for the immunization programme.
RESPONSIBILITIES/FUNCTIONS	Under the supervision of the national EPI manager the incumbent is responsible for: <ul style="list-style-type: none"> • Planning and monitoring of the EPI cold chain system in the country. • Ensuring functionality of the cold chain system. • Providing support and means for preventive and curative maintenance of the cold chain equipment. • Training of cold chain technicians at sub-national level.
QUALIFICATIONS AND EXPERIENCE	Diploma in engineering or equivalent with experience in refrigerating equipment. Previous experience as a cold chain officer at sub-national level is an advantage.

MAIN DUTIES/TASKS	PERCENTAGE OF WORK- TIME NEEDED (example)
<ul style="list-style-type: none"> • Prepare a cold chain plan as a component of overall EPI plan (strategic and annual) with the following sub-sections: <ul style="list-style-type: none"> - Cold chain rehabilitation plan to replace old equipment. - Cold chain emergency plan. - Plan for preventive and curative maintenance of the cold chain equipment. 	5%
<ul style="list-style-type: none"> • In liaison with the logistician, estimate cold chain equipment and supply needs and advise the EPI manager on selection of equipment with specifications approved by WHO/UNICEF. 	5%
<ul style="list-style-type: none"> • Maintain an accurate cold chain inventory and update it regularly. 	20%
<ul style="list-style-type: none"> • Organize a unit for regular maintenance of equipment and equip it with trained repair technicians. Provide the unit with repair tools. 	20%
<ul style="list-style-type: none"> • Identify alternative cold chain equipment (refrigerators, freezers, back-up generators, etc.) to cater for emergencies (power cuts, floods, collapse of vaccine stores). 	-
<ul style="list-style-type: none"> • Make suggestions for having vaccine refrigeration facility at national airport(s). 	-
<ul style="list-style-type: none"> • Conduct regular supervision of national/sub-national cold chain facilities to ensure uninterrupted functionality of the cold chain in the country. 	30%
<ul style="list-style-type: none"> • Provide regular reports to EPI manager on cold chain status, needs and constraints and make recommendations on how to overcome them. 	5%
<ul style="list-style-type: none"> • Carry out training of national and sub-national cold chain staff (cold chain officers, repair technicians and other health staff) with cold chain responsibilities. 	15%
<ul style="list-style-type: none"> • Carry out any other programme activities assigned by the EPI manager. 	-

2.3.4 Logistics officer

TITLE	Logistics officer
RANK	As per national personnel nomenclature.
IDENTIFICATION OF THE POST	As per national personnel coding system.
RESPONSIBLE TO	National EPI manager.
OBJECTIVE OF THE POST	To ensure the proper management of vaccines and injection materials, ordering and distribution of supplies, and providing transport for uninterrupted programme operations.
RESPONSIBILITIES/FUNCTIONS	Under the supervision of the national EPI manager, the incumbent is responsible for the following: <ul style="list-style-type: none"> • Estimating vaccine and injection material needs. • Determining quantities for ordering supplies according to storage capacities of the dry and cold stores and vaccine stock levels. • Managing the vaccine stock to prevent stockouts. • Ensuring a functional distribution system for supplies. • Monitoring use of vaccine and injection material to minimize vaccine wastage.
QUALIFICATIONS AND EXPERIENCE	Post-graduate diploma in public health or certificate or diploma in logistics management. Previous experience in logistics management is an advantage.

MAIN DUTIES/TASKS	PERCENTAGE OF WORK-TIME NEEDED (example)
<ul style="list-style-type: none"> • Prepare a logistics plan as a component of overall EPI plan (strategic and annual) with the following information: <ul style="list-style-type: none"> - Vaccine and injection material needs according to target population to be immunized during the planning period. - Estimated cost of supplies. - Approved schedule of vaccine/injection material ordering/supply periods. 	5%
<ul style="list-style-type: none"> • In liaison with the national cold chain manager, estimate vaccine and other supply needs and advise the EPI manager on selection of suppliers whose product specifications are approved by WHO/UNICEF. 	10%
<ul style="list-style-type: none"> • Conduct regular monitoring and stock inventory of vaccines and supplies. 	30%
<ul style="list-style-type: none"> • Establish an efficient supply distribution system and ensure availability of transport for safe deliveries. 	10%
<ul style="list-style-type: none"> • Make regular supervisory visits to vaccine stores and health facilities to observe whether: <ul style="list-style-type: none"> - Proper stock management practices are applied (fitness, cleanliness, etc.). - Supplies are made according to the "bundling policy". - Store records are accurate and consistent with the physical count. - Vaccine movement in and out are correctly recorded in the vaccine register. - Expired and discarded vaccines and injection materials are exposed according to safety norms. - Staff apply vaccine quality tests (vaccine vial monitor (VVM), shake test, reading vaccine quality indicators, etc.) to prevent use of expired or damaged vaccines. 	20%
<ul style="list-style-type: none"> • Provide regular reports to EPI manager on logistics needs and constraints and make recommendations on how to overcome them. 	20%
<ul style="list-style-type: none"> • Carry out training of national and sub-national staff on vaccine handling, stock management, calculations of vaccine wastage rates, logistics record keeping, etc. 	5%
<ul style="list-style-type: none"> • Carry out any other programme activities assigned by the EPI manager. 	-

2.3.5 Communication/social mobilization/health promotion officer

TITLE	Communication/social mobilization/health promotion officer
RANK	As per national personnel nomenclature.
IDENTIFICATION OF THE POST	As per national personnel coding system.
RESPONSIBLE TO	As per national health system organizational infrastructure. If working within EPI, he/she is responsible to national EPI manager.
OBJECTIVE OF THE POST	To plan, organize, coordinate communication and public relations activities and strengthen the advocacy and community mobilization in favour of immunization.
RESPONSIBILITIES/FUNCTIONS	Under the supervision of the supervisor (head of unit, director or coordinator, national EPI manager), the incumbent is responsible for: <ul style="list-style-type: none"> • Ensuring that EPI communication activities are effectively managed, implemented, monitored and evaluated. • Using communication skills for improved advocacy and social mobilization to maximize resources for immunization programmes. • Facilitating formative research and use of research findings in immunization communication programming.
QUALIFICATIONS AND EXPERIENCE	Post-graduate diploma in public health or certificate or diploma in communication techniques. Excellence in written and spoken communication ability and specific experience in computer processing are an advantage.

MAIN DUTIES/TASKS	PERCENTAGE OF WORK-TIME NEEDED (example)
<ul style="list-style-type: none"> • Develop a communication plan as part of the EPI general plan (strategic and annual) with the following information: <ul style="list-style-type: none"> - Communication activities (workshops, production of tools, assessment, etc.), covering the EPI routine, the monitoring of the diseases and SIA. - Activities to be undertaken jointly with the main communication events such as national or global health days and launching ceremonies related to vaccination. - Target audience to be addressed, including strategies to reach remote areas. - Strategies for dealing with resistance to vaccination. - Communication indicators. - Calendar, required resources and budget for communication activities. 	5%
<ul style="list-style-type: none"> • Coordinate the design, development, pre-testing, purchase and distribution of educational materials and tools for the vaccination programme. 	15%
<ul style="list-style-type: none"> • Hold meetings and liaise with other departments, immunization partners and the media to communicate progress, best practices and constraints. 	15%
<ul style="list-style-type: none"> • Involve communities and the public in the planning and implementation of immunization activities to ensure their acceptance. 	-
<ul style="list-style-type: none"> • Prepare and issue regular press releases to the media to inform them of progress and innovation, and develop a well-informed media network. 	30%
<ul style="list-style-type: none"> • Develop a set of indicators to measure the achievement of the targets of communication 	5%
<ul style="list-style-type: none"> • Monitor communication activities and expected results using specific communication indicators and make improvements as necessary. 	5%
<ul style="list-style-type: none"> • Develop and conduct baseline surveys on knowledge, attitudes and practices related to the immunization programme. 	5%
<ul style="list-style-type: none"> • Carry out training of national and regional staff on communication techniques and strategies to reach different target groups. 	10%
<ul style="list-style-type: none"> • Provide regular reports to the EPI manager on progress and constraints and make recommendations on how to overcome them. 	5%
<ul style="list-style-type: none"> • Evaluate the component information, education, communication and community mobilization on the immunization programme to check its effectiveness. 	5%
<ul style="list-style-type: none"> • Carry out any other programme activities assigned by the EPI manager/supervisor. 	-

2.3.6 Data manager/statistician

TITLE	Data manager/statistician
RANK	As per national personnel nomenclature.
IDENTIFICATION OF THE POST	As per national personnel coding system.
RESPONSIBLE TO	As per national health system organizational infrastructure. If working within EPI, he/she is responsible to national EPI manager.
OBJECTIVE OF THE POST	To ensure immunization and disease surveillance data collection and processing and establishment of a computerized database for regular reporting.
RESPONSIBILITIES/FUNCTIONS	Under the supervision of the supervisor (head of unit, director or coordinator, national EPI manager), the incumbent will be responsible for: <ul style="list-style-type: none"> • Extracting immunization and disease surveillance data from regular reports from health facilities. • Computer processing of the resultant data sets and establishing a computerized data base. • Producing regular data sets for monthly, quarterly and annual reports. • Training health workers in data management using computers.
QUALIFICATIONS AND EXPERIENCE	Post-graduate diploma in statistics or computing, monitoring and evaluation. Excellent computer skills. Some years of experience involving data processing and analysis.

MAIN DUTIES/TASKS	PERCENTAGE OF WORK-TIME NEEDED (an example)
• Establish computer database for data entry and processing as per established indicators using computer software (e.g. EPI information).	10%
• Collect EPI-related information from regular reports and process data through verification and validation of the report content.	20%
• Based on the established reporting procedures, estimate completeness and timeliness of the reports.	5%
• In liaison with the national disease surveillance officer, analyse and present data to the EPI manager to prepare required regular reports on immunization coverage and target diseases occurrence.	30%
• Liaise with other departments, institutions and organizations (e.g. WHO, UNICEF) collecting information on immunization and disease occurrence to harmonize data and achieve a common database.	5%
• Carry out internal data quality self-assessment (DQS) to improve reliability and accuracy of the reporting data.	10%
• Supervise data processing equipment of the EPI unit.	-
• Carry out training of national and sub-national health staff on reporting procedures and the use of computer software.	20%
• Carry out any other programme activities assigned by the EPI manager.	-

3. APPENDICES

Appendix 1: Immunization systems and operations

Introduction on the Expanded Programme on Immunization

The Expanded Programme on Immunization is a global programme for the control of vaccine-preventable diseases (VPD). Its goal is to eradicate poliomyelitis, eliminate neonatal tetanus (NT) and measles and reduce morbidity and mortality due to all other vaccine-preventable diseases (diphtheria, whooping cough, tuberculosis, hepatitis B, *Haemophilus influenzae* type b infection, pneumonia, diarrhoea, cervical cancer, meningococcal meningitis and others).

In line with global targets set by WHO, EPI has expanded its focus on immunization coverage to include disease surveillance and eradication/elimination activities. Today, EPI is a well-established public health programme. It has various components that include vaccines and their handling, cold chain to keep them potent, service delivery, disease surveillance, social mobilization to ensure community support, monitoring and evaluation to assess the impact of the programme on disease and child mortality reduction.

Currently, EPI is facing new challenges related to carrying out supplementary immunization activities or mass campaigns (e.g. national immunization days), incorporating new vaccines and injection safety devices, and increasing and sustaining immunization coverage levels through the RED/REC strategies and other reference strategies (GVAP, GAPPD, etc.).

The global EPI therefore has the following three orientations:

1. Achieve and sustain high immunization coverage among target populations (90% and above) for all vaccines included in the programme.
2. Establish reliable disease surveillance for detection of disease cases and outbreaks and ensure an adequate response.
3. As a result of the first two strategies, implement disease eradication and elimination initiatives.

Vaccine-preventable diseases remain one of the major causes of morbidity, disability and mortality in the African Region. Pneumococcal and Hib related diseases, rotavirus diarrhoea, measles, hepatitis B infection and neonatal tetanus together account for most of the 9 million deaths recorded each year among children under five years of age. Among the reasons for this huge toll are inadequate use of available cost-effective preventive measures, such as immunization due to poor health infrastructure, poor planning, lack of supervision and training of health personnel.

Following GIVS (2006–2015), the Regional EPI Strategic Plan (2014–2020), GVAP (2011–2020) and GAPPD (2011–2025) are focusing on the following objectives:

- To increase and sustain high vaccination coverage.
- To complete the interruption of poliovirus transmission and ensure virus containment.
- To eliminate measles and advocate for the elimination of rubella and congenital rubella syndrome.
- To attain and maintain elimination/control of other vaccine-preventable diseases.

In the context of capacity building, the following areas of action are emphasised under the objectives:

- To improve immunization coverage beyond the current levels:
 - Reach DTP3-containing vaccine coverage of at least 90% region-wide by the end of 2020.
 - All countries have introduced pneumococcal conjugate vaccine (PCV) by the end of 2020.

- To complete interruption of poliovirus transmission and ensure virus containment:
 - All countries using OPV have introduced at least one dose of inactivated polio vaccine by the end of 2015.
 - All polioviruses are laboratory-contained and the Region certified polio-free by the end of 2018.
- To eliminate measles and advocate for the elimination of rubella and congenital rubella syndrome:
 - All countries have achieved an incidence of less than one confirmed measles case per million by 2020.
 - Attain MCV1 coverage $\geq 95\%$ at national and district levels and at least 95% supplementary immunization activities (SIAs) coverage in all districts.
- To attain and maintain elimination/control of other vaccine-preventable diseases:
 - All countries have attained and validated the elimination of maternal and NT by the end of 2020.
 - All high-risk countries have attained yellow fever immunization coverage $\geq 90\%$ by the end of 2020.
 - All countries within the meningitis belt have introduced MenAfriVac through campaigns, with some of them introducing it into routine immunization.
 - Seroprevalence of HbsAg among children below five years of age is less than 2% by the end of 2020.

The guiding principles of the Regional EPI Strategic Plan are:

- Country ownership.
- Partnership and mutual accountability.
- Access to universal health coverage (UHC).
- Integration of global disease eradication and elimination initiatives in the broader health system.
- Financial sustainability.
- Innovation and quality improvements across all aspects of immunization.

It is essential that these principles are considered in revising existing curricula and developing new training programmes, in order to place due emphasis on special activities and areas of immunization service performance that are in line with the Regional Strategic Plan and the short- and long-term country goals for immunization. For example, curriculum revisions and new training programmes need to be developed on a country basis to address existing capacity gaps for immunization service delivery. In this process, it is important that due funding is made available for the development and implementation of the programme and for student support. Furthermore, relevant cross linkages with other aspects of immunization should be addressed to improve competencies for overall immunization service delivery outcomes.

External environment and immunization programmes

Like other programmes, the immunization systems are constantly undergoing internal changes, notably those related to the introduction of new vaccines and new technologies. Immunization programmes also have to face external changes related to ongoing decentralization, using vaccines beyond childhood and other health sector reforms.

To ensure the continuity of immunization programmes, EPI staff has to understand and manage those internal and external changes. It requires specific skills in problem solving, setting priorities, decision-making, managing time and human, financial and material resources.

The health system and the external environment form the framework within which the immunization services function. To plan, implement and evaluate functions, the EPI staff must take into account the context in which the management of services in health centres, hospitals and administrative units (e.g. district health office) is carried out.

The health system is, therefore, one factor in the immunization services’ framework, and the external environment is another (Figures 3.1 and 3.2).

The managers of immunization programmes should be aware of the influences of the health system and the external environment on services and factor them into planning, implementation and evaluation.

FIGURE 3.1
INTERRELATIONSHIPS BETWEEN IMMUNIZATION SYSTEMS, HEALTH SECTOR AND EXTERNAL ENVIRONMENT

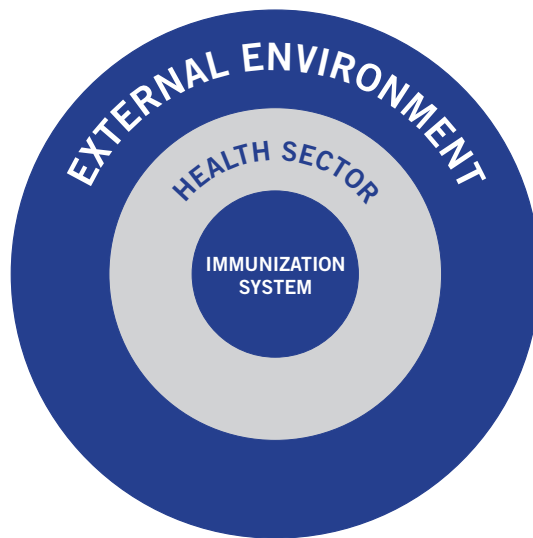
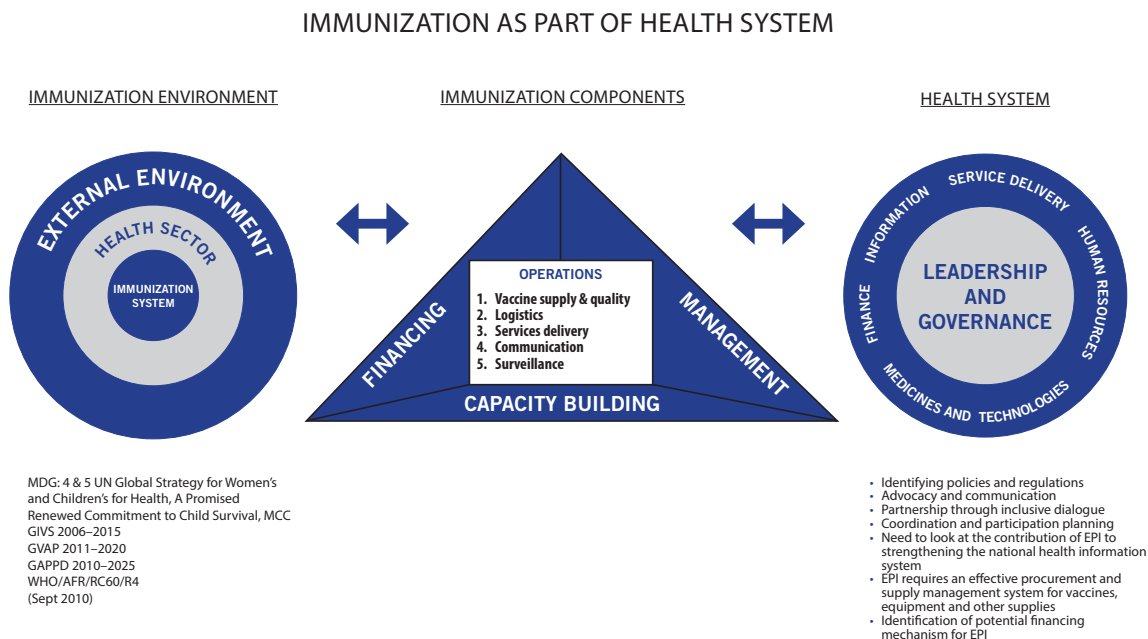


FIGURE 3.2
INTERRELATIONSHIPS BETWEEN IMMUNIZATION SYSTEMS, THE EXTERNAL ENVIRONMENT AND HEALTH SYSTEM



The immunization management staff should be able to improve the components and operations of immunization programmes within the health sector that are dependent on factors in the wider socioeconomic environment: demographic, sociocultural, epidemiological and macroeconomic changes. Let us illustrate this using an example of tetanus toxoid (TT) immunization of women. This example shows the close interrelation of the three systems that should be considered in decision-making.

EXAMPLE

In deciding a strategy for introducing TT vaccination to women of reproductive age, some of the following external and internal factors have to be considered:

External environment

- Has the target group, “women of reproductive age”, been well defined, and has the central statistical office in the country provided an estimate of its size?
- Will vaccination as a mass public health intervention be acceptable to the communities as a whole or certain population groups?
- What are the traditional beliefs and sociocultural barriers to immunization of young women (e.g. related to rumours of infertility following vaccination)?
- Is the macroeconomic climate in the country able to support an increase in the budget of the ministry of health (MOH) or is an external loan required to accommodate the additional costs incurred by this strategy?

Health environment

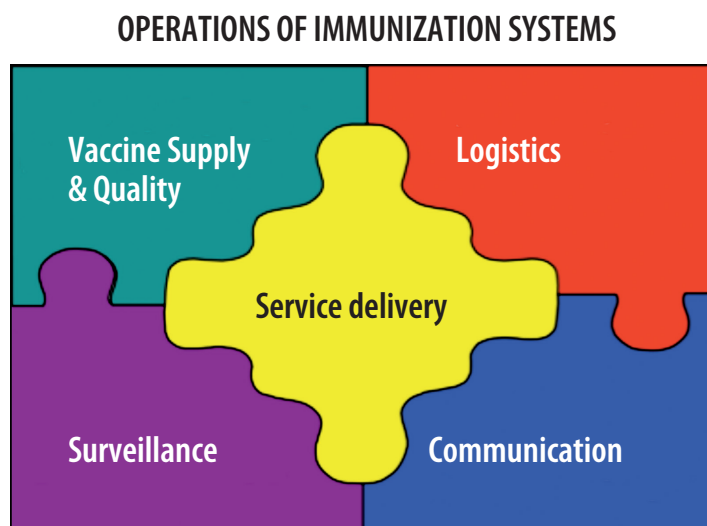
- Has the MOH prioritized the change in the health policy and the plan?
- Does the MOH have sufficient staff to implement the strategy change from immunizing pregnant women to women of reproductive age, which involves a considerable increase in workload?
- Has the MOH budgeted for purchase of additional vaccines and consumables to implement the strategy?
- What other programmes does the MOH intend to integrate with the proposed vaccination of women of reproductive age?

Immunization systems

- Has EPI organized training of health personnel in the TT introduction policy change? Are training materials available?
- Has EPI calculated additional cold chain needs for storing TT vaccine?
- Has EPI introduced changes in immunization recording and reporting forms to accommodate additional doses of TT?
- Has EPI established close links with reproductive health programmes to benefit from their experience or share resources for supervision, monitoring and evaluation?
- Has EPI sensitized communities and stakeholders on new approaches in TT immunization?

Immunization operations

FIGURE 3.3
FIVE KEY OPERATIONS IN IMMUNIZATION SYSTEMS



Immunization systems comprise five key operations (see also Part 2, Topic 7):

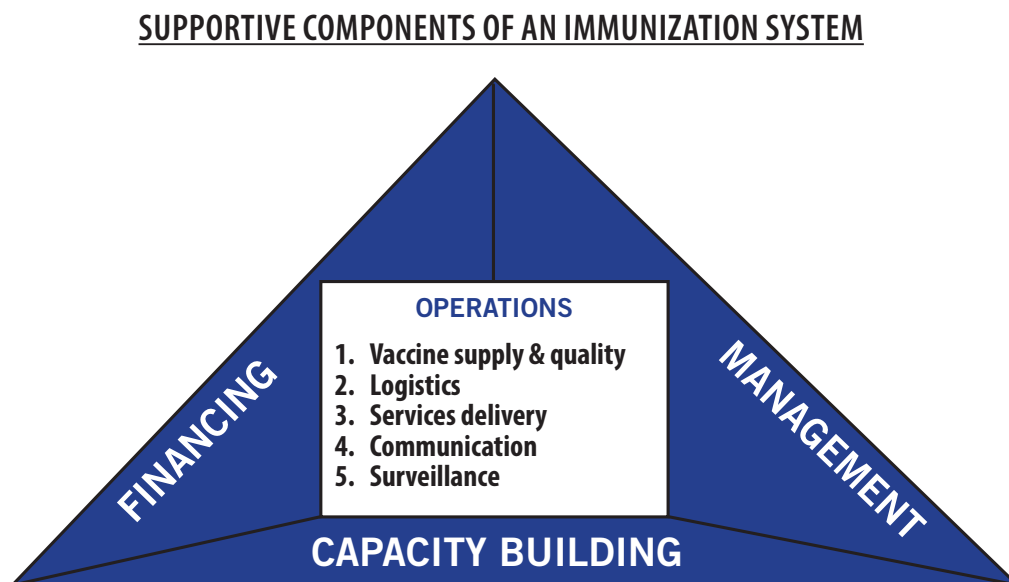
- **Service delivery** covers the strategies and activities to ensure provision of immunization services to target populations. Service delivery is exercised with pre-determined strategies depending on various situations and priorities in a country.
- **Logistics** include delivery of vaccines and other equipment to the place of use, provision of transport, management of cold chain and disposal of immunization waste (used syringes and needles, discarded vaccines and diluents, etc.).
- **Vaccine supply and quality** comprises forecasting vaccine needs, procuring vaccines, monitoring vaccine quality, utilization and vaccine safety.
- **Disease surveillance** includes monitoring of disease incidence, laboratory testing, record keeping, reporting, case and outbreak investigations and response.
- **Advocacy and communications** comprises social mobilization, advocacy, community education on immunization and programme promotion.

Supporting components of immunization services

Immunization operations are sustained through the following supporting components: management, sustainable financing and human and institutional resources strengthening.

- **Management** includes policy-making and standard setting, planning, coordination, information collection and sharing, collaboration with other partners, quality assurance, monitoring and evaluation.
- **Sustainable financing** comprises budgeting, identifying funding sources, actions leading to adequate allocation of financial resources to immunization programmes.
- **Strengthening human and institutional resources** includes staffing, training, supervision and institutional support (including supply of technical information, support to research projects etc.).

FIGURE 3.4
FIVE KEY OPERATIONS AND THEIR THREE SUPPORTING COMPONENTS



Appendix 2: Immunization policies, norms and standards

To ensure that immunization programmes are in line with national health policies – formulated around the principle of primary health care – the immunization policy should be developed as a component of the national child health policy. The child health policy should ensure equity and universal access to immunization, define quality standards by level of health system and guarantee health worker adherence to standards. To attain this, in spite of budgetary limitations in countries in the African Region, rules and guiding principles must be determined, priorities established and strategies adapted to implement the policy.

The immunization policy is a consolidated national effort to contribute to the improvement of the quality of life of children and mothers, with the following objectives:

- To provide a technically sound basis for immunization procedures according to international standards and norms that countries have adapted to specific conditions.
- To ensure that children, adolescents and women receive good quality, safe and efficient vaccines against vaccine-preventable diseases.
- To ensure that disease eradication and elimination programmes, which include immunization and disease surveillance strategies, are carried out according to established norms and procedures.

As programmes mature and new developments and research take place in the country and internationally, policies and technical requirements will need to be reviewed and updated.

Expanded Programme on Immunization

As evidenced from World Health Assembly records for a number of years, the WHO Member States striving for child survival are committed to the EPI, including poliomyelitis eradication, measles and neonatal tetanus elimination initiatives.

Political commitment at national and community levels is crucial for EPI to make the programme visible and well resourced. Political commitment can encourage national key stakeholders and international partners and communities to participate and take ownership of the programme. It ensures sustainability of immunization programmes. The main indicators of political commitment are the creation of a budget line for EPI in MOH annual budgets, creation of the position of National EPI Manager, public announcements in favour of immunization, and personal participation of community leaders in major health events.

Currently, countries in the African Region and elsewhere continue their efforts to protect children from vaccine preventable-diseases through EPI reaching all districts in a country irrespective of their geographical location and accessibility. The “expansion” that appears in the title of this programme reflects its characteristics and evolution. It can be interpreted based on the following considerations:

- **Geographical considerations:** EPI is a global programme, implemented by all countries in the world, developing and developed.
- **National coverage:** In a single country, its goal is to cover the entire country; the beneficiaries are the children and the whole population in all communities.
- **Disease coverage:** It covers and ensures protection from a wide range of diseases – six to ten and even more diseases in various countries. It is always “expanding”, incorporating new vaccines and diseases (e.g. HepB and Hib vaccines) as they are proved safe and effective by clinical and field trials. It may also “expand” to incorporate non-vaccine interventions such as vitamin A supplementation.
- **Programme components:** EPI “expands” from being just a vaccination programme to disease prevention and eradication programmes for poliomyelitis, neonatal tetanus, measles and others.

General norms and guiding principles for programme implementation

Community participation and social mobilization

- (a) Community is the main stakeholder and partner in any immunization programme be it routine EPI or SIAs. Therefore, all possible avenues to involve community members and community-based structures in programme activities should be explored.
- (b) National immunization strategies should support all initiatives geared towards awareness creation, demand generation, attitude change and community participation. The immunization programme should seek close cooperation with community leaders, village chiefs, religious leaders, parliamentarians, teachers and women’s groups as well as health committees and community health workers.

Integrated approach

- (a) Immunization services should be provided as an integral part of national family health programmes including prevention and control of childhood diseases, breastfeeding, growth monitoring, information, education and communication, nutritional advice, antenatal, postnatal care and family planning.
- (b) As one of the most cost-effective health interventions, immunization should be a priority component of district health packages.

Accessibility and equity

- (a) To achieve high immunization coverage among communities, the programme should aim to be accessible to every child and woman of child-bearing age. Studies and experience from many countries have shown that only coverage as high as 80% and above can decrease the disease burden in a country; even higher rates, such as 90–95%, are needed to eradicate a disease. The programme should apply two basic strategies to achieve these levels: static services and scheduled outreach visits to reach target children in remote communities. Because of the special requirements of certain eradication programmes (polio, measles, neonatal tetanus), however, EPI should also use a campaign strategy to break the chain of transmission of the disease by mass immunizations performed simultaneously in all or some selected areas of the country during the same period.
- (b) To ensure equity and social justice, the immunization should be provided to all target populations irrespective of ethnicity, gender or political and religious affiliation.

Quality of services and safety considerations

- (a) One of the important goals of any health service is to improve the quality of health-care provision, including immunizations. The programme should achieve this through regular training of field staff and their technical supervision, provision of necessary equipment and injection materials and monitoring and evaluation.
- (b) The programme should put under close surveillance the safety aspects of immunizations that involve human factors, such as the health worker, vaccine handling and procedures for vaccinations. Once again, training and regular supportive supervision should be carried out to ensure safe immunization practices.

Coordination and leadership

- (a) The coordination of the programme and all participating agencies and other partners, e.g. nongovernmental organizations (NGOs), should rest with the MOH through regular meetings and committees.
- (b) A senior official in the MOH should chair the inter-agency coordinating committee (ICC) as a forum for key stakeholders tasked to promote advocacy and resource mobilization for immunization programmes.
- (c) A national immunization technical advisory group (NITAG) should be put in place to act as an advisory body.

Regulatory issues relating to immunization

In the past, various countries of the African Region have issued a number of acts and regulations to guide public health, including provision of immunization services. Most of these are now considered outdated and not relevant for health practice and administration. In accordance with updated African Vaccine Research Forum guidelines, national health authorities should therefore, within the framework of health reform programmes, update public health acts to reflect modern thinking in regulating immunization activities. This will, among other things, cover the rights and responsibilities of individuals and communities and the private sector towards immunization.

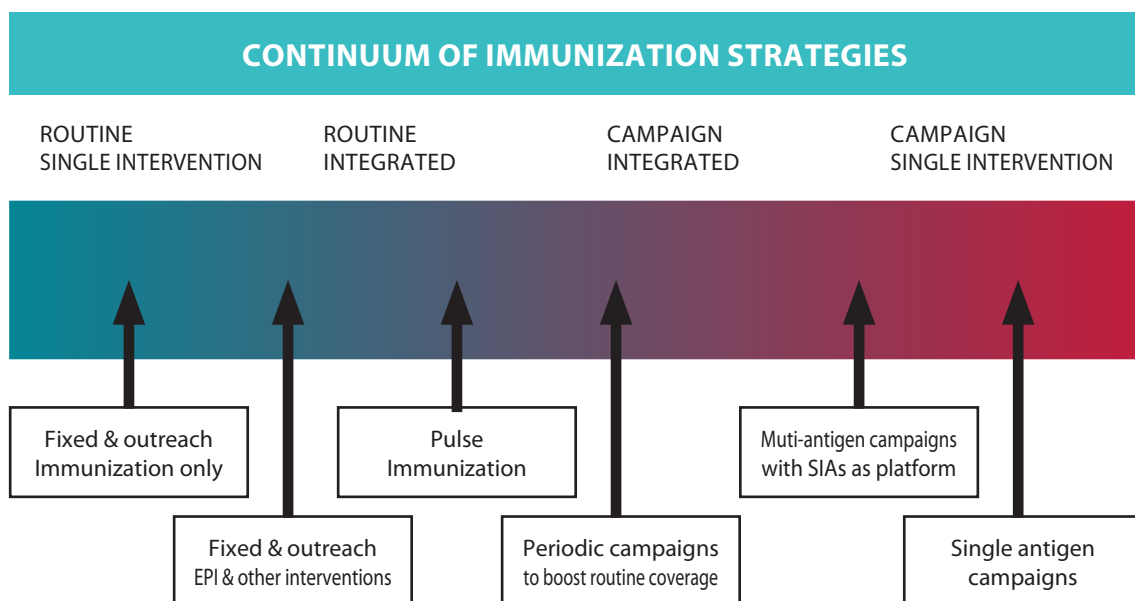
- (a) Most countries in the African Region do not manufacture vaccines and almost all vaccines used for immunization programmes are imported.
 - Imported vaccines must be registered by national drug registration units.
 - These vaccines should conform to WHO and UNICEF standards.
 - All vaccine preparations in use within the EPI should be made available at all levels of the health-care delivery system at all times to the recipient.

- (b) Health workers should respect the rights of users of immunization services. Among other things, this should include:
- Showing the user diligence and respect.
 - Informing them about gains and the possibility of an adverse event following immunization (AEFI), and what should be done in such a case; where and when the child or mother should be present for their next vaccination.
 - Issuing certificates about individuals' vaccination status.
- (c) Obligations and responsibilities of users of immunization services include:
- Respect the rights of other users of the service.
 - Observe any rules concerning organization of immunization services in the health establishment.
 - Cooperate with health facility personnel in connection with their own immunization.
 - Users may, through appropriate channels, submit suggestions or complaints with regard to their visit to the health facility.

Appendix 3: Immunization service delivery strategies and innovative approaches

The African Regional EPI Strategic Plan 2014–2020 on vaccines and immunization and excerpts from the WHO AFRO agreed strategic options to reach the unreached are focusing on increasing and sustaining high vaccination coverage; completing the interruption of poliovirus transmission and ensuring virus containment; eliminating measles and advocating for the elimination of rubella and congenital rubella syndrome; and attaining and maintaining elimination/control of other VPD. To achieve these regional immunization objectives, the following range of immunization strategies are being adopted (see Figure 3.5).

FIGURE 3.5
RANGE OF IMMUNIZATION STRATEGIES



Immunization at static health facilities (fixed strategy)

In principle, all health facilities in the country should provide immunization services as part of routine family health activities at the first available opportunity to infants and women coming to the health facility for whatever reason. Immunizations are carried out at each health facility that provides maternal and child health services and has a refrigerator. The preparations for immunizations include:

- Scheduling days and times for immunization sessions; to decide on the number of sessions per month, health workers need to calculate the monthly target population, number of contacts with a child or woman needed to be fully immunized and the number of children and women that the health centre staff can serve in a session.
- Informing and reaching a consensus with the community on immunization session days and times.
- Making sure those vaccines, supplies, equipment, recording forms are available.
- Arranging space for the convenience and comfort of health workers and clients.
- Ensuring that safety boxes and other waste disposal facilities are in place.

Fixed centres usually provide other services to children and caregivers for which space and equipment are needed. These services include weighing babies and charting their growth, treatment, antenatal care and health education. Where possible, immunization services at static units should be integrated with other health services.

Routine immunization essentially involves:

- Regular scheduled services that reach each new cohort.
- Services provided at a health facility or at a scheduled outreach site, by competent health workers.
- **Participating communities are well informed regarding when and where services are being offered.**

Immunization delivery through outreach services

Outreach immunization sessions are held in locations other than a health facility, which health workers can travel to and from the same day. These locations usually have no health workers and therefore rely on outreach visits from the nearby health facility. Often, these localities are hard to reach, and outreach services play an important role in increasing immunization coverage throughout the entire district.

Through this strategy, health services provide immunization and other mother and child care for the population usually living beyond a 5–10-km radius from a health facility. The locations are accessible by vehicle, motorcycle, on foot or by local traditional transport. The equipment needed for outreach services is the same as for fixed immunization sessions. Additional care should be taken to keep the vaccine carrier in the shade and out of the heat.

Outreach visits are organized regularly – e.g. weekly or monthly – depending on available resources. Successive outreach sessions in a community should be held on the same day of the week and in the same place (e.g. school) to maximize attendance.

Outreach services need good planning as they involve additional resources (transport and money). The immunization team may provide services additional to immunizations on an outreach visit, including prevention, treatment and health promotion. The community should be involved in planning for the outreach programme. For best results, community leaders and caregivers should be consulted about dates and time of the sessions. They can also help mobilize the community and increase attendance.

Immunization delivery by mobile teams

Some countries in the African Region with inadequate health services coverage, long distances between communities, difficulties in communication and critical shortages in health personnel (e.g. Sahelian countries) use this strategy for remote and inaccessible populations to deliver health-care packages, including immunizations. In addition, mobile teams may only be able to reach some fragments of some populations, such as nomads. This strategy has certain limitations including the need for reliable transport (vehicles, boats, even helicopters, etc.), funds to cover fuel costs and per diem for the staff. There are also difficulties ensuring sustainability of this strategy related to factors mentioned earlier.

Immunization campaigns or supplementary immunization activities

Because of the special requirements of eradication/elimination programmes, such as those for poliomyelitis, measles and neonatal tetanus, the programme also makes use of mass campaigns undertaken through fixed, temporary and mobile teams to break the chain of transmission of these diseases.

The use of SIAs is a strategy to improve immunization coverage among target populations through mass immunizations performed simultaneously nationwide during national immunization days (NIDs) or, in some selected areas of the country, sub-national immunization days (SNIDs). Mass campaigns should also be used in certain circumstances, e.g. when available health facilities are inadequate to achieve high coverage through routine services. They are also conducted when large outbreaks of the disease occur despite high coverage or when the government has endorsed a global mandate for elimination or eradication (e.g. NIDs for polio eradication). Such campaigns should target age groups identified through analysis of age-specific attack rates of the disease. Urban areas, particularly those with low coverage and high measles incidence, may be operational targets in measles immunization campaigns.

Supplementary immunization activities for **polio eradication** include:

- **NIDs** designed to immunize all eligible children within one-to-three/five days in two rounds (four to six weeks apart). The original intention was to use NIDs exclusively for polio immunization, but an increasing number of countries are now using them to simultaneously address related national priorities (distribution of vitamin A capsules, anti-helminthic preparations or insecticide-treated mosquito nets, etc.).
- **SNIDs** where NIDs are no longer required nationwide but where a specific area is to be targeted, often, for example, border districts with higher risk of polio transmission.
- **Mopping-up** – specifically a house-to-house SNID in a focal area where polio transmission is thought to be occurring.
- **Short-interval additional dose (SIAD) is an intensified approach to deliver two successive doses (passages) of Vaccine within a period of a few days (usually less than 2 weeks). The objective is to build up population immunity rapidly.**

Supplementary immunization activities for **measles elimination** include:

- **Catch-up** campaign when one dose for all children between nine months and 14 years is given, regardless of vaccination or disease history.
- **Follow-up** campaign implies one dose of measles vaccine to children born since the catch-up campaign.
- **Mopping-up** – a house-to-house vaccination campaign in a focal area where poor coverage was achieved in the catch-up or follow-up campaigns, or when epidemiological evidence suggests measles transmission is focalized.
- **Periodic intensification of routine immunization (PIRI)** approach reinforces routine immunizations and uses a second opportunity to immunize susceptible persons remaining in the population and those never vaccinated.

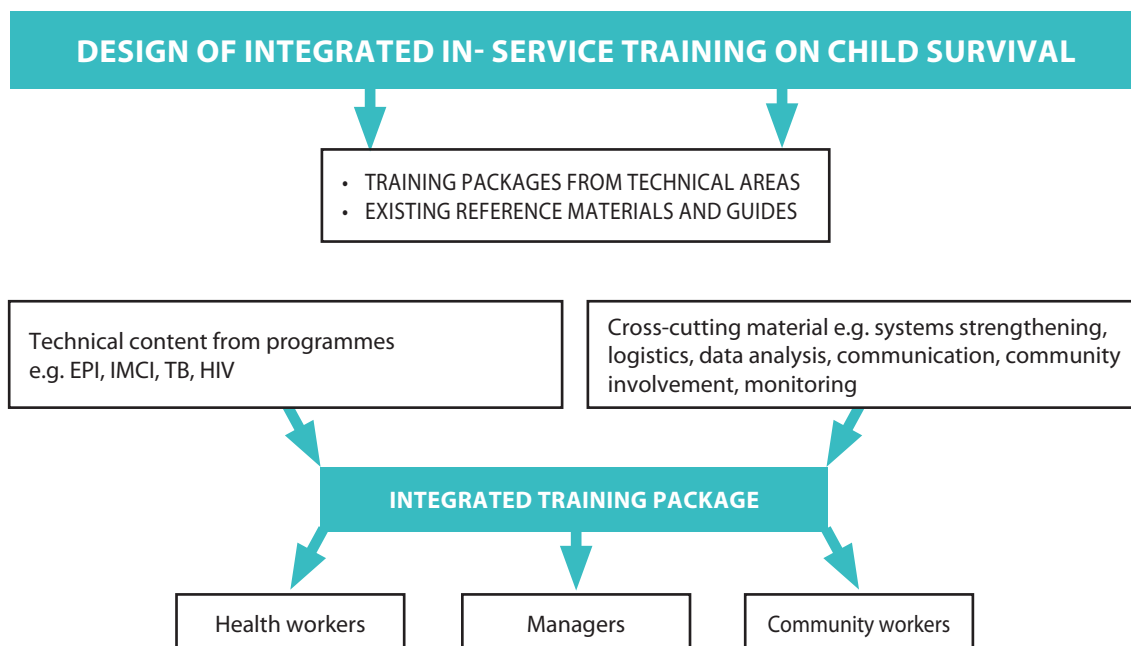
Immunization activities for **maternal and neonatal tetanus:**

Tetanus is not a person-to-person disease. Therefore, SIAs to reduce the incidence of MNT are simply TT campaigns among women of child-bearing age to raise coverage. Usually, two doses of TT are given one month apart, then a third dose after six months. This gives protection for a minimum of three years, probably longer if the subject has been previously immunized during her childhood.

Always during mass campaigns, children are vaccinated irrespective of their previous immunization or disease history. Such campaigns should not be isolated events but should be part of a comprehensive, long-term strategy, especially for diseases under eradication or elimination (poliomyelitis, neonatal tetanus, measles).

Strategy of integration of child health-care interventions

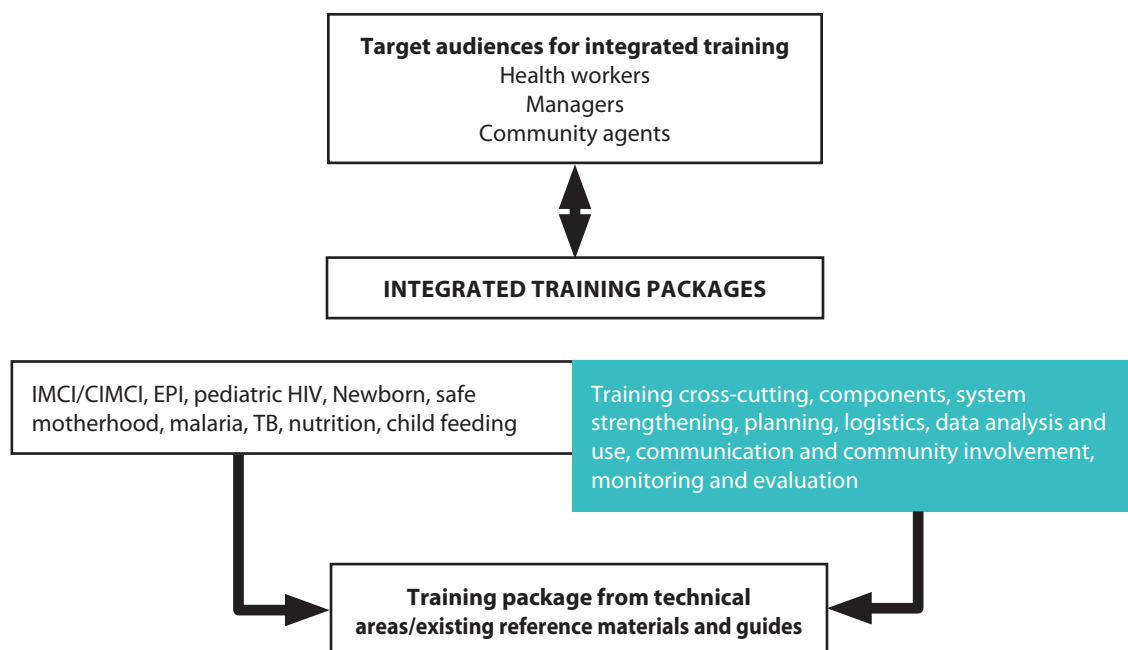
FIGURE 3.6
DESIGNING INTEGRATED TRAINING ON CHILD SURVIVAL AT DISTRICT LEVEL



Currently, immunization services are delivered as part of integrated mother-and-child health-care interventions at district and health-facility levels in almost all African countries. For this reason, the RED/REC operational strategies have to be implemented in an integrated manner using immunizations as a platform for priority programme interventions such as in Roll Back Malaria, reproductive health, IMCI, HIV/AIDS, the Micronutrient Initiative and Integrated Disease Surveillance and Response (IDSR). Provision of this package of integrated services at fixed health facilities or during outreach visits may include vaccination, deworming, insecticide-treated mosquito nets, malaria treatment kits, vitamin A etc., accompanied by health and nutritional advice and health education materials.

Figure 3.6 highlights the various components of designing an integrated curriculum, and Figure 3.7 outlines the process of developing an integrated curriculum.

FIGURE 3.7
DEVELOPING INTEGRATED TRAINING MATERIALS



Vitamin A supplementation is an example of an integrated activity in immunization service delivery. Vitamin A deficiency (VAD) is prevalent in developing countries. Currently, more than 42 countries have integrated vitamin A into their routine immunization programmes. The target groups of the two interventions are within close range: Children under five years of age and women of child-bearing age (**except for pregnant women who should not get vitamin A supplement** due to possible side-effects on the unborn child).

Dosage:

- Children from 6–11 months should be given 100 000 IU vitamin A.
- Subsequent doses of vitamin A should be given every six months up to five years during routine services.
- Children from 12–59 months should be given 200 000 IU vitamin A.

The vitamin A delivery technique is simple (drops in the mouth in infants or swallowing the capsule by children older than two years or mothers) and it does not interfere with EPI procedures; vitamin A does not require a cold chain. Vitamin A given to mothers can also benefit infants through breast milk. Supervision of these two programmes can be done jointly, thus saving resources.

Any vitamin A given during routine immunizations should be recorded on the child's immunization card. No record is needed during mass campaigns during which children 6–59 months of age are targeted for vitamin A supplementation.


The early manifestations of vitamin A deficiency are night blindness and xerophthalmia (dry eye) in advanced stages leading to blindness. The manifestations of this condition are necrosis, ulceration and, finally, perforation of the cornea. The disease mostly occurs in young children. For treatment purposes, vitamin A (100 000 IU if under one year and 200 000 IU if one year or older) is given to all cases and repeated the next day and a week later.

New challenges and innovative strategies in immunization

To address the current challenges in immunization service delivery, WHO, UNICEF and partners adopted a variety of strategies for the coming decade, as a continuation of GIVS (2006–2015).

The Decade of Vaccines and the Global Vaccine Action Plan (GVAP) (2011–2020)

The Global Vaccine Action Plan is a framework approved by the World Health Assembly in May 2012 to achieve the Decade of Vaccines vision by delivering universal access to immunization. The mission of GVAP is to:



Improve health by extending by 2020 and beyond the full benefits of immunization to all people, regardless of where they are born, who they are, or where they live.

This ambitious action plan to reach all people with the vaccines they need is the product of the Decade of Vaccines collaboration; an unprecedented effort that brought together development, health and immunization experts and stakeholders. The powerful idea that vaccines work and save lives must now be shared with a much broader audience, using such vehicles as World Immunization Week and others to promote universal vaccination and help focus on current challenges related to immunization. While dedicated health workers immunize people daily in all countries, World Immunization Week gives countries and organizations additional, focused opportunities to raise public awareness of how immunization saves lives – during the same week, every year, in every country. The action plan comprises six strategic objectives and each targets key interventions as summarized in the Figure 3.8. A monitoring and evaluation framework is also proposed.

FIGURE 3.8

GVAP STRATEGIES TOWARDS ATTAINING THE GOALS OF THE DECADE OF VACCINES

*Reaching every district (RED)/Reaching every community (REC)*

Some common barriers to reaching every district/every community/every child have been identified, notably: poor quality district micro-planning, low quality of service and inadequate monitoring systems. To achieve sustained and equitable access to good quality immunization services and accelerate progress towards the immunization goals, GAVI partners proposed an approach, called reaching every district (RED). This approach is district focused, prioritizing districts with unimmunized children with annual milestones. The aim of the RED approach is to improve organization of immunization systems, to maximize the use of available resources and to guarantee equitable and sustainable access to eligible target populations.

RED comprises five operational components designed to reach at least 80% of immunization coverage in every district and has recently been extended to incorporate a reaching every community (REC) approach:

- **Planning and management of resources:** Better management of human and financial resources.
- **Reaching target population:** Improving access to immunization by all.
- **Linking services with communities:** Partnering with communities to promote and deliver services.
- **Supportive supervision:** Regular on-site training, feedback and follow-up with health staff.
- **Monitoring for action:** Through monitoring charts, maps for each facility catchment area, monitoring plans of action and providing feedback for continuous self-assessment and improvement.

TABLE 3.1
EXTENDING THE REACHING EVERY DISTRICT APPROACH TO REACHING EVERY COMMUNITY

RED APPROACH ¹	REC APPROACH
<ul style="list-style-type: none"> • Effective planning and management of resources: Ensuring effective management of human, financial and material resources at every governing level. • Reaching all target populations: Reaching out to underserved, unreached communities in giving support and access to services. • Supportive supervision: Providing local staff with on-site training by supervisors. • Monitoring for action: Promoting use of data for action through utilization of data and self-assessment tools at all governing levels. • Linking services with communities: Linking communities with health services through regular meetings between them and health staff. 	<p>REC strengthens and builds on RED approaches by:</p> <ul style="list-style-type: none"> • Adding emphasis on micro-planning of immunization services under the oversight of local health, civil, political, traditional and religious authorities and leaders. • Ensuring that immunization, along with other primary health care services, is available, accessible, acceptable and of optimal quality. • Providing local staff with orientation training on the process to shift from supply-driven to demand-driven services through greater advocacy, community awareness and trust building, and service provider responsiveness. • Within each district, enumerating, mapping and targeting families and communities with insufficiently immunized children.² • Devoting maximum attention and resources to unimmunized children while reaching and sustaining the highest attainable immunization coverage in the whole children's population.

BOX 3.1
FREQUENTLY USED DEFINITIONS

Unimmunized (programmatic definition): This term generally refers to individuals who have not received any scheduled vaccines. The term can also refer to a specific vaccine dose. For example, “unimmunized for measles vaccine” can be expressed as “target population minus the population who have received measles vaccine”.

Under-immunized: Individuals who have received at least one dose of a scheduled vaccine, but who fail to receive all doses in the schedule.

Unreached: Individuals who are not immunized because the immunization services do not reach them, or because the services that are provided may not meet the needs of the clients.

Hard to reach: A subset of the unreached, who may include the following:

- Geographically hard-to-reach (remote, nomads etc.).
- Culturally hard-to-reach (ethnic minorities, some religious communities etc.).
- Urban hard-to-reach groups (living in squatter settlements, slums etc.).
- Those in insecure areas.
- Some communities may be hard to reach in certain seasons such as during the rains.

Global Action Plan for Pneumonia and Diarrhoea (GAPPD) (2012–2025)

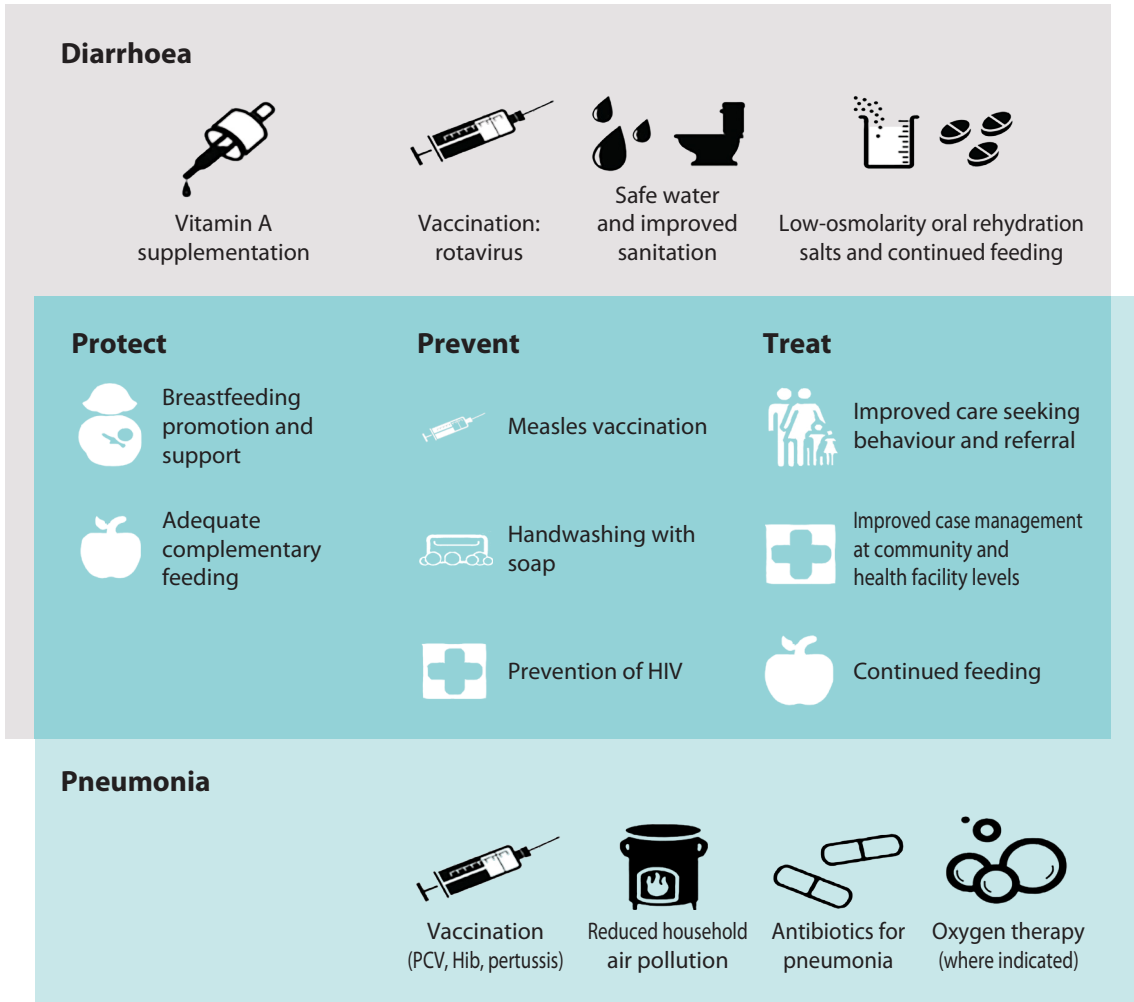
The Global Action Plan for Pneumonia and Diarrhoea (GAPPD) from WHO and UNICEF is an integrated plan of action for the prevention and the control of pneumonia and diarrhoea (see Figure 3.9). The plan goes to the heart of the challenge: recognizing that prevention and control of pneumonia and diarrhoea cannot be adequately dealt with separately but only through integrated programmes. Without such urgent accelerated and coordinated efforts, each year more than two million of the world's most vulnerable children will continue to die from these two diseases. Programmes to control these two diseases must be addressed together to speed up achieving Sustainable Development Goal Target 3.2 to save the lives of children under the age of five.

1 WHO Regional Office for Africa. Immunization and vaccination development: reach every district (RED) approach (http://www.who.int/immunization/funding/03_WHO_AFRO_IVD_RED.pdf).

2 The local knowledge of health workers and community members will be most valuable assets in identifying the hard to reach, since they may not even be included in official population statistics.

FIGURE 3.9
GAPPD NEW OPPORTUNITIES AND STRATEGIES

NEW OPPORTUNITIES AND STRATEGIES FOR PREVENTING AND TREATING PNEUMONIA AND DIARRHOEA



Reaching the unreached children with immunization services in the African Region

Life, survival, maximum development, access to health and access to health services are not just basic needs of children and adolescents, but fundamental human rights embodied in the United Nations Convention on the Rights of the Child (CRC). In addition, there are compelling moral arguments for the routine immunization of children, especially those in developing countries. But if immunization coverage is an index of how a child’s right to basic health is respected, then the CRC is currently failing children in African countries. A child born in a typical low-income country in Africa is 17 times more likely to die before reaching the age of five compared with a child in a high-income country. The scope of routine immunization has changed. It is no longer the delivery of just six antigens as it was in the 1980s. The national schedule now contains many more vaccines, and more are in the pipeline.

The very concept of “routine immunization” is changing and expanding. There is now an urgent need to increase its scope by:

- Reaching more of those who were previously unreached.
- Ensuring that more of those who were under-immunized become fully immunized.
- Reaching older age groups who are targeted for new vaccines or extra doses of current vaccines.
- Delivering more antigens (as considered affordable and epidemiologically appropriate for each country).
- Delivering vaccine doses within 24 hours of birth.
- Exploring new ways of delivering the services.
- Recruiting, providing pre- and in-service training, and retaining more staff.
- Appropriately adapting and fine-tuning the national immunization schedule to meet these new demands.
- Involving the community in demanding services and partnering in providing them.
- Securing resources for the above.
- Integrating activities with other services and primary health care initiatives (e.g. provision of bed nets, reaching mothers and babies at birth), thereby broadening immunization programmes to include other disease prevention and health promotion programmes and primary health care elements.

These challenges will test countries to the utmost in the face of scarce resources. All partners in immunization believe that African children deserve the protection afforded by vaccines. And to make the best use of available vaccines requires a renewed emphasis and prioritization of routine immunization services – the platform on which other immunization activities can be mounted. To make the best use of available vaccines a renewed emphasis and prioritization of routine immunization services is required as a platform for expanding immunization services.

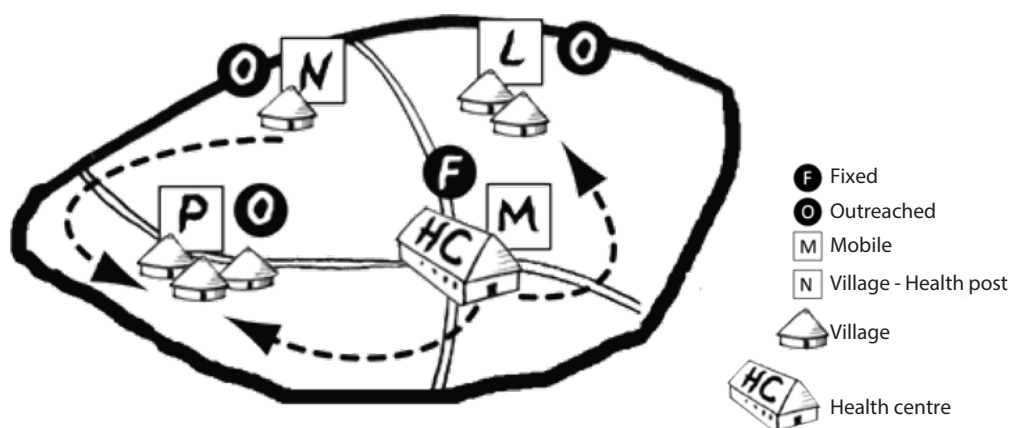
KEY RECOMMENDATIONS FOR IMPROVING ROUTINE IMMUNIZATION SERVICES

The following recommendations are made for consideration in developing or revising pre- and in-service training programmes that focus on improving routine immunization services.

EXPLORE WAYS TO RAISE ROUTINE COVERAGE

The last 20% of unimmunized and under-immunized children are generally the hardest to reach. Innovative strategies will therefore be needed to raise coverage. The strategies in RED/REC must be taken into consideration. Other ways of raising coverage in a sustained manner should also be explored that are locally appropriate to each country. Not only must more children be reached, but the quality of services must be improved.

FIGURE 3.10
A HAND-DRAWN MAP OF A HEALTH DISTRICT



INTEGRATE IMMUNIZATION POLICY AND FUNCTION

Immunization policy should be integrated into national fiscal and health development policy and strategic plans. Interventions must be quantified, costed and incorporated into the various components of national health systems strengthening. These components include financing, human resources, procurement and supply management, links with other programmes (e.g. maternal and child health services), infrastructure (including cold chain capacity), information systems, and monitoring and evaluation.

USE THE INTRODUCTION OF NEW VACCINES TO STRENGTHEN ROUTINE SERVICES

New vaccine introduction provides opportunities for example in infrastructural developments, such as cold chain and modernization of monitoring systems, as well as opportunities to monitor adverse events.

INCREASE IMMUNIZATION FINANCING TO CLOSE FUNDING GAPS

It is important to establish national budget lines for immunization and ensure appropriate disbursement of allocated funds for routine immunization. In addition, countries should effectively utilize and manage existing national and external resources. There should be strong emphasis on the need for additional resources to sustain and increase immunization coverage from 80% to the 90% coverage goal and beyond.

FOSTER PARTNERSHIP FOR IMMUNIZATION

Advocacy should be undertaken to mobilize other sectors, leaders and communities to rally behind the goal of achieving high immunization coverage in the African Region. Partnerships for immunization should be broadened to include civil society and to reflect other regional initiatives such as Harmonization for Health in Africa.

BROADEN COMMUNITY AWARENESS, PARTICIPATION AND OWNERSHIP

Promote behavioural change communication (BCC) and ensure that health promotion interventions are adequately covered and fully implemented in the comprehensive multi-year plans for immunization, thereby engaging communities and increasing demand for immunization services. Effective links between immunization services and communities should be established and/or strengthened so that communities become active partners in the process of immunization. Strategies to implement BCC should refocus to positively influence parental attitudes and knowledge.

ENHANCE INSTITUTIONAL AND HUMAN RESOURCE AND MANAGERIAL CAPACITY

The human resource capacity of immunization programmes should be built up to ensure that adequate capacity exist to develop, implement, monitor and evaluate strategic plans. Adequate numbers of staff with a range of disciplines and training, and appropriate institutional arrangements should be put in place. Supportive supervision must be operationalized, especially at the peripheral levels. The capacity to plan and manage at district and sub-district levels should be prioritized with a view to improving and sustaining high immunization coverage levels through the provision of optimal routine immunization services. Adequate pre- and in-service training should be provided.

STRENGTHEN MONITORING AND EVALUATION

In collaboration with statistics ministries (or equivalent), methods must be developed that provide accurate estimates of target populations for planning and monitoring purposes. Vital registration systems must be strengthened to record all births. Systems for the monitoring and evaluation of immunization programmes and services should be strengthened. Immunization coverage surveys should be conducted regularly in order to validate administrative immunization coverage data. Information generated from monitoring systems and surveys should be widely shared and used both locally and nationally for advocacy and for programme and service improvement.

STRENGTHEN SURVEILLANCE OF VACCINE-PREVENTABLE DISEASES

Keen efforts should be made to achieve and sustain VPD surveillance targets at all levels by ensuring active surveillance and, as a minimum, monthly supportive supervision at the operational level. In addition, regular feedback should be instituted as part of monitoring and evaluation of the programme at all levels. Countries should scale up the implementation of integrated disease surveillance to all districts, including adapting and disseminating the revised IDS guidelines.

COMPLETE THE JOB OF INTERRUPTING POLIO TRANSMISSION

Gains made so far have brought the goal of polio eradication in the African Region so close that the task must be completed if the efforts to date are not to be wasted. While SIAs are essential for completing the job of eradicating polio, high routine coverage is a vital pre-requisite to achieving and sustaining the interruption of wild poliovirus circulation.

STRENGTHEN IMMUNIZATION RESEARCH

Ensure full implementation of the Algiers Declaration and the Bamako Call to Action on research for health in the African Region as a means to enhance understanding of and refine strategies for improved immunization service delivery. Countries should promote and increase their involvement in vaccine research for VPDs and other priority diseases such as malaria, TB and HIV.

VACCINE MANUFACTURE

Countries and partners should explore ways of increasing production of relevant vaccines within the African Region.

DATA QUALITY AND USE

The quality of monitoring and surveillance data should be improved, thereby improving the accuracy of forecasting requirements for vaccine stock and other materials. Higher quality data will also allow for their better use by managers. Such data should be collected, analysed, discussed and used for action at the level that they are collected, not simply filed centrally.

INTEGRATE WITH OTHER ELEMENTS OF PRIMARY HEALTH CARE

Ways should be explored to integrate immunization services and functions with other elements of primary health care. Training of health workers should include skills to enable them to function in an integrated way. Locally appropriate elements should be selected for integration in a prudent manner with precautions to avoid overload of the system. Ultimately, the national immunization programme should move away from its current vertical structure towards inclusion in a broader based disease prevention and control programme.

Appendix 4: Target diseases for immunization programmes and disease surveillance

Measles

Measles is a highly infectious disease. It is caused by a virus and often occurs in epidemic proportions. Measles epidemics occur in conditions of overcrowding and poverty where large numbers of non-immunized people are in close contact. The disease is more severe in infants and adults than in children. It is a notifiable disease and kills more children than any other EPI target disease.

» **Transmission**

The measles virus is transmitted through respiratory droplets (released from sneezing and coughing) from infected persons even before the rash is seen. The incubation period ranges from 7 to 18 days.

» **Epidemics**

Epidemics continue to occur as the number of people susceptible to measles accumulates and reaches a critical size. Children never immunized or children vaccinated but failing to develop antibodies (some 15–20% of those vaccinated) are susceptible. In areas with high population density, measles is likely to occur all year round (sometimes with seasonal peaks). In less dense areas, measles comes in epidemics occurring every two to three years.

People who recover from measles are immune for the rest of their lives, and infants born to mothers who have had measles are usually immune for six to eight months. The response to immunization of a vaccinated child will depend on the level of acquired antibody at the time the child had the vaccine.

» **Patterns change**

When high coverage of measles immunization is achieved:

- Overall incidence (number of cases in a month or year) is reduced.
- The interval between outbreaks is lengthened.
- An increasing proportion of cases occurs in older age groups.
- An increasing proportion of cases occurs in vaccinated children.
- The case fatality ratio declines.

» **Signs and symptoms**

The first sign of infection is a high fever lasting from one to seven days. During this period, there may be runny nose, cough, red and watery eyes, and small white spots inside the cheeks. After several days, a slightly raised rash develops, spreading from the face and upper neck to the body and then to the hands and feet over about three days. It lasts for five to six days and fades successively from the same areas. The complications of measles include severe diarrhoea, dehydration, inflammation of the middle ear and acute respiratory infections (ARI). Pneumonia is the commonest cause of death associated with measles. It can be fatal in malnourished children or HIV/AIDS-infected infants. Measles is a major cause of blindness among children in Africa.

Measles claims the lives of many infants and children, especially infants. Vaccination will make a big difference in reducing child morbidity and mortality.

» **Clinical case definition**

- High fever, with cough, runny nose (coryza), watery, red eyes (conjunctivitis), which are sensitive to light.
- Appearance of generalized rash slightly raised spreading from the face. The rash disappears after about a week.

Confirmed measles is when the patient has these symptoms and laboratory tests show measles antibodies (IgM). Laboratory confirmation is used to verify that the outbreak is caused by measles.

» **Recommended type of surveillance**

Surveillance of measles is an important activity as countries of the African Region are in the transition phase from its control to elimination. Surveillance should include the following:

- When detecting a measles case, the nurse in charge should immediately contact the district health management team (DHMT) for investigation and response.
- Routine reporting to the epidemiology unit at the MOH of all clinical cases within 48 hours by districts, by age and by vaccination status.
- Blood samples should be taken and sent to the laboratory for confirmation of the diagnosis.
- Investigation of outbreaks within 48 hours should be undertaken to determine the factors supporting the epidemic.
- Line-listing of all cases should be prepared with information on age, sex, date of onset, vaccination status of patients.
- Specimen collection for viral strain characterization.
- Zero reporting should be introduced, that is health workers check all the daily records and if they do not find any measles case in the records they put "0" in the appropriate box of the reporting form. Health workers should never put "0" without checking the records, or leave the box blank.

Poliomyelitis


Poliomyelitis (polio) is an acute, highly infectious viral infection. There are three types (otherwise called serotypes) of polioviruses: 1, 2 and 3; all of them capable of infecting the human body. All three types may provoke paralysis, although type 1 is the usual source of epidemics and paralysis. The virus invades the nervous system and can cause total paralysis in a matter of hours. It enters the body through the mouth and multiplies in the intestine. The incubation period ranges from three to 35 days.

» **Transmission of infection**

Transmission is primarily person-to-person via the faecal-oral route. Poliovirus infects only human beings, thus rendering the eradication of the disease feasible. Poliomyelitis is easily spread. Nearly all children living in households where someone is infected become infected. Transmission is higher in areas of poor sanitation and contaminated water.

» **Signs and symptoms**

The disease is characterized by sudden onset of fever followed by acute flaccid paralysis. Most cases of poliomyelitis are asymptomatic, that is, without apparent clinical symptoms, unnoticed, yet capable of spreading the virus around them. Most of those affected suffer only mild symptoms similar to a respiratory viral infection. One in 200 infections leads to irreversible paralysis (usually in the legs). Among those paralysed, 5–10% die when their breathing muscles become immobilized. Polio mainly affects children under five years of age who are not immunized against this disabling disease. There is no cure for polio, it can only be prevented. Polio vaccine given multiple times can protect a child for life.



Polio is easily preventable by immunization, so all cases are avoidable.

» **Eradication of polio: A challenge for Africa**

All countries in the world had committed themselves to eradicate polio and certify its global eradication by 2005. Since the declaration and the launch of the polio eradication initiative in 1988, polio cases in the world dropped from 350 000 to only 95 cases at the end of 2015 with no case reported in the WHO African Region. This decline is continuing at an accelerated rate. This tremendous reduction was achieved through strengthening routine immunization programmes, organization of NIDs and strict surveillance. Countries have established national poliomyelitis expert committees for classification of reported or suspected cases and national certification committees to monitor polio eradication activities. Only a few countries in Africa and Asia currently report polio. Countries in the WHO American and European Regions have achieved country-wide polio eradication.

» **Clinical case definition**

Any child under 15 years of age with acute flaccid paralysis (AFP) or any person with paralytic illness suspected to be polio.

» **Recommended type of surveillance**

A highly sensitive surveillance for AFP, including case investigation and specimen collection, is critical to detect wild poliovirus circulation, with the ultimate goal of polio-free certification in the remaining countries worldwide. The surveillance should be established at all health facilities to implement the following:

- All AFP cases under 15 years of age should be reported immediately, investigated within 48 hours and two stool specimens collected 24–48 hours apart and within 14 days of paralysis onset.
- Collected specimens should be forwarded to the national or WHO-accredited laboratory within three days.
- Number of AFP cases should be included in routine monthly surveillance reports. If a good polio surveillance system is in place, the non polio AFP detection rate should be at least 2 per 100 000 children of under 15 years of age.
- Zero reporting should be introduced at all level.
- All outbreaks should be investigated within 48 hours.
- Active surveillance should be implemented in hospitals for case finding.

Neonatal tetanus

African countries are committed to neonatal tetanus (NT) and maternal tetanus elimination by the year 2020. Elimination will be certified if every district in the country registers less than one NT case per 1000 live births. To achieve this goal, the following strategies need to be adopted:

- Increase routine immunization of children under one year of age.
- Issuing certificates about their vaccination status.
- Increase routine immunization coverage of women of child-bearing age, and especially pregnant women, with tetanus toxoid (TT).
- Conduct supplementary immunizations in high-risk districts.
- Ensure clean deliveries.

Tetanus is an infectious disease caused by the bacterium *Clostridium tetani*. The germ is common in the environment, often found in soil containing manure. The bacteria form spores that can survive in soil for many years. The toxin they produce poisons the nerves that control the muscles, causing stiffness. The disease is particularly common and serious in newborn babies, and it is called neonatal tetanus, which is a deadly disease with more than 95% of infected babies dying.

WHO targets global elimination of NT by 2020 through the reduction of NT cases to less than one case per 1000 live births in every district in every country.

» Transmission of infection

Tetanus is not transmitted from person to person. A person may become infected if soil or dung enters a wound or cut. This may happen, for example, if the wound is made by a dirty object: nails, needles, thorns, sharp agricultural instruments, etc. The disease affects babies through contamination of the umbilical cord if delivery or care after delivery has not been clean (either by cutting the cord with a non-sterile instrument like a knife or blade, or by applying cow dung, mud or ash onto it). Infants and children may also contract tetanus when dirty instruments are used for circumcision, scarification and skin piercing.

» Signs and symptoms

The disease is characterized by involuntary painful spasms of muscles. Jaw muscles are often first affected – the face of the patient changes expression, which is known as *risus sardonicus*, and trismus (lockjaw). Later increasingly painful spasms occur in all muscle groups, giving a characteristic picture of neck stiffness, rigid abdomen, and difficulty breathing and swallowing. Neonates usually develop feeding problems (cannot suck) having previously been feeding well. Other signs include constipation, abnormal high-pitched cry, characteristic wrinkled face. Newborn babies appear normal at birth but stop sucking 3–10 days later. At 5–13 days if still not breastfeeding, the whole body becomes stiff, severe muscle contractions and convulsions occur, and death follows in most cases.

» Clinical case definition

- **Tetanus:** Acute onset of increased muscle tone and/or painful muscle contractions (usually of the jaw and neck muscles) and generalized muscle spasms; history of injured skin helpful but not always present.

- **Neonatal tetanus:** A well newborn baby who develops feeding difficulty after the first two days of life, followed by generalized stiffness and/or convulsions or often death between 3–28 days.

» **Recommended type of surveillance**

Neonatal tetanus is a notifiable disease. The surveillance of NT should be done along the following lines:

- Every single case of NT should be investigated to identify the cause of the disease by the nurse in charge of the health facility; and forms should be sent to the DHMT for further analysis.
- Number of confirmed NT cases should be included in the routine monthly surveillance report.
- Zero reporting should be introduced at all levels.
- Active surveillance for NT to be carried out in major hospitals.
- Community surveillance should be initiated in remote areas where routine reporting is non-functional.

Tuberculosis

Tuberculosis is a chronic bacterial infection caused by *Mycobacterium tuberculosis*, which is carried by almost one third of the population globally. The disease is common, causing about 1.45 million deaths per annum worldwide. HIV/AIDS and multi-drug resistant TB worsened the public health burden of the disease causing treatment failure among patients. Therefore, the prevention through immunization, especially for children, is important. Bacille Calmette-Guérin (BCG) immunization at birth will reduce the morbidity and mortality from TB among children. Vaccine efficacy to prevent TB meningitis or miliary TB in children varies between 75–85%.

» **Transmission**

Transmission takes place by airborne droplets that are produced by sputum-positive people. Occasionally, spread by the blood stream transmission occurs in the weeks before immunity develops, which can cause TB meningitis among infants and very young children. Factors that may facilitate transmission of infection include:

- Overcrowded and poorly ventilated houses.
- Public places facilitating close contact with an infected person.

» **Signs and symptoms**

The incubation period for TB is 4–12 weeks, but the infection may persist for months or years before the disease develops. Risk factors for getting TB are:

- Immunodeficiency due to HIV infection and clinical AIDS.
- Malnutrition.
- Chronic diseases, e.g. diabetes.
- Low access to health care, etc.

Most commonly, the disease affects lungs (pulmonary TB). In children it can cause severe meningitis, often ending in death. Other parts of the body, including bones, joints and brain can also be affected. The symptoms of TB include general weakness, weight loss, low-grade fever and night sweats. In TB of the lungs, the symptoms include persistent cough, sometimes with blood, and chest pain.

People with TB must complete a course of curative therapy. The treatment is expensive and takes a long time: six to eight months depending on the type of drugs taken (and still is called “short-term”; directly observed treatment short course, widely known as DOTS). Unfortunately, some people fail to take the medication as prescribed to complete their course of therapy. This may lead to multi-drug resistant TB, which is extremely difficult to treat, and it can spread to other people.

» **Case definition**

This is rather general due to the multiple symptoms of the disease, some of which are also common for other generalized infections. Any person with:

- History of cough for more than three weeks.
- Night sweats, general weakness, loss of weight.
- Abnormal swelling of lymph nodes.
- History of contact with a suspect or confirmed case of pulmonary tuberculosis.

An ill child with signs suggesting meningitis or disease in the central nervous system that does not respond to antibiotic therapy for acute respiratory disease.

» **Recommended type of surveillance**

Surveillance has an important role for detecting pulmonary TB in the family and community. Early diagnosis of cases using direct sputum-smear examination technique and early start of DOTS will significantly reduce the spread of TB infection. All detected cases are recorded in a special TB register to follow-up compliance with DOTS and to observe trends of sputum-positivity among patients. No special surveillance technique is recommended for TB meningitis, except for monitoring the incidence of this complication among target children.

Diphtheria

Diphtheria is an infection caused by bacteria called *Corynebacterium diphtheriae*, which produces a toxin. The toxin can cause swelling of the neck, heart failure and breathing paralysis. Diphtheria affects people of all ages, but mostly non-immunized children under 15 years of age. The target is to control diphtheria to such a level where it ceases to be a public health problem, using the following strategies:

- Routine childhood immunizations within the framework of EPI.
- Rapid investigation of close contacts to ensure their proper treatment.

» **Transmission**

Diphtheria is spread either by direct contact (skin to skin) or by droplets from the cough of nasal carriers who may be asymptomatic and immune. The transmission of diphtheria is increased in overcrowded and poor socioeconomic conditions. Diphtheria can also affect the skin, which is common in Africa. The incubation period is one to seven days. People infected with diphtheria usually become ill within two to four days, although the symptoms may not appear until six days have elapsed. Infected individuals can spread the disease to others for up to four weeks. During outbreaks and epidemics, some children may carry the germ without showing signs or symptoms, but they can still spread the disease to other people.

» **Signs and symptoms**

The early symptoms are sore throat, loss of appetite and slight fever. Within two or three days, a bluish-white or grey membrane forms in the throat and tonsils. If there is bleeding, the membrane may become greyish-green or black and it sticks to the soft palate of the throat. There may be inflammation of the heart muscle and valves, leading to acute heart disease and heart failure. Death occurs in 5–10% of cases. In the type of diphtheria attacking the skin, the lesions may be painful, reddened and swollen. Any chronic skin lesions may become infected with diphtheria.

» **Clinical case definition**

An illness characterized by laryngitis or pharyngitis or tonsillitis accompanied by a greyish membrane of the tonsils, pharynx or nose.

» **Recommended type of surveillance**

Outbreaks should be investigated immediately and results reported to a higher level.

- Routine monthly reporting of the number of cases confirmed and probable causes.
- Zero reporting to be established.

Whooping cough (pertussis)

This is a bacterial disease caused by *Bordetella pertussis*, which can be found in the mouth, nose and throat. The disease is extremely contagious, especially where people live in crowded conditions and have poor nutrition. In recent years, severe epidemics occurred in countries where immunization coverage declined. An estimated 45 million cases and 400 000 deaths occur in the world annually. The case fatality rate in African countries can reach 15%. If not controlled, it may spread and cause massive outbreaks and contribute to high infant mortality. The disease is most dangerous in children aged one year or less. The target is to control pertussis in African countries to the level that it ceases to be a public health problem, using the following strategies:

- Routine childhood immunizations within the framework of EPI.
- Disease surveillance methods.

» **Transmission**

Pertussis spreads very easily from person to person in droplets when a patient is coughing or sneezing. The disease is transmitted from seven days after the person has been exposed to the germs until three weeks after the start of coughing. The incubation period can be up to 21 days. There is little or no transfer of passive immunity from mother to child, leading to the occurrence of infections in early childhood.

» **Signs and symptoms**

Initially, for about the first week, the child appears to have a common cold with runny nose, watery eyes, sneezing, fever and mild cough. The cough gradually worsens. The second stage involves numerous bursts of rapid coughing. Vomiting and exhaustion often follow the coughing attacks, which are particularly frequent at night. This stage usually lasts one to six weeks. In the third stage, the coughing gradually becomes less intense and stops in two to three weeks. There is usually a high fever during the illness.

The following complications are most probable in young infants:

- Bacterial pneumonia is most common and the cause of most deaths.
- Convulsions and seizures may occur due to inadequate oxygen supply to the brain.
- Inflammation of the middle ear and dehydration.

Antibiotics are not helpful in established whooping cough, except in treating complications such as pneumonia or otitis media. Plenty of fluids should be given to prevent dehydration. Refer to hospital if child is dehydrated, unable to feed, breathlessness is present or complications are developed: pneumonia or otitis.

» **Case definition**

A person with a cough lasting at least two weeks with at least one of the following:

- Paroxysm (fits or burst of coughing).
- Inspiratory whooping.
- Vomiting immediately after coughing.

» **Recommended type of surveillance**

- Routine monthly reporting of the number of confirmed and suspected cases.
- Zero reporting to be established.
- All outbreaks to be investigated and laboratory confirmed.
- During an outbreak, case-based data should be collected to see whether the child was vaccinated against the disease and determine the source of infection.

Hepatitis B

Hepatitis B is a highly infectious viral disease affecting a large proportion of children at a very young age, including infants.

The reasons for introducing hepatitis B immunization are to prevent hepatitis B virus (HBV) infection of newborns (through mother-to-child transmission), which results in chronic liver disease later in life, and to save human lives and the workforce.

Hepatitis B (HepB) is a major public health problem worldwide. Approximately 2 billion persons are infected with hepatitis B virus. HBV is second only to tobacco as a known human carcinogen. The disease is highly endemic in Africa; by adulthood, between 60–90% of the people have been infected, of whom 5–25 % are chronic carriers.

» **Transmission**

The virus is found in blood and in various body secretions, including saliva, semen and vaginal fluid. The primary routes of transmission are:

- Perinatal (from mother to child), during birth, when contact with blood, amniotic fluid and/or vaginal fluid always occurs.
- Child to child, which accounts for a large proportion of cases.
- From unsafe injections and transfusions, scarification and sexual contact. In a health-care setting, HBV infection can be transmitted through contaminated needles and syringes and other equipment not properly decontaminated.
- Sexual transmission can account for a high proportion of hepatitis B cases among adolescents and adults.

Unlike hepatitis A virus, HBV does not appear in an infected person's stools. It does occur in milk of infected mothers but in such a small quantity that nursing can proceed.

» **Signs and symptoms**

The incubation period is 45–160 days (mean 120 days). Infection with HBV can cause both acute and chronic disease. Acute hepatitis B is similar to other types of acute viral hepatitis. Clinical features, when they occur, include loss of appetite (anorexia), extreme weakness, stomach upset (nausea), vomiting, abdominal pain and jaundice (yellow skin or eyes). Patients may have dark urine or pale stools. Symptoms may last several weeks. General weakness and fatigue may continue for months. The disease results in the following complications:

- Acute hepatitis leading to liver failure and death.
- A carrier state with or without chronic hepatitis.
- A carrier state leading to liver cancer (hepatocellular carcinoma).

» **Case definition**

An acute illness that typically includes acute jaundice, dark urine, anorexia and extreme fatigue.

» **Recommended type of surveillance**

- Routine monthly reporting of aggregate data of suspected and confirmed cases.
- Zero reporting from each level.
- All outbreaks to be investigated immediately and confirmed serologically.

Haemophilus influenzae type b (Hib) infection

The bacterium *Haemophilus influenzae* type b (Hib) is an important cause of childhood meningitis and a major cause of bacterial pneumonia in infants and children less than five years old in developing countries. Bacterial meningitis is fatal unless treated immediately with antibiotics. Even with proper treatment, 3–25% of affected children may die. Studies have also shown that Hib accounts for up to one quarter of the severe pneumonia cases in young children in developing countries where 2–3 million cases of Hib pneumonia occur each year. WHO estimates that without vaccination 400 000–700 000 children will die annually of Hib disease.

In developed countries, meningitis accounts for the majority of Hib disease, whereas in developing countries acute respiratory infection, particularly the estimated 2–3 million cases of Hib pneumonia occurring each year, represents an even heavier burden.

Safe and effective vaccines against Hib infections exist, giving high-level protection to 90–95% of vaccinated children. Since 1998, WHO has recommended that Hib vaccine should be included in routine infant immunization services in all countries. For more than 10 years now this vaccine has been integrated into childhood immunization programmes in more than 40 countries. Hib disease has largely disappeared in Australia, Canada, New Zealand, the United States and Western Europe.

The causative agent, *Haemophilus influenzae* type b, is one of six types (a, b, c, d, e and f) of strains of the bacteria that cause almost all systemic infections (95%).

» **Transmission**

Up to 15% of children in non-immunized populations may harbour Hib in their nasopharynx. However, only a fraction of those acquiring the microorganism will subsequently develop clinical disease. Others, who are asymptomatic carriers of Hib, are important disseminators of the infection. Transmission of Hib is by droplets of saliva originating from both clinically ill children and asymptomatic carriers. The infection can also be transmitted by children sharing toys and other objects that they have put into their mouths.

» **Signs and symptoms**

Diseases caused by Hib are many, with a variety of signs and symptoms, ranging from less frequent manifestations of epiglottitis (inflammation of larynx and pharynx), osteomyelitis (inflammation of the bones), septic arthritis (inflammation of the joints), septicemia (presence of Hib in the blood), pericarditis (inflammation of the heart membrane) to most frequent and often fatal meningitis and pneumonia. Hib meningitis causes fever, decreased mental status, neurological disorders (especially hearing impairment) and stiff neck. The mortality rate is 2–5% irrespective of appropriate antimicrobial therapy. Symptoms and signs of Hib pneumonia include fever, shivering, rapid and shallow breathing, cough and chest pain. Epiglottitis causes sore throat and fever; swollen epiglottis can obstruct the airways and, without an effective and prompt treatment, may result in death of the patient.

» **Clinical case definition**

Bacterial meningitis is characterized by the acute onset of fever, headache and stiff neck; pneumonia by high fever, shallow and rapid breathing and cough. Meningitis and pneumonia are not specific for Hib disease alone; laboratory confirmation is essential (culture from cerebrospinal fluid (CSF) or blood).

» **Recommended type of surveillance**

- Routine monthly reporting of aggregate data of confirmed cases.
- Sentinel surveillance sites (designated sites) to be established at all levels where laboratory services are developed.
- Zero reporting from sentinel sites.

» **Monitoring indicators**

- Age-specific incidence rate.
- Percentage of cases in which Hib bacteria was identified from CSF or blood.
- Case fatality rate.
- Cases by immunization status.

Yellow fever

Yellow fever is a viral disease endemic in 33 countries in tropical Africa and 11 countries in South America. The disease continues to be a public health concern causing an estimated 200 000 cases and 30 000 deaths each year. Most of these cases and deaths occur in sub-Saharan Africa, but are underreported due to weak surveillance systems, especially in the area of laboratory diagnosis. The disease is characterized by a high case fatality rate, which in certain epidemics may reach 50% or more. An infection confers lifelong immunity.

» **Transmission**

There are two patterns of transmission of the virus: sylvatic (occurring in forests) and urban or epidemic transmission. Sylvatic transmission begins when the mosquito vector (*Aedes africanus*) feeds on infected non-human primates and then feeds on people working or passing through the forest. The epidemics occur when infected people with live virus in their bloodstream return to urban areas and are fed on by domestic vector mosquitoes (*Aedes aegypti*), which then transmit the virus to other humans, forming the urban cycle. A severe epidemic is most likely to occur if conditions are allowed to increase substantially the density of vector populations (e.g. during the rainy season).

» **Signs and symptoms**

The clinical symptoms of yellow fever range from mild, undifferentiated fever to severe illness, resulting in death from either liver or kidney failure or from the consequences of severe bleeding. The disease is characterized by the sudden onset of fever, chills, headache, back and muscle pain, nausea and vomiting. This may progress to jaundice and haemorrhagic signs or death within three weeks of onset. Clinical diagnosis is difficult because the symptoms are similar to viral hepatitis, malaria, dengue, and other diseases accompanied with jaundice and haemorrhagic syndromes. Laboratory confirmation is therefore essential for differential diagnosis of yellow fever.

» **Case definition**

- Suspected: A case with acute onset of fever followed by jaundice within two weeks of onset of the first symptoms.
- Confirmed: A suspected case that is laboratory-confirmed or epidemiologically linked to a laboratory-confirmed case or outbreak.

» **Recommended type of surveillance**

- Routine monthly reporting of suspected and confirmed cases.
- Zero reporting by the sentinel (designated) reporting sites.
- Immediate reporting of suspected cases from the peripheral to the next levels.
- All suspected cases to be investigated immediately with blood samples taken for the laboratory.
- Case-based surveillance to be applied by countries at high risk of yellow fever.

Mumps

Mumps or *parotitis epidemica* is a viral infection primarily affecting the salivary glands. Although mostly a mild childhood disease, mumps virus may also affect adults, among whom complications such as meningitis and orchitis are relatively common. In most parts of the world, the annual incidence rate of mumps is in the range of 0.1–1%, with epidemic peaks every two to five years. High incidence is found among children five to nine years of age. Natural infection with mumps virus is likely to confer lifelong protection. In hot climates, the disease is endemic throughout the year, whereas in temperate climates incidence peaks in late winter.

All commercially available mumps vaccines are based on live, attenuated strains of the virus. Extensive use of these vaccines in industrialized countries has proved them safe and efficacious. Approximately 120 countries are currently using mumps vaccine in their national immunization programmes. Where sustained vaccination has been achieved, the incidence of mumps has been significantly reduced. In general, adverse reactions to mumps vaccination are rare and mild.

Large-scale mumps vaccination is recommended in countries with an efficient childhood vaccination programme and sufficient resources to maintain high-level vaccination coverage. In such countries, the combination of mumps vaccine with measles or, preferably, measles with rubella vaccines is recommended. Mumps vaccines are available as monovalent, bivalent measles-mumps (MM) and trivalent measles-mumps-rubella (MMR) vaccines.

The control of mumps can be achieved through high routine coverage with an effective mumps-containing vaccine administered at 12–18 months of age. Children immunized with most mumps vaccines at the age of 12 months or older have excellent serological response rates. Low immunization coverage may reduce the number of cases in infants but fails to interrupt circulation of mumps virus in the community. Therefore, programmes should aim at infant coverage of more than 90%. Strategies for achieving mumps elimination should include:

- Achieving high (>90%) coverage with a first dose of mumps-contained vaccine at the age of 12–18 months.
- Ensuring a second opportunity for immunization.
- Conducting catch-up immunization of susceptible cohorts.

Rubella

Rubella occurs worldwide and is normally a mild childhood disease. However, infection during early pregnancy may cause foetal death or congenital rubella syndrome (CRS) with multiple defects to the brain (resulting in mental retardation), heart, eyes and ears. An estimated 100 000 cases occur each year in developing countries alone. Humans are the only known host. Rubella virus is transmitted by the respiratory route. The incubation period ranges from 12–23 days. In pregnant women, the virus infects the placenta and the developing foetus. Diagnosis of rubella requires laboratory confirmation using serological methods (to measure rubella IgM).

The primary purpose of rubella vaccination is to prevent the occurrence of congenital rubella infection including CRS, which is an important cause of deafness, blindness and mental retardation. Rubella vaccination is included in national immunization services in most countries of the world. The vaccines are highly protective and without significant adverse effects.

The currently licensed rubella vaccines in international use are based on the live attenuated virus propagated in human diploid cells and have proven to be safe and efficacious. Rubella vaccines are commercially available in monovalent form, bivalent combination with measles vaccine or mumps vaccine, or as trivalent measles-mumps-rubella vaccine. Large-scale rubella vaccination during the last decade has drastically reduced or practically eliminated rubella and CRS in many developed countries and in some developing countries. For countries wishing to prevent the occurrence of congenital infection two approaches are recommended:

- Elimination of rubella and CRS through universal vaccination of infants, surveillance and assuring immunity in women of child-bearing age.
- Prevention of CRS only, through immunization of adolescent girls and/or women of child-bearing age.

Rotavirus infection

Rotavirus infection has a worldwide distribution and is the most common cause of severe diarrhoea in young children. Almost all children are infected by the age of three to five years. More than 125 million cases of diarrhoea each year are attributed to rotavirus. Rotavirus causes an estimated 25% of all deaths due to diarrhoeal disease, and 6% of all deaths occur in children under five years of age. The disease follows an incubation period of one to two days, and is characterized by acute onset of vomiting, fever and profuse watery diarrhoea.

Although the infection is usually mild, severe disease may rapidly result in life-threatening dehydration if not appropriately treated. The greatest disease burden is in developing countries, where 20–40% of annual hospitalizations are for childhood diarrhoea, and about 600 000 deaths each year are associated with this infection. In developing countries, most cases of severe rotavirus disease occur in infants, whereas in the industrialized world most severe cases occur after the age of one.

The first rotavirus vaccine available, RotaShield, was licensed in the United States in 1998, but withdrawn in 1999 due to an increased risk of intussusception. Currently two rotavirus vaccines are available: the monovalent (RV1) Rotarix and the pentavalent (RV5) RotaTeq vaccines. Both vaccines need to be administered orally. The risk of intussusception is 5–10 times lower than that observed with RotaShield and the benefits of rotavirus vaccinations against severe diarrhoea and death from rotavirus infection outweighs the risk of intussusception. Most African countries are in the process of introducing one of these new rotavirus vaccines.

Pneumococcal infection

Pneumococcal diseases are a major public health problem all over the world. The causative agent, the pneumococcus, has about 90 serological types some of which are frequently associated with pneumococcal disease that includes pneumonia, meningitis and febrile bacteremia as well as otitis media, sinusitis and bronchitis. At least one million children die of pneumococcal disease every year, most of these are young children in developing countries. In the developed world, elderly persons carry the major disease burden.

The currently licensed pneumococcal vaccine is based on the 23 most common serotypes, against which the vaccine has an overall protective efficacy of about 60–70%. Children under two years of age, and persons suffering from various states of immunodeficiency (e.g. HIV infection), do not consistently develop immunity following vaccination, thus reducing the protective value of the vaccine.

The new generation of pneumococcal vaccines, pneumococcal conjugate vaccines (which are protein-polysaccharide combinations) are protective in children under two years of age and may reduce pneumococcal transmission through the herd effect. Currently available pneumococcal conjugate vaccines (PCV) include PCV7, PCV10 and PCV13, with PCV7 being phased-out. Many African countries are in the process of introducing either PCV10 or PCV13.

More information on the epidemiology and burden of pneumococcal disease is urgently required, in particular from developing countries.

Meningococcal meningitis

Meningococcal meningitis is a bacterial form of meningitis, a serious infection of the meninges that affects the brain membrane. It can cause severe brain damage and is fatal in 50% of cases if untreated. Several different bacteria can cause meningitis. *Neisseria meningitidis* is the one with the potential to cause large epidemics. Twelve serogroups of *N. meningitidis* have been identified, six of which (A, B, C, W135, X and Y) can cause epidemics. Geographic distribution and epidemic potential differ according to serogroup.

The bacteria are transmitted from person to person through droplets of respiratory or throat secretions from carriers. Close and prolonged contact – such as kissing, sneezing or coughing on someone, or living in close quarters (such as a dormitory, sharing eating or drinking utensils) with an infected person (a carrier) – facilitates the spread of the disease. The average incubation period is four days, but can range between two and 10 days.

N. meningitidis only infects humans; there is no animal reservoir. The bacteria can be carried in the throat and sometimes, for reasons not fully understood, can overwhelm the body's defences allowing infection to spread through the bloodstream to the brain. Although there remain gaps in our knowledge, it is believed that 10–20% of the population carries *Neisseria meningitidis* in their throat at any given time. However, the carriage rate may be higher in epidemic situations.

The most common symptoms are a stiff neck, high fever, sensitivity to light, confusion, headaches and vomiting. Even when the disease is diagnosed early and adequate treatment is started, 5–10% of patients die, typically within 24–48 hours after the onset of symptoms. Bacterial meningitis may result in brain damage, hearing loss or a learning disability in 10–20% of survivors. A less common but even more severe (often fatal) form of meningococcal disease is meningococcal septicaemia, which is characterized by a haemorrhagic rash and rapid circulatory collapse.

Initial diagnosis of meningococcal meningitis can be made by clinical examination followed by a lumbar puncture showing a purulent spinal fluid. The bacteria can sometimes be seen in microscopic examinations of the spinal fluid. The diagnosis is supported or confirmed by growing the bacteria from specimens of spinal fluid or blood, by agglutination tests or by polymerase chain reaction. The identification of the serogroups and susceptibility testing to antibiotics are important to define control measures.

Meningococcal disease is potentially fatal and should always be viewed as a medical emergency. Admission to a hospital or health centre is necessary, although isolation of the patient is not necessary. Appropriate antibiotic treatment must be started as soon as possible, ideally after the lumbar puncture has been carried out if such a puncture can be performed immediately. If treatment is started prior to the lumbar puncture it may be difficult to grow the bacteria from the spinal fluid and confirm the diagnosis.

A range of antibiotics can treat the infection, including penicillin, ampicillin, chloramphenicol and ceftriaxone. Under epidemic conditions in Africa in areas with limited health infrastructure and resources, oily chloramphenicol or ceftriaxone are the drugs of choice because a single dose has been shown to be effective on meningococcal meningitis.

» **Prevention**

There are three types of vaccines available.

- Polysaccharide vaccines have been available to prevent the disease for over 30 years. Meningococcal polysaccharide vaccines are available in either bivalent (groups A and C), trivalent (groups A, C and W), or tetravalent (groups A, C, Y and W135) forms to control the disease.
- For group B, polysaccharide vaccines cannot be developed, due to antigenic mimicry with polysaccharides in human neurologic tissues. Consequently, vaccines against group B, used in particular in Cuba, New Zealand and Norway, are based on the outer membrane proteins and are strain-specific to control specific epidemics. Additional universal group B protein vaccines are in late stages of development.
- Since 1999, meningococcal conjugate vaccines against group C have been available and widely used. Tetravalent A, C, Y and W135 conjugate vaccines have been licensed since 2005 for use in children and adults in Canada, the United States and Europe.

In December 2010, a new meningococcal A conjugate vaccine was introduced nationwide in Burkina Faso, and in selected regions of Mali and Niger, with a total of 20 million persons 1–29 years of age vaccinated. Subsequently these countries reported, in 2011, the lowest number of confirmed meningitis A cases ever recorded during an epidemic season. Between October and December 2011, another 35 million persons were immunized across Mali and Niger – both countries have completed their nationwide campaigns – and three countries Cameroon, Chad and Nigeria launched their national campaigns. Four countries in the African meningitis belt are preparing for introduction of the vaccine in 2012: Benin, Ghana, Senegal and Sudan; while Cameroon, Chad and Nigeria are pursuing their nationwide campaigns.

The vaccine has several advantages over existing polysaccharide vaccines: it induces a higher and more sustainable immune response against group A meningococcus. It reduces the carriage of the bacteria in the throat and thus its transmission; it is expected to confer long-term protection not only for those who receive the vaccine, but on family members and others who would otherwise have been exposed to meningitis; it is available at a lower price than other meningococcal vaccines; and it is expected to be particularly effective in protecting children under two years of age, who do not respond to conventional polysaccharide vaccines.

It is hoped that all 26 countries in the African meningitis belt will have introduced this vaccine by 2016. High coverage of the target age group of 1–29 years is expected to eliminate meningococcal A epidemics from Africa.

» **Outbreak trends**

Meningococcal meningitis occurs in small clusters throughout the world with seasonal variation and accounts for a variable proportion of epidemic bacterial meningitis. The largest burden of meningococcal disease occurs in an area of sub-Saharan Africa known as the meningitis belt, which stretches from Senegal in the west to Ethiopia in the east. During the dry season between December to June, dust winds, cold nights and upper respiratory tract infections combine to damage the nasopharyngeal mucosa, increasing the risk of meningococcal disease. At the same time, transmission of *N. meningitidis* may be facilitated by overcrowded housing and by large population displacements at the regional level due to pilgrimages and traditional markets. This combination of factors explains the large epidemics which occur during the dry season in the meningitis belt.

» **Global public health response**

With the introduction of the new meningococcal A conjugate vaccine, WHO promotes a strategy comprising epidemic preparedness, prevention and response. Preparedness focuses on surveillance, from case detection to investigation and laboratory confirmation. Prevention consists of vaccinating all 1–29 year-olds in the African meningitis belt with this vaccine. WHO regularly provides technical support at the field level to countries facing epidemics. Epidemic response consists of prompt and appropriate case management with oily chloramphenicol or ceftriaxone and reactive mass vaccination of populations not already protected through vaccination.

Meningitis epidemics in the African meningitis belt constitute an enormous public health burden and WHO is committed to eliminating meningococcal disease as a public health problem.

Human papilloma virus

The human papilloma virus (HPV) is the most common sexually transmitted infection (STI) and is so common that nearly all sexually active men and women get it at some point in their lives. There are many different types of HPV. Some types can cause health problems including genital warts and cancers. But there are vaccines that can stop these health problems from happening.

A person can get HPV by having oral, vaginal or anal sex with someone who has the virus. It is most commonly spread during vaginal or anal sex. HPV can be passed even when an infected person has no signs or symptoms. Anyone who is sexually active can get HPV, even if you have had sex with only one person. You also can develop symptoms years after you have sex with someone who is infected making it hard to know when you first became infected.

In most cases, HPV goes away on its own and does not cause any health problems. But when HPV does not go away, it can cause health problems like genital warts and cancer. Genital warts usually appear as a small bump or group of bumps in the genital area. They can be small or large, raised or flat, or shaped like a cauliflower. A health-care provider can usually diagnose warts by looking at the genital area.

HPV can cause cervical and other cancers including cancer of the vulva, vagina, penis or anus. It can also cause cancer in the back of the throat, including the base of the tongue and tonsils (called oropharyngeal cancer). Cancer often takes years, even decades, to develop after a person gets infected with HPV. The types of HPV that can cause genital warts are not the same as the types of HPV that can cause cancers. There is no way to know which people who have HPV will develop cancer or other health problems. People with weak immune systems (including individuals with HIV/AIDS) may be less able to fight off HPV and more likely to develop health problems from it.

Although most women infected with genital HPV will not have complications from the virus, worldwide there are an estimated 529 000 new cases of cervical cancer and 275 000 deaths per year. About 85% of cancers and 80% of deaths from cervical cancer occur in developing countries. In the United States, most of the approximately 11 000 cervical cancers found annually occur in women who have never had a Pap smear, or not had one in the previous five years. HPV is also the cause of cervical intraepithelial neoplasia (CIN). CIN is a precursor to cervical cancer, and is painful and costly to treat. It is not known how many women worldwide are diagnosed with CIN.

The human papilloma virus (HPV) vaccine prevents infection with certain genotypes of human papillomavirus associated with the development of cervical cancer, genital warts and some less common cancers. Two HPV vaccines are currently on the market: Gardasil and Cervarix. Both vaccines protect against the two HPV

types (HPV-16 and HPV-18) that cause 70% of cervical cancers, 80% of anal cancers, 60% of vaginal cancers and 40% of vulvar cancers. These HPV types also cause most HPV induced oral cancers, and some other rare genital cancers. Gardasil also protects against the two HPV types (HPV-6 and HPV-11) that cause 90% of genital warts.

Both vaccines have been shown to prevent potentially precancerous lesions of the cervix. Gardasil has been shown to prevent potential precursors to anal, vulvar, vaginal and penile cancers. HPV vaccines are expected to protect against HPV induced cancers of these areas as well as HPV induced oral cancers.

WHO recommends vaccination of adolescent girls (9–13 year old) against HPV to prevent cervical cancer, and to reduce the number of treatments for cervical cancer precursors.

Since the vaccine only covers some high-risk types of HPV, experts still recommend that women get regular Pap smear screening even after vaccination.

HPV vaccination is approved for use in males in many areas. In addition to protecting their partners from cervical cancer, vaccination can protect males against anal cancer, and may prevent other HPV associated cancers. Gardasil can also protect males against genital warts. HPV vaccination has been recommended for males in the United States, where vaccine uptake among women has been low. Vaccination is also recommended in populations at higher risk for HPV associated cancers, such as men who have sex with men and those with compromised immune response.

Disease surveillance

Epidemiological surveillance (refer also to the IDSR pre-service training guide) collects data for describing and analysing health events focusing on diseases and outbreaks; it provides information for early detection of emergency outbreaks, thus facilitating preparedness for response. There are two interrelated types of disease surveillance: passive or routine surveillance and active surveillance. The passive surveillance includes the following actions:

- Notification of health events (diseases cases or outbreaks) by the health worker.
- Collection and consolidation of pertinent data.
- Routine analysis and preparation of reports.
- Feedback of information to persons providing data.
- Forwarding data to the next, more central level.

The health team or health worker carry out the “active surveillance” through regular visits to health facilities to look for cases of target diseases (e.g. neonatal tetanus or AFP cases) that have not been recognized or reported by these facilities. During these visits, hospital inpatient and outpatient registers are checked and clinical staff interviewed to determine whether any cases have been identified or suspected since the previous visit. The active surveillance may also include house-to-house visits to trace cases that were not referred to health services. Data collected during passive and active surveillance should complement each other and, if a new case is confirmed or suspected, this should lead to case or outbreak investigation and response.

Communities play an important role in the surveillance system. Community surveillance includes a number of communication activities directed towards sensitization of community members about target diseases. To have an effective community surveillance, community education messages should be developed about recognizing the illness, how to prevent transmission and when and where to refer cases or seek treatment. It is also important to select and train community volunteers who will assist in recognizing cases and report them to health facilities.

Integrated disease surveillance and response

Currently, many intervention programmes have their own disease surveillance system. Each programme has made efforts through the years to improve its ability to collect programme-specific data for action. In many instances, however, these systems involve similar functions, especially at district and health facility levels. They often use the same structures, personnel, transport and other resources.

To increase cost efficiency and save human and material resources towards prevention and control of communicable diseases in the African Region, an integrated disease surveillance (IDS) approach is recommended. The objectives and aims of IDSR for EPI are to:

- Strengthen the capacity of health systems to improve effectiveness of the surveillance system: case finding, disease recording and reporting, case and outbreak investigations, laboratory confirmation of diagnosis, organization and direction of response measures for containment of the epidemics, etc.
- Integrate multiple surveillance systems so that activities, personnel, logistics, forms and other resources can be used more efficiently. For example, surveillance activities for AFP can address surveillance needs of neonatal tetanus, measles and other diseases. Thus, health staff that routinely monitor AFP cases can also review clinic records for information about other priority diseases.
- Improve the flow of information between levels of the health system and between various programmes. In the IDSR system, information flows to more people and decision-makers, so they can observe common trends and identify actions that can benefit more than one individual programme. For example, based on the EPI target diseases surveillance reports received by the DHMT, a joint supervision visit can be suggested to review EPI surveillance and disease reporting procedures for other diseases.
- Improve laboratory capacity in identification of various pathogens within and outside EPI.
- Enhance community participation in general surveillance activities, which will also benefit polio or NT surveillance.
- Contribute to epidemic preparedness, including forecasting, planning and stocking emergency vaccine supplies, oral rehydration solutions, antibiotics etc. for epidemic-prone diseases, including measles, polio and others.

Based on the above advantages, the WHO Regional Office for Africa identified 19 diseases prevalent in the Region to be considered for the IDSR approach. These diseases are categorized into three groups that include most of the EPI target diseases:

- **Epidemic-prone diseases:** Cholera, diarrhoea with blood (shigella), measles, meningitis, plague, viral haemorrhagic fevers, yellow fever.
- **Diseases targeted for eradication/elimination:** Poliomyelitis, neonatal tetanus, measles, dracunculiasis, leprosy.
- **Other diseases of public health importance:** Diarrhoea in children under five, pneumonia in children under five, new AIDS cases, malaria, onchocerciasis, STIs, trypanosomiasis, tuberculosis.

Each country is encouraged to prioritize the diseases depending on their communicable diseases profile; focusing on the main priorities to ensure their system cope.

In EPI, the IDSR approach will be implemented at three operational levels of the health system:

» **Central level**

The following activities should be considered:

- Integration of EPI disease surveillance into the IDSR system, the latter being part of health management information systems (HMIS).
- Supply of updated forms for reporting on immunizations performed (which should include new vaccines) and on target diseases seen by public and private clinics/hospitals, health clinics.
- Training of health staff on IDSR principles and importance of integration of disease-specific surveillance requirements into the IDSR system: polio, NT, measles, which are targeted for eradication/elimination and have specific surveillance requirements to be met by health authorities.
- Dissemination of technical information on disease surveillance to field workers:
 - Case definition of target diseases.
 - Case finding methods.
 - Case/outbreak investigation techniques: clinical and epidemiological observations, laboratory support including specimen-collection techniques, community surveillance.
 - Disease reporting requirements and schedules: from the field to central level and from the central level to WHO.
 - Identification of high-risk areas.
 - Planning and conducting outbreak response.
- Ensure case and outbreak investigation of target diseases including laboratory confirmation of cases where applicable.
- Give guidance to DHMT staff to define their catchment areas and target populations.
- Publish EPI newsletter (or integrate it within MOH family health newsletter) to give feedback to the field staff on achievements of the programme and constraints.

» **DHMT level**

- Define DHMT catchment area and calculate the number of target populations to use as a denominator for estimating immunization coverage rates and other programme needs. This exercise is also useful for other target-oriented programmes (health-care coverage, water and sanitation coverage etc.).
- Monitor completeness and timeliness of target disease reporting using three indicators: reporting completeness, timeliness and zero reporting.
- Train health staff on IDSR principles.
- Conduct regular supervision of immunization and disease reporting procedures by health centres and private clinics and hospitals.
- Disseminate technical information on disease surveillance to field workers, emphasizing aspects indicated above.
- Conduct case and outbreak investigation of target diseases, including collection of specimens for laboratory confirmation, where applicable.
- Provide information and articles on success stories to publish in the epidemiological newsletter.
- Give feedback to field staff on achievements of the programme by health centres.

» **Health clinic level**

- Define health centre catchment areas and calculate the number of target populations to use as a denominator for estimating immunization coverage rates and other needs.
- Send regular and timely reports to DHMT.
- Conduct regular self-audit of immunization and disease reporting procedures to see if they conform with MOH requirements.

- Refer to technical information on disease surveillance supplied by central or DHMT levels.
- Assist in case and outbreak investigation of target diseases, including collection of specimens for laboratory confirmation, where applicable.
- Encourage communities to exercise community surveillance for target diseases case finding and follow-up activities.
- Give feedback to the community on achievements of the programme.

Appendix 5: Vaccinology and the Expanded Programme on Immunization vaccines

Immunity: A general overview

Immunity is the ability of the body to resist microorganisms, in particular, the harmful causative agents of infectious diseases.

Natural history of diseases

The onset of a disease is marked by the entry and multiplication of infectious agents in the body. Until typical signs and symptoms of the disease appear, patients remain in a sub-clinical state. The interval between exposure to an infectious agent and onset of clinical symptoms is called the incubation period, which varies for different diseases (from a few hours to three weeks and more, and for some diseases, e.g. leprosy, HIV infection, the incubation period may last several months or even longer). Infectious disease may result in complete recovery or, if severe, may result in disability (e.g. paralysis in polio or blindness in measles) and even death. Measles, Hib infection and neonatal tetanus are recognized as “childhood killers”. Other EPI target diseases may also be fatal for an unvaccinated child.

Causative agents

Infectious diseases are caused by microorganisms that get into the body through inhalation (tuberculosis, diphtheria, measles, whooping cough), ingestion (polio) or by direct contact through the skin or open wounds (tetanus, hepatitis B). These microorganisms grow and multiply in the blood or body tissues and cause illness. Many microorganisms can cause disease: bacteria (whooping cough, TB, Hib infection) and viruses (polio, measles, hepatitis B, yellow fever). Some bacteria produce very dangerous poisons – toxins – that cause tetanus, diphtheria and some other illnesses.

Microorganisms are very specific and are responsible for a particular disease. Moreover, some of them have their own sub-types, which can only be identified by laboratory tests. For example, polio virus has three such sub-types: 1, 2 and 3, all of which can cause poliomyelitis; the virus of infectious hepatitis also has various sub-types, one of them causing hepatitis B, a target disease for EPI; *Haemophilus influenzae* bacteria has six types with type b being the most aggressive for young children.

Types of immunity

There are various types of immunity depending on the ways the human body develops it. Our bodies have two lines of defence that protect us from pathogens: non-specific (or innate) immunity, which is the first-line protection against a vast number of harmful pathogens, and specific (or adaptive) immunity, which is developed specifically in response to the particular pathogen or antigen (e.g. vaccine) that has entered the body. The substance (microorganism or vaccines) that is recognized by the body as “non-self” and is able to

trigger a specific immune response is referred to as an antigen. The response to the antigen is ensured by mechanisms based on specialized white blood cells called lymphocytes. There are two types: T-lymphocytes and B-lymphocytes, both participate in the production of protective substances called antibodies for destruction of invaded pathogens.

The human body may acquire immunity naturally, as a consequence of infection or artificially through immunization.

Natural immunity

When the microorganisms invade the body, white blood cells in the blood or in the liver identify and interact with the organism or their toxin, referred to earlier as antigen. As a result of this interaction, lymphocytes produce special protective substances – antibodies (or antitoxin in case of diphtheria or tetanus). When antibodies are produced in sufficient quantities, the infected person recovers and the body's lymphocytes keep the memory of the organism for life. Next time the organism attacks, the antibodies produced earlier will attack them and protect the person from contracting the disease. He or she will not get ill again due to acquired natural immunity. For example, if a child has had measles before and recovered, antibodies in his/her body will protect the child from getting the disease a second time.

Acquired immunity

This is the type of immunity obtained through vaccination (active immunity) or immunoglobulin administration (passive immunity). A vaccine may be made up of an organism or a toxin. The organism may be either killed/inactivated or live/attenuated. A toxin used as a vaccine is inactivated (in which case it is called toxoid). This means that vaccine, even if obtained from the microorganism or toxin, has lost its harmfulness. A vaccine may also be made from sub-units of an organism. Hence, there are live vaccines (polio, BCG, measles), killed vaccines (pertussis vaccine), toxoids (tetanus or diphtheria toxoids) and sub-unit vaccines (hepatitis B).

“Borrowed” antibodies (passive immunity) can protect a person temporarily. A newborn child's blood contains protective antibodies against measles made by the mother (only if she has contracted the disease earlier in her life), which passes through the placenta and breast milk so that the newborn is protected during the first months of life. The passive immunity can also be produced artificially by administering immunoglobulins that contain specific antibodies against diseases.

Herd immunity

Herd immunity describes a type of immunity that occurs when the vaccination of a high proportion (usually around 80% or above) of the population (or herd) provides protection to un-vaccinated individuals. Herd immunity works by reducing the rate of contact of susceptible with infectious individuals.

Immunization and types of vaccines

After a vaccine has been administered, active immunity usually takes a few weeks to develop. Some vaccines need to be given in several injections, usually in one-month intervals, to develop a protective level of immunity (e.g. DPT needs three injections four weeks apart), others, like yellow fever vaccine can protect a child even with a single shot. Some immunization programmes also provide a so-called “booster” dose to expand protection of the child beyond infancy. The vaccines, in contrast to immunoglobulins, give long-lasting immunity.

Vaccination is generally safe. Serious vaccine reactions or side-effects are very rare, much rarer than the complications caused by the diseases they prevent. Some post-vaccination complications, called adverse event following immunization (AEFI), may be related to the vaccines themselves or to hypersensitivity of the child to some vaccine components. However, the major share of AEFI episodes is due to human errors as a consequence of poor training or negligence of the health worker of norms and standards attached to vaccination process.

Vaccines are very fragile; they should be stored in a special way, in special equipment – refrigerators, freezers or cold rooms. The movement of vaccines from the manufacturer to the eligible child or woman should be done with special care and in cold conditions that we call “the cold chain”.

Vaccination is only of benefit if it provides a significant degree of protection against a disease to the majority of those vaccinated with minimum side-effects. The ideal vaccine should have the following characteristics:

- Immunogenic, provoking a good immune response.
- Providing long-lasting immunity.
- Safe, with no or very rare AEFIs.
- Stable in field conditions and can be stored reasonably long without or with minimum cold chain requirements.
- Combined with several antigens producing immunity against a number of diseases.
- Administered with a single dose, preferably by non-injectable routes (oral or through inhalation).
- With affordable cost and accessible to all.

Most of the vaccines in use today fall into one of three categories: live-attenuated, killed and sub-unit vaccines.

Live-attenuated vaccines

These are produced from original virulent strains of virus or bacteria that have been weakened, so that they cannot cause disease, but are able to provoke an immune response. This group includes viral vaccines (e.g. oral polio vaccine, vaccines against measles, mumps, rubella, yellow fever) and bacterial vaccines (e.g. BCG, vaccines against cholera, tularemia, etc.). Live vaccines (especially viral vaccines) produce a good and long-lasting immune response, although they can lose their potency in the absence of or in poorly maintained cold chain. There is also a theoretical risk that the pathogen used in a live vaccine may retain some pathogenicity or even revert to a virulent form and thus cause disease.

Killed vaccines

Killed vaccines contain microorganisms that have been treated (killed) by heat or chemicals, so they are no longer harmful but maintain their immunogenicity. Examples are some viral vaccines: hepatitis A or inactivated polio injectable vaccine, or killed bacterial vaccines, such as against pertussis, a component of DPT combined vaccine, or killed cholera vaccine. While there is no danger of reversal of the vaccine strain in killed vaccines, they do not, in general, induce strong and long-lasting immunity. Several doses may therefore be required to build up adequate long-term immunity (pertussis vaccine develops it after only three primary shots placed four weeks apart).

Sub-unit vaccines

These vaccines include toxoids (inactivated toxins): examples are tetanus toxoid used to immunize women in reproductive age, including pregnant women to prevent newborns from neonatal tetanus, and tetanus in injured persons. This toxoid is also a component of DPT vaccine widely used in childhood immunization.

This group is large and also includes vaccines developed by modern technology: acellular vaccines containing antigens purified from wild pathogens (acellular pertussis vaccine); genetically engineered vaccines (hepatitis B vaccine); conjugate polysaccharide vaccines, which are linked with suitable carrier proteins (*Haemophilus influenzae* type b vaccine – Hib, currently being introduced in EPI by many African countries; pneumococcal vaccine).

Vaccines can be a single preparation called monovaccine (such as measles vaccine) or contain several antigens – combined or polyvalent vaccines. DPT is a classical example of combined vaccine used for decades in immunization to protect infants and young children from diphtheria, pertussis and tetanus. It is now increasingly replaced by quadruple or pentavaccine in national immunization programmes that represent DPT and hepatitis B and/or Hib components. The human body has a marvellous capacity to develop immune response simultaneously against 10–12 antigens. This has given a green light for a simultaneous administration of several vaccines when a child is brought to the vaccination clinic.

Vaccine development and research

Vaccine development and research proceeds through discovery of the candidate vaccine, better knowledge of the functioning of the antigens with new adjuvants able to reinforce immune response with fewer side-effects, process engineering to improve its potency, toxicological tests and animal studies. These are followed by human studies focusing on safety and stimulation of immune response and large-scale epidemiological studies to establish its efficacy (whether a vaccine actually prevents diseases as intended). Future vaccines will certainly be DNA vaccines or vaccines with viral/bacterial vectors able to induce humoral and cellular reaction.

In low-income countries, however, vaccines against prevalent diseases such as pneumonia, diarrhoea, malaria, and HIV/AIDS are not being developed rapidly enough. This is partially due to technical reasons, as the candidate vaccines against these conditions are not immunogenic enough for large-scale introduction. Therefore, more research is needed to improve potency of these vaccines before they can be included in national immunization programmes for routine use.

To stimulate vaccine research and development and to improve access of children to available and new vaccines, public and private organizations (WHO, UNICEF and others) established the Global Alliance for Vaccines and Immunization (GAVI) in 1999. GAVI and partners aim to strengthen systems for sustainable, effective and safe universal immunization including use of new and under-utilized vaccines (*Haemophilus influenzae* type b, hepatitis B and yellow fever vaccines, rotavirus, HPV, PCV, meningococcal vaccines etc).

A number of other new vaccines with major potential for controlling infectious diseases are at advanced stages of development. Among the illnesses targeted by GIVS and GVAP are rotavirus diarrhoea, pneumococcal disease and cervical cancer. Most of these are in developing countries and have a high number of annual deaths. Continuing and intensive efforts are also under way to develop effective vaccines against HIV/AIDS, malaria, dengue, leishmaniasis and shigella dysentery, among others. It is expected that all of these vaccines will be available for wide use by 2020.

Vaccines used in national immunization programmes

Since the inception of the EPI, each vaccine has been selected based on safety, effectiveness, reasonable price and the ability to combat childhood disease of significant public health importance. The six vaccine-preventable diseases originally targeted in 1974 were tuberculosis, poliomyelitis, diphtheria, pertussis, tetanus and measles. Later this was expanded to include some new and under-utilized vaccines: hepatitis B and yellow fever (for endemic countries) was added during 1990s; and most recently, PCV, rotavirus, HPV, meningococcal vaccines, were introduced in 2010. Table 3.2 summarizes the general characteristics of these vaccines.

TABLE 3.2
VACCINES USED IN NATIONAL IMMUNIZATION PROGRAMMES

VACCINES (number of main series dosage)	TYPE OF VACCINES	FORM	EFFICIENCY OF VACCINE	DURATION OF IMMUNITY (after main series)	OBSERVATIONS
BCG (1)	Attenuated Mycobacterium bovis	Lyophilized Reconstituted before use	75–86%	Unknown Immunity disappears over time	Against TB meningitis and miliary TB
Diphtheria (3)	Toxoid	Liquid	>87%	Around 5 years	Against all forms of diphtheria
Tetanus toxoid (3)	Toxoid	Liquid	>95%	5 years	Against neonatal and tetanus among adults
Pertussis (3)	Bacteria with whole cell killed	Liquid	80%	Unknown Immunity disappears over time	Efficiency greater with serious diseases
Polio (3) – OPV	Attenuated living virus, of 3 types: 1, 2, 3	Liquid	72–98%	Lifelong	No cross-protection among vaccines types
Polio (3) – IPV	Inactivated poliovirus	Liquid			
Measles (2)	Live attenuated virus	Lyophilized Reconstituted before use	>85% at 9 months	Lifelong	Duration is longer when boasted with wild virus. Also presented with rubella (MR) and mumps (MMR)
Rubella (1)	Live attenuated virus	Lyophilized Reconstituted before use		Lifelong	Also presented with measles (MR) and mumps (MMR).
Hepatitis B (3)	Surface antigen HB virus	Liquid	75–95%	>15 years	Efficiency against chronic infection
Hib (3)	Polysaccharide linked to protein	Liquid	>95%	At least 3 years	
Yellow fever (1)	Use live attenuated virus	Lyophilized Reconstituted before use	90–98%	Several decades, may be lifetime	
Meningococcus meningitides (1)	Use live attenuated virus	Lyophilized		Unknown	Protect birth cohorts
Rotavirus (2 and 3)	Use live attenuated virus	Liquid		Unknown	Prevent diarrhoea One vaccine requires 2 doses; one vaccine requires 3 doses
Pneumococcal vaccine (3)	Conjugated	Liquid		Unknown	Prevents pneumococcal pneumonia
HPV (2 or 3)	Subunit vaccine	Liquid		Unknown	Adolescent – cervical cancer, genital warts (quadrivalent): 2 doses if girl aged <15 years; 3 doses if girl >15 years.

Source: Adapted from WHO/V&B/02.28, Core Information for the Development of Immunization Policy, 2012 update.

Appendix 6: Immunization service delivery and vaccine administration

Delivery of immunization services

- All health facilities in countries shall provide immunization services as part of their routine family health activities at the first available opportunity to infants and women coming to the facility to seek services for whatever reason.
- Hospitals, health centres/clinics/dispensaries shall organize immunization sessions daily or on specific days during the week agreed upon with the local community.
- Outreach services shall be organized preferably monthly for widely dispersed populations falling within the catchment area of fixed health facilities.
- Mobile clinics, expensive to maintain, shall be used selectively to reach remote communities or during mass campaigns.
- School immunization services.

The MOH in many countries have adopted the WHO policy guidelines to deliver immunization services to children and women at specific ages to suit the local needs. According to this policy, the priority is for all children to receive all doses of protective vaccines included in the EPI before their first birthday. Some countries, however, continue vaccinations through school health programme.

A “fully immunized child” is one who has received all antigens as indicated in the national immunization schedule with respect to recommended doses.

Vaccination services are integrated with other aspects of family and child health: growth monitoring, vitamin A and other micronutrient supplementation, family planning, antenatal care, breastfeeding and health education and counselling.

Target population groups for vaccination

Target groups for immunization include:

- For primary series of vaccinations: children under two years of age.
- Women of child-bearing age (15–45 years) with emphasis on pregnant women.
- Adolescents and the elderly.

Routine immunization and the national immunization schedule

Every child should have one dose of BCG, four doses of OPV, three doses of DPT-containing vaccine and three doses of HepB vaccine, one dose of IPV and measles vaccine before his/her first birthday. These doses are given on schedule, irrespective of any supplementary immunization activities or mopping-up activities. Missed doses of any of these vaccines should be given at the next contact with a minimum interval of four weeks between doses.

BCG, HepB and OPV0 should be given at birth or at first contact with the child. However, if the first contact is after 14 days, OPV0 should not be given.

The first doses of diphtheria, pertussis and tetanus (DPT1), HepB1, Hib1 and OPV1 should be given at the age of six weeks, with an interval between the first and second, second and third doses of at least four weeks. Measles vaccine should be given at nine months or as soon as possible thereafter.

It is important for a child to receive immunization before exposure to diseases, but after sufficient loss of its mother's antibodies, as these influence the effectiveness of the vaccines. Immunization at an early age has been shown to be effective. However, children younger than the recommended age should not be vaccinated unless in exceptional circumstances suggested by national authorities.

Children vaccinated at ages younger or with shorter intervals between doses than those shown in Table 3.3 may not maintain protection against diseases. These doses are known as “non-valid”.

TABLE 3.3
VACCINATION SCHEDULE RECOMMENDED BY EPI

VACCINE	AGE						
	Newborn	6 weeks	10 weeks	14 weeks	9 months	18 months	10–13 years
BCG	X						
OPV	X	X	X	X			
IPV*		X	X	X			
DPT		X	X	X			
Hepatitis B ^a	X	X	X	X			
Haemophilus influenzae <i>type b</i>		X	X	X			
Yellow fever					X ^b		
Measles					X ^c	X	
Rubella					X		
PCV		X	X	X			
Rotavirus		X	X	(X)**			
Meningococcal							X
HPV							XX

Since perinatal or early postnatal transmission is an important cause of chronic infections, globally, all infants should receive their first dose of hepatitis B vaccine as soon as possible (<24 hours) after birth even in low-endemicity countries.

* A booster dose after 6 months is needed if the primary series start before 2 months of age.

** For the three-dose vaccine, a third dose will be required at 14 weeks.

a Option A is recommended for countries where perinatal transmission of hepatitis B virus is frequent (e.g. South Asian countries). Option B is applied by countries with less frequent perinatal transmission (e.g. sub-Saharan Africa).

b In countries at risk for yellow fever.

c A second opportunity to receive a dose of measles vaccine should be given to all infants within the routine immunization schedule or during the vaccination campaigns/routine immunization.

Vaccine administration

- DPT, DT, TT, PCV, meningococcal, HPV and HepB vaccines should be injected intramuscularly. The preferred site for intramuscular injection in infants and young children is the antero-lateral aspect of the thigh since it provides the largest muscular mass. In older children and women of child-bearing age, the deltoid is recommended for administration. The buttock should not be used routinely as an immunization site for infants, children or adults because of the risk of injury to the sciatic nerve.
- OPV and rotavirus are oral vaccines and are administered by mouth.
- IPV is given intramuscular.
- Measles vaccine is administered subcutaneously in the left upper arm.
- BCG (vaccine against severe forms of infant tuberculosis) is administered intradermally on the outer aspect of the left forearm or deltoid muscles.

Diluents and reconstitution of vaccines

The diluents supplied with some vaccines are specific for each vaccine, since they contain certain chemicals, which enhance, stabilize or protect reconstituted vaccine from contamination due to their bactericidal effect. Diluents must be stored, distributed and used correctly. Incorrect handling of diluents may cause AEFI, including death.

The diluents should be included in stock control to ensure their adequate supplies and distribution. Diluents should be shipped, stored and distributed together with the vaccine vials they will be used to reconstitute. They do **not**, however, need to be stored in a freezer, and must **not** be frozen. To avoid thermal shock to the vaccine, diluents must be cooled to below +8°C before reconstitution by keeping them in the fridge. Thermal shock can occur if the diluent is warm.

Health workers should always check that the vaccines have been supplied with the **correct diluent** and report to a supervisor in case of an error. Only the diluent that is indicated for each type of vaccine should be used. Distilled water for clinical injections **should not be used** as a vaccine diluent.

The vaccinator should ensure that the volume of the diluent is correct so that proper number of doses per vial is obtained.

For each vial of vaccine to be reconstituted, the process requires a sterile syringe and sterile needle to mix the powder in the vaccine vial or in the ampoule with the diluent. Reconstituted vaccine should be kept on icepacks to preserve its potency.

Reconstituted vaccines may become contaminated with staphylococcus and other organisms from improper handling. Once this happens, a chemical called a toxin is produced that may be deadly if injected. It can cause “toxic shock syndrome” in a vaccinated person. To avoid this, reconstituted BCG, measles (and yellow fever) vaccines must be kept cooled and must be discarded six hours after reconstitution. Also, multiple dose liquid vaccines without preservative should be discarded six hours after opening (e.g. 2-dose PCV).

Cold chain and logistics

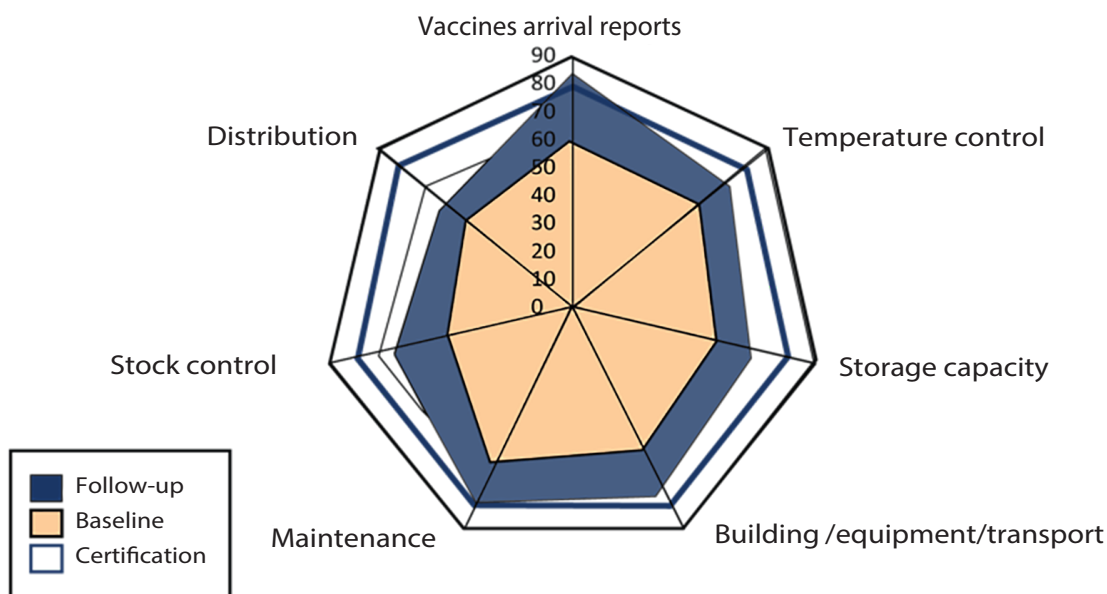
The cold chain is a system of people and equipment ensuring that potent vaccines get from vaccine manufacturer to target population to be immunized. The elements for an effective cold chain include:

- Health worker trained in cold chain maintenance and vaccine handling.
- Adequate functional equipment: cold room, refrigerators, freezers, vaccine carriers and cold boxes, temperature monitors, refrigerator repair tools etc.
- Vaccine supply and transport.

EPI needs a well-established system of logistics to administer high quality and safe vaccines to women and children. This should include needles, syringes, and sharps disposal boxes. Too often unsafe injections occur simply due to shortages of injection equipment.

FIGURE 3.11

TYPICAL ASSESSMENT OF EFFECTIVE VACCINE SUPPLY MANAGEMENT (EVM)



Procurement and storage of vaccines and equipment

Procurement of the vaccines, cold chain and injection equipment and sharps disposal boxes is centralized in the MOH, in consultation with UNICEF and WHO offices in the country. Only WHO- and UNICEF-approved vaccines and materials specified in the WHO publication *Product information sheets* should be procured for EPI. This will ensure the uniformity of the equipment and high quality of imported vaccines. Before getting WHO or UNICEF approval, they will be subjected to meticulous laboratory tests for quality control. The same applies to refrigerators, freezers, cold boxes and vaccine carriers.

At any stage of the cold chain, vaccines are transported at +2 to +8°C using specialized refrigerated vehicles, cold boxes and vaccine carriers and stored at central and district stores and health clinics at required temperatures. These temperatures are monitored daily by temperature monitoring devices to ensure that they are not subjected to heat or freezing.

WHO no longer recommends that BCG (or yellow fever) be shipped and stored at -20°C storing it at -20°C is not harmful but it is unnecessary and uses up valuable storage space in the deep freeze or deep-freeze section of the refrigerator. Instead, it should be kept in refrigeration and transported at +2 to +8°C. OPV and measles vaccines need to be deep frozen at -20°C at central and district levels. At health clinic levels, they may be stored at +2 to +8°C.

Interval between doses of same vaccine

DPT, OPV, TT, Hepatitis B vaccines require administration of more than one dose for development of an adequate antibody response. For these vaccines, the interval between doses must at least be four weeks.

Giving doses of a vaccine at less than the recommended four weeks may lessen the antibody response. As previously mentioned, these doses are considered **non-valid**.

If a vaccine dose is given at less than the recommended four-week interval, it should not be counted as part of the primary series and should be repeated at the appropriate time (after four weeks or thereafter).

A longer than recommended interval between doses does not reduce final antibody response although it extends the time when the child is at risk of contracting the disease. When a child is behind schedule, try to start the doses as soon as possible. If a dose of DPT, HepB or OPV is missed, vaccination on the next occasion should be continued as if the usual interval had elapsed, and no extra dose is needed.

Therefore, interrupted immunizations need not be restarted, but the remaining dose or doses should be given as if the prolonged interval had not occurred.

For all practical purposes, there is no maximum interval between doses of the same vaccine.

Simultaneous administration of vaccines and vitamin A

All EPI vaccines are safe and effective when administered simultaneously, that is, during the same vaccination session but at different sites.

Multiple vaccinations, for instance BCG, OPV1, DPT1 and HepB1, should be given at the same time if the child is eligible. This reduces the number of contacts required to complete the immunization schedule.

Mixing different vaccines in one syringe before injection or using a fluid vaccine for reconstitution of a freeze-dried vaccine is not recommended.

For routine immunizations, two viral vaccines can be given simultaneously, but if not, should be separated by at least four weeks to avoid interference (scheduled doses of live viral vaccines can be given even within four weeks of a mass campaign).

EPI provides an excellent opportunity for vitamin A supplementation to child immunization. A supplementary dose of vitamin A may be administered to children together with measles vaccine during routine immunizations, when the programme is sufficiently matured and stabilized, and during mass immunization campaigns.

Contraindications to immunization

EPI recommends that health workers should use every opportunity to vaccinate eligible children and avoid false contraindications. Based on numerous studies on this issue, the WHO confirms that there are few absolute or true contraindications to EPI vaccines.

The risk of delaying an immunization because of a mild illness is that the child may not return again and the opportunity is lost. The missed immunization opportunities because of false contraindications are the major cause of delay in completing the schedule, or of non-immunization at all.

All children between 9–59 months should be given measles vaccine, preferably on admission to the hospital (if the child has no proof of previous measles vaccination) because of the risk of nosocomial measles transmission. Those children having serious illness should be vaccinated as soon as their general condition improves and at least before discharge from hospital. Premature babies should be vaccinated on discharge. Vaccines should be given to all eligible children attending outpatient clinics.

In cases of immune deficiency diseases or individuals who are immuno-suppressed due to malignancy, they should generally not get live vaccines. However, all antigens except BCG and yellow fever should be given to children with symptomatic HIV and AIDS.

A severe adverse event following a dose of vaccine (anaphylaxis, collapse or shock, encephalitis or encephalopathy, or non-febrile convulsions) is true contraindication to immunization. Subsequent doses of that vaccine should not be given to a child who suffered such adverse reaction to the previous dose. The mother and the health worker can easily recognize such events.

False contraindications

It is particularly important to immunize children suffering from malnutrition. Low-grade fever, mild respiratory infection and other minor illnesses should not be considered as contraindication to immunization. Diarrhoea should not be considered a contraindication for any vaccination, including OPV and rotavirus vaccine.

Conditions that are not contraindications to immunization:

- Minor illnesses such as upper respiratory or diarrhoea with fever <38.5°C.
- Asthma, allergy (except in the case of egg allergy and yellow fever vaccine).
- Malnutrition.
- Child being breastfed.
- Treatment with antibiotics, low dose corticosteroids.
- Dermatoses, eczema or localized skin infection.
- Chronic diseases of the heart, lung, kidney and liver.
- Stable neurological conditions, such as cerebral palsy and Down's syndrome.
- History of jaundice after birth.

Some rare contraindications:

- Live vaccines should not be given to individuals who are immuno-suppressed due to malignant disease, having therapy with immuno-suppressive agent or irradiation. All vaccines should be given to people with HIV infection however.
- Children with symptomatic HIV infection should not be vaccinated with BCG, but should receive all other vaccines.
- The same vaccine should not be administered to an individual who had a severe adverse event following a dose of vaccine, i.e. anaphylaxis, collapse or shock, encephalitis/encephalopathy or non-febrile convulsions when receiving a previous dose.
- Vaccines containing the whole cell pertussis component should not be given to children with an evolving neurological disease: uncontrolled epilepsy, progressive encephalopathy. DT vaccine should be given instead.

- Persons with a history of generalized urticaria, difficulty in breathing, swelling of the mouth and throat, shock following egg ingestion should not receive vaccines prepared on hens' egg tissues, i.e. yellow fever and influenza vaccines.



Mothers and other caregivers should be encouraged to keep their children's vaccination cards beyond childhood, for future reference.

HIV infection and immunization

- If a sterile syringe and needle are used for each injection, there is no risk of transmitting HIV or any other blood-borne infection through immunization.
- Individuals with known or suspected asymptomatic HIV infection should receive all EPI vaccines as early in life as possible, according to the immunization schedule.
- Because of the risk of early and severe measles infection, these infants should receive a dose of measles vaccine at six months of age; this dose is not counted as part of the routine. The child should subsequently receive the standard first dose at nine months and a second dose at 18 months of age.
- Individuals with symptomatic HIV infection (e.g. AIDS) can receive all EPI vaccines except BCG (measles, rubella and yellow fever).

Policy on opened vials of vaccines to be used in subsequent immunization sessions

EPI programmes in countries adopted the new WHO policy on opened vaccine vials, which declares that:

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

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

This policy on the use of opened multi-dose vials of vaccines applies to vaccine vials for use in both static and outreach vaccination sessions, in different sites, over several days, provided that the standard handling procedures are followed. The revised policy does not change the normal procedures for handling vaccines such as BCG and measles (and other freeze-dried or lyophilized vaccines) that must be reconstituted. Once reconstituted, vials of these vaccines must be discarded at the end of each immunization session or at the end of six hours, whichever comes first.



NEVER RETURN OPENED VIALS OF MEASLES OR BCG TO THE FRIDGE. These vaccines must be given during scheduled sessions and discarded after the session or six hours after reconstitution, whichever comes first.

Missed opportunities

A missed opportunity occurs when a child or woman who is eligible for vaccination visits a health facility but is not vaccinated by the health staff. To reduce missed opportunities and provide vaccination at every opportunity, all health facilities in the country seeing women and children should:

- Routinely screen their vaccination cards.
- Administer simultaneously all vaccines for which a child or woman is eligible.
- Disregard false contraindications to vaccination.
- Open a multi-dose vial of vaccine even for a small number of eligible children or women.

Health facilities should also improve their clinic organization by adjusting the clinic schedule to local needs, including offering services as much as possible at hours convenient for mothers. All health facilities in the country should strive to provide the full range of EPI services every day of the week.

Dropout rates

The dropout rate (DOR) is a comparison of the number of children who start receiving immunizations with the number who do not receive later doses for full immunization expressed as a percentage. Dropout could be estimated for the following vaccine doses: BCG in relation with measles (BCG-measles); DPT1-measles; DPT1-DPT3; Hep 1-Hep 3 etc. In principle, it can apply to any other two immunizations within EPI, depending on the purpose of the analysis.

This indicator is used for measuring the level of utilization of immunization services. Dropout rates are calculated by comparing the number of infants that started receiving immunizations to the number of infants who received all needed doses of vaccines.

In the example of DPT1-measles, let us see how the dropout rate (%) is calculated:

$$\text{DPT1-measles DOR} = \frac{\text{DPT1 administered} - \text{measles vaccine administered}}{\text{DPT1 administered}} \times 100$$

After analysing population data, immunization coverage and dropout level, you need to interpret them and answer the following specific questions:

- Routinely screen vaccination cards.
- How does the immunization coverage compare with the objectives?
- How does the coverage compare with the figures of the previous period?
- Judging from DPT1 coverage, what is the situation relating to physical access to immunization services?
- Do all those who have access continue to use the services? (Dropout rates between DPT1/DPT3 and DPT1/measles)?
- Do vaccines administered at the same age have the same coverage levels (OPV3, DPT3 and HepB3)?
- Which are the most disadvantaged communities regarding their access and utilization of services?

This analysis may reveal several problems related to access to immunization services and coverage, dropout rates or missed opportunities. This will necessitate action at all levels of the health system to correct the situation that follows.

Community information and participation

The health worker is responsible for making sure that parents have the following information before leaving the immunization session:

- The reasons for immunization and the disease for which immunization is given.
- When and where the caregiver/parent should return for the next dose.
- The possible side-effects of the vaccine given and what to do in the case of fever.
- Side effects to report to the health centre (abscesses, etc.).
- The importance of keeping the vaccination card into adulthood.

Health workers should also counsel on the progress of the child, including discussing the results of the child's growth monitoring and giving advice on nutrition, home care, and early attendance at the facility in case of illness. Upon completion of the childhood immunization schedule, health workers should encourage caregivers/parents to continue to bring their children regularly for well-child sessions, for growth monitoring, vitamin A supplementation, etc. All sessions should be conducted in a friendly and courteous manner, so as not to discourage the caregivers/parents from returning. Health workers should refrain from criticizing the caregiver/parent for problems with the child or for failure to attend on schedule. They should always maintain a positive focus. Tell the caregiver/parent that it is good that they brought the child, even if there are problems or attendance is not timely, and give positive advice for improvement; praise the caregiver/parent if the child has made good progress.

Appendix 7: Immunization programme management

Please refer to Part 2, 2. Curriculum Topics, Topic 7: Immunization programme management, pp. 93.

Appendix 8: Training modules and other reference materials related to curriculum content

Teachers may consult the most recent *Directory of Vaccines and Biological Products* (available at country WHO Office library) for detailed information. Those who have internet access can visit <http://www.vaccines.who.int/> to locate reference documents.

This appendix contains explanations of various reference and audio-visual materials, CD-ROMs and other software related to curriculum content. Most of these materials are available in national EPI units or WHO country offices.

Among reference courses, two are directly related to this curriculum and constitute a basis for teaching immunization: *Immunization in Practice* with its eight modules and *Mid-Level Management (MLM) Course for EPI Managers* with 16 core modules. The teaching is easier when the student has their own copy of the module. For this reason, it is helpful to obtain enough copies for the school library for every student through the national EPI manager or from the WHO country office. The EPI manager may request assistance from the country WHO representative or the WHO Regional Office for supply of these course materials in hard or soft copies to be duplicated at country level.

Mid-Level Management (MLM) Course for EPI Managers modules

EXPANDED MODULAR OPTION FOR COMPLETE COURSE	SELECTED ESSENTIAL MODULES FOR MODULES OPTION
BLOCK I: Introductory modules (0–3)	
Module 0: Introduction	Module 0: Introduction
Module 1: Problem-solving approach to immunization services management	Module 1: Problem-solving approach to immunization services management
Module 2: Role of the EPI manager	Module 2: Role of the EPI manager
Module 3: Communication for immunization programmes	Module 3: Communication for immunization programmes
BLOCK II: Planning/organization (4–6)	
Module 4: Planning immunization activities	Module 4: Planning immunization activities
Module 5: Increasing immunization coverage	Module 5: Increasing immunization coverage
Module 6: Costing, budgeting and resource mobilization	
Reference guides: WHO-UNICEF Guidelines for cMYP for Immunization (September 2013) and A Tool and User Guide for cMYP Costing and Financing (May 2014)	
BLOCK III: Logistics (7–11)	
Module 7: Cold chain management	Module 7: Cold chain management
Module 8: Vaccine management	Module 8: Vaccine management
Module 9: Immunization safety	Module 9: Immunization safety
Module 10: Transport management	
Module 11: Maintenance	
Reference material: Product information sheets, WHO, UNICEF, 2012	
BLOCK IV: New vaccines (12)	
Module 12: New vaccine introduction	Module 12: New vaccine introduction
BLOCK V: Supplementary immunization (13)	
Module 13: How to conduct quality SIAs	
Reference manuals: Guidelines for improving the quality of NIDs AFRO field guide for quality measles SIAs	
BLOCK VI: Disease surveillance (14)	
Module 14: Ensuring VPDs surveillance within the context of integrated disease surveillance and response	Module 14: Ensuring VPDs surveillance within the context of integrated disease surveillance and response
BLOCK VII: Monitoring and evaluation (15–18)	
Module 15: Monitoring and data management	Module 15: Monitoring and data management
Module 16: Supportive supervision by EPI managers	Module 16: Supportive supervision by EPI managers
Module 17: Conducting EPI coverage survey	Module 17: Conducting EPI coverage survey
Module 18: Conducting assessment of the immunization programme	Module 18: Conducting assessment of the immunization programme
Reference: Guide for Preparation of Integrated Supervisory Checklist for Disease Prevention and Control Activities at District Level (to be updated)	
BLOCK VIII: EPI training materials (19)	
Module 19: Facilitator's guide	Module 19: Facilitator's guide
Other training tools and guides: Facilitator's guide EPI training kit; Course, Director's guide, EPI/IMCI interactive resource (2014)	

Include integration of services. Add other sources of materials: online and books, WHO reference documents.

Immunization in Practice (2015 update)

Immunization in Practice is a seven-module WHO publication intended for health workers who regularly administer vaccines to women and children. The modules contain information on diseases that feature in most immunization programmes and guidelines on the handling of vaccines, maintenance of the cold chain, injection safety, planning and management of immunization sessions with the support of the community, administration of immunizations and monitoring of immunization coverage.

MODULE 1	Target diseases and vaccines
MODULE 2	The vaccine cold chain
MODULE 3	Ensuring safe injections
MODULE 4	Micro-planning for reaching every community
MODULE 5	Managing an immunization session
MODULE 6	Monitoring and surveillance
MODULE 7	Partnering with communities

Immunological Basis of Immunization

The Immunological Basis for immunization”, was initially developed in 1993 as a set of eight modules focusing on the vaccines included in the Expanded Programme on immunization (EPI). With the expansion of immunization programmes in general, as well as the large accumulation of new knowledge since 1993, these modules series have been updated and extended targeting the following diseases: 1: Vaccine immunology, 2: Diphtheria, 3: Tetanus, 4: Pertussis, 5: Tuberculosis, 6: Poliomyelitis, 7: Measles, 8: Yellow fever, 9: Haemophilus influenzae type b, 10: Varicella-zoster virus, 11: Rubella, 12: Pneumococcal, 13: Japanese encephalitis, 14: Cholera, 15: Meningococcal, 16: Mumps, 17: Rabies, 18: Hepatitis A, 19: Human papillomavirus (HPV), 20: Typhoid, 21: Rotavirus, 22: Hepatitis B.

MODULE 1	Basics of immunology
MODULE 2	Diphtheria
MODULE 3	Tetanus
MODULE 4	Whooping cough
MODULE 5	Tuberculosis
MODULE 6	Poliomyelitis
MODULE 7	Measles
MODULE 8	Yellow fever

Primary health care logistics

Prepared for primary health-care (PHC) workers, this manual is concerned with the logistics of five programmes, particularly malaria, diarrhoeal diseases, EPI, maternal and child health, and essential drugs. It comprises 27 complete modules, which may be selected according to training needs; they range from the simplest module on calculating the necessary stocks of a warehouse to the more complex user’s manual for solar-powered refrigerators. Consult the most recent Directory on Vaccines and Biological Products for detailed information on each module.

Audio-visual materials

» Posters

- Posters on the cold chain and logistics system
- Cold chain monitoring cards
- Vaccine vial monitors
- Injection safety
- Immunize and protect your child
- These diseases can be avoided
- Neonatal tetanus
- Differential diagnosis of polio
- Vitamin A

» Stickers

- EPI logo (also TT logo)
- Defrost when ice accumulates
- Label of the vaccine vial monitor – presents colour changes on the VVM

» Sets of slides

- Recognizing disease – Guide for diagnosing six diseases – 30 slides
- Measles – Treating measles among children, and the child with measles – 20 slides
- Set of slides on sterilization – visual material for vapour sterilization – 48 slides
- Cold chain – How to monitor the cold chain – 48 slides

» Videos

- Breaking the chain of cross infections. Role of auto-disable syringes and needles in routine and special immunization activities – unsafe injections, 6 minutes, EPI/IMCI interactive training resource (2015).

» CD ROMs

- Mid-Level Management Course for EPI Managers. WHO AFRO, March 2015. It contains 16 priority modules and WHO FRO reference documents and tools.
- Operational Level Training Manual for Health Workers. Kenya EPI, May 2000.
- Resources for Immunization Managers. UNF.WHO/V7B/ Version 2.0. October 2002 (epitraining@who.int).
- State of vaccines and immunization in the world.
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» Software

- CEIS – EPI computer system for monitoring EPI coverage, survey on immunization coverage, demographic data, etc.
- COSAS 4.4 – Analysis of cluster sampling survey.
- EPIC and E-mate – Analysis of the study on the cold chain monitoring card.
- EPI cost – Estimating the cost of immunization programmes.
- EPI Info – Series of programmes for compiling data and organizing the study database.
- Epimap, Version 2 for IBM compatible computers.

Apart from documents offered by WHO Geneva, the training modules for intermediate level staff can be consulted on the WHO AFRO website. Consult the most recent directories and the websites for specific sources, which may not be included in this document.

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PART 2

EXPANDED PROGRAMME ON
IMMUNIZATION PROTOTYPE
CURRICULUM FOR MEDICAL
SCHOOLS: TEACHING COURSE

1. INTRODUCTION

The prototype curriculum in Chapter 2 details a course of study designed to assist students to learn the tasks involved in management and provision of immunization services. Students who complete this course should be able to:

- Plan and manage immunization services integrated with other child health programmes.
- Monitor, supervise and evaluate immunization activities.
- Manage the cold chain and ensure vaccine management.
- Conduct an immunization session, including an outreach session.
- Conduct disease surveillance.
- Communicate effectively with stakeholders.
- Promote immunization activities in the community.

The curriculum structure includes the following information:

- **Curriculum topic:** There are 17 content topics divided into three main groups: general topics (1–5) providing vital information on immunization programme operations and foundation elements, target diseases and the basics of vaccinology and current vaccines used in the programme. The second group of topics (6) refers to operational aspects of the programme and includes vaccine administration, cold chain and vaccine handling, organization and conduct of immunization sessions, immunization safety, communication and community participation in the programme. The last group of topics (7) contains management issues related to programme planning, monitoring, supervision and evaluation.
- **Lesson objective:** The aim and the goal of the lesson.
- **Time allocation:** This indicates the approximate time required to cover each content topic, including time for classroom sessions, practicals and field placements.
- **Sub-topics:** The elements that the lesson covers.
- **Learning/enabling objectives:** Here what the student must know and be able to do after completing the lesson are specified.
- **Teaching methods:** The variety of pedagogical methods employed – lectures, role-plays, simulation, demonstration – and whether the lesson is taught in the classroom or in the health facility during practicals and field placement.
- **Teaching materials** The pedagogical resources required by instructors and teachers, including basic information to be learned through reference materials, course modules, didactic materials, samples of immunization items, etc.
- **References:** Details of the reference documents and modules.
- **Student assessment:** This includes sample examination questions and exercises.

Chapter 3–7 of the curriculum contain guidelines regarding the organization of practical sessions and field placements of the students with examples of projects and teacher observation checklists. These sections also refer to student evaluation options and have sample examination questions with answers to assist teachers in student assessment.

Chapters 8–12 and Appendices 1 and 2 provide guidelines on implementing the curriculum: planning, endorsement, introduction of the EPI curriculum into the overall educational programme, its monitoring and evaluation.

2. CURRICULUM TOPICS

Topic 1: Immunization systems and operations

» LESSON OBJECTIVE

Provide key information on immunization goals and operations, relationship with health system and external environment.

» TIME ALLOCATION

Classroom session:
 - Theory – 45 minutes
 - Practicals – 0
 - Field placement – 0

SUB-TOPICS	LEARNING/ENABLING OBJECTIVES	TEACHING METHODS	TEACHING/LEARNING MATERIALS	PRACTICUM		REFERENCES	STUDENT ASSESSMENT
				Practical session	Field placement		
Introduction to EPI External environment and immunization programmes Immunization operations Supportive components of immunization services	Describe goals and orientations of immunization programme globally, in the African Region. Describe the role and relationship of external environment and health system with immunization programme. Outline five key immunization operations. Describe three supportive components of immunization programme.	Introductory lecture by teacher Individual reading by students Questions and answers Brainstorming Group discussions	Hard copy or CD of MLM (Mid-Level-Management Course for EPI Managers) National vaccination training manual	-	-	MLM Module 0: items 2.1– 2.3 MLM Module 1: items 2.1– 2.4 Refer to GIVS and GVAP documents	Answers to sample examination questions in Chapter 7, Topic 1, nos 1–2

Topic 2: Immunization policies, norms and standards

- » **LESSON OBJECTIVE**
- » **TIME ALLOCATION**
- Provide information, discuss and explain the role of EPI policies, global and national goals, norms and standards.
- Classroom session:
 - Theory – 30 minutes
 - Practicals – 0
 - Field placement – 0

SUB-TOPICS	LEARNING/ENABLING OBJECTIVES	TEACHING METHODS	TEACHING/LEARNING MATERIALS	PRACTICUM		STUDENT ASSESSMENT
				Practical session	Field placement	
National immunization policies Global policies and health development goals Norms and standards	Describe the aims and objectives of the national immunization policies/schedule. Describe the three main orientations of the global immunization policies. Explain health related goals in the SDGs Interpret the following general norms and guiding principles on immunization: <ul style="list-style-type: none"> • Community participation • Integration of immunization with other child health services • Accessibility and equity • Quality and safety of immunizations • Programme coordination and leadership • Role of the national regulatory authorities • Rights and responsibilities of service users 	Introductory lecture by teacher Individual reading by students Questions and answers	Documentations on national and global immunization policies	-	-	Answers to sample examination questions in Chapter 7, Topic 2, nos 1–3 National immunization/child health policy documents Immunization policy WHO GPV/GEN/95.03.Rev 1 MLM Module 2: item 4.1 Refer to GIVS and GVAP documents

Topic 3: Immunization service delivery strategies and innovative approaches

- » **LESSON OBJECTIVE**
- Explain EPI service delivery current and innovative strategies (GIVS, RED etc.) and underline the need for integrated delivery of services.
- » **TIME ALLOCATION**
- Classroom session:
- Theory – 90 minutes
 - Practicals – 0
 - Field placement – 0

SUB-TOPICS	LEARNING/ENABLING OBJECTIVES	TEACHING METHODS	PRACTICUM		STUDENT ASSESSMENT
			TEACHING/LEARNING MATERIALS	Practical session	
Immunization at static health facilities (fixed strategy) Immunization through outreach services Immunization delivery through mobile services Immunization campaigns and SIAs Integration of child health-care services Innovative strategies: GIVS, GVAP, RED, REC	Describe the fixed strategy Describe the advantages and limitations of fixed strategy Describe the outreach strategy Describe the advantages and limitations of outreach strategy Describe the mobile strategy Describe the advantages and limitations of mobile strategy Describe the types of campaign strategy and when to apply them Describe the advantages and limitations of campaigns Describe the integration strategy Describe the advantages and limitations of service integration Describe RED and its five strategic components Decode RED and describe its five strategic components and challenges	Introductory lecture shared by teacher and national EPI manager Individual reading by students Demonstration of poster/map by EPI manager Questions and answers Brainstorming/discussion	Documents on national, regional and global immunization policies Wall map showing catchment areas (health facilities and outreach sites) Wall map or LCD presentation showing districts implementing RED	- During field placement	National immunization or child health policy documents GIVS 2006–2015, A58/12 Appendix 3 of this document: Immunization service delivery strategies and innovative approaches 2006 Regional Child Survival Strategy Refer to GIVS and GVAP documents Answers to sample examination questions in Chapter 7, Topic 3, nos 1–3

Topic 4: Target diseases for immunization and disease surveillance

- » **LESSON OBJECTIVE**
 - Provide key information on immunization goals and operations, relationship with health system and external environment.
- » **TIME ALLOCATION**
 - Classroom session:
 - Theory – 45 minutes
 - Practicals – 0
 - Field placement – 1 week

SUB-TOPICS	LEARNING/ENABLING OBJECTIVES	TEACHING METHODS	TEACHING/LEARNING MATERIALS	PRACTICUM		REFERENCES	STUDENT ASSESSMENT
				Practical session	Field placement		
Measles	Highlight the burden of vaccine-preventable diseases for African countries and for the country where the school is located	Introductory lecture by teacher	Current textbooks on infectious diseases	-	Field placement 1 (1 week):	Immunization in Practice	Answers to sample examination questions in Chapter 7, Topic 4, nos 1–7.
Poliomyelitis	Explain the signs and case definition for each of target diseases.	Individual reading by students	National and WHO publications		to designated health facility	Module 1: Target diseases	Observation during role-play
Neonatal tetanus	Explain the mode of transmission of each target diseases	Questions and answers	Videos on vaccine-preventable diseases		Conduct a project on disease surveillance (as explained in Chapter 5).	Volume: New vaccine introduction into the national EPI (NESI/WHO AFRO, 2005)	Observation during field placement
Diphtheria	Explain prevention and control strategies of target diseases	Demonstration of an advertisement/ chart by EPI manager	Slides on EPI target diseases			Section on Epidemiology of vaccine-preventable diseases	Report on project work completed by students during field placement
Whooping cough	Outline diseases surveillance concept (active, passive surveillance; community surveillance) and methods/ tools	Case study 1: An epidemic has been reported	Handout on case study Map of catchment area			Manual of Epidemiology for District Health Management, chapters 5 and 6 (WHO, 1993)	Results in assessment check explain form for overall performance of clinical tasks
Hepatitis B	Explain the role of surveillance in epidemic preparedness and response	Demonstration: surveillance tools (during the practice too)	Specimen collection kits			WHO recommended standards for surveillance of selected vaccine-preventable diseases (WHO/V&B/03.01)	
Haemophilus influenzae type b	Explain advantages of integrating different surveillance systems under IDSR	Project work on disease surveillance					
Yellow fever	Analyse and interpret disease trends	Homework on surveillance tools					
Mumps Rubella	Prepare disease maps and graphs						
Rotavirus disease	Review/extract relevant surveillance information from patient registers						
Pneumococcal disease							
Meningococcal infection							
Rotavirus							
HPV infection							
Integrated disease Surveillance							

SUB-TOPICS	LEARNING/ENABLING OBJECTIVES	TEACHING METHODS	TEACHING/LEARNING MATERIALS	PRACTICUM		STUDENT ASSESSMENT
				Practical session	Field placement	
	Participate in specimen collection and dispatch to laboratory Explain the role of disease recording and reporting Define major VPD surveillance quality monitor indicators. Complete a monthly surveillance report					
						Appendix 4 of this document: Target diseases for immunization programmes and disease surveillance Technical Guidelines for Integrated Disease Surveillance and Response in the African Region (WHO AFRO, CDC, Atlanta, USA)

Topic 5: Vaccinology and the Expanded Programme on Immunization vaccines

» LESSON OBJECTIVE

Introduce fundamentals of vaccinology; describe/demonstrate current EPI vaccines and discuss future vaccine development.

» TIME ALLOCATION

Classroom session:
 - Theory – 45 minutes
 - Practicals – 0
 - Field placement – 0

SUB-TOPICS	LEARNING/ENABLING OBJECTIVES	TEACHING METHODS	TEACHING/LEARNING MATERIALS	PRACTICUM		STUDENT ASSESSMENT
				Practical session	Field placement	
Immunity: A general overview Immunization and types of vaccines Vaccine development and research New vaccines Vaccines used in national immunization programmes	Describe types of immunity and immune response mechanisms Explain different types of vaccines: monovalent and combination vaccines, live and killed vaccines, bacterial and viral vaccines Sub-unit vaccines (toxoids, polysaccharides, etc.) Liquid vaccines and lyophilised (dry) vaccines Explain most common new vaccines; characterize vaccine of the future (ideal vaccine) Describe differences between vaccines and other drugs in terms of the mechanism of their action, storage and transportation requirements Explain vaccines used in the national immunization programme	Lecture Individual reading by students Questions and answers Brainstorming/discussion Demonstration: vaccine samples	Lecture handouts Training modules Vaccine posters Sample vaccines	-	-	Answers to sample examination questions in Chapter 7, Topic 5, nos 1–5 Immunization in Practice Module 2: The vaccines Immunological Basis of Immunization series National training manuals Handout on Enhanced Programme Implementation. Volume: New vaccine introduction into the national EPI (NESI/WHO AFRO, 2005), section on Vaccinology and vaccine essentials Appendix 5 of this document: Vaccinology and EPI vaccines Refer to updated NV document

Topic 6: Immunization service delivery and vaccine administration

Topic 6.1: General guidelines for vaccine administration

- » **LESSON OBJECTIVE**
 - » **TIME ALLOCATION**
 - Classroom session:
 - Theory – 45 minutes
 - Practicals – 0
 - Field placement – 0
 - Provide information on EPI target groups and immunization schedules; explain and discuss validity of vaccine doses and ability of the human body to respond simultaneously to several antigens/vaccines.

SUB-TOPICS	LEARNING/ENABLING OBJECTIVES	TEACHING METHODS	TEACHING/LEARNING MATERIALS	PRACTICUM		STUDENT ASSESSMENT
				Practical session	Field placement	
Target groups for immunization Immunization schedule Simultaneous administration of vaccines	State target groups for immunization programmes in the African Region/countries Describe immunization schedule recommended by WHO and country What vaccines children should have before their first birthday (fully immunized child – FIC) When to give TT to women and period of protection after each dose Valid and non-valid doses For each vaccine, state the number of doses and quantity to be given, the optimal age for each dose, booster doses, missed opportunities and the route of administration Specify the minimum interval between doses of the same vaccine Explain basis for simultaneous administration of vaccines	Bedside teachings (in history taking) Lecture Individual reading by students Questions and answers	Lecture handouts Training modules Poster on national immunization schedule Immunization schedule	-	-	Answers to sample examination questions in Chapter 7, Topic 6.1, nos 1–8
						Immunization in Practice Modules 2, 5 and 6 National training manuals Handout on Enhanced Programme Implementation Volume: New vaccine introduction into the national EPI. NESI/WHO AFRO, 2005 Appendix 6 of this document: Immunization delivery and vaccines administration

Topic 6.2: How to administer EPI vaccines and vitamin A

» **LESSON OBJECTIVE**

Demonstrate administration techniques for each vaccine and vitamin A; safe injection practices; health worker-client

» **TIME ALLOCATION**

- Classroom session:
 - Theory – 60 minutes
 - Practicals – 3 hours
 - Field placement – 0

SUB-TOPICS	LEARNING/ENABLING OBJECTIVES	TEACHING METHODS	TEACHING/LEARNING MATERIALS	PRACTICUM		STUDENT ASSESSMENT
				Practical session	Field placement	
BCG Polio DPT and other combination vaccines Measles Yellow fever Vitamin A New vaccines e.g. HPV, Rotavirus, PCV	Check conditions of vaccines and diluent before use such as expiry dates, WVM Reconstitute vaccines as appropriate Administer the vaccine at correct site, using the correct technique (oral, or by injection: intradermal, subcutaneous, intramuscular) Maintain sterile technique throughout vaccine administration Apply correct waste disposal practice after injection Indicate age of the child and doses of vitamin A to be given Describe how the health worker should maintain good interpersonal relationship with clients during the immunization session	Introduction by teacher Individual reading by students Questions and answers Demonstration Simulation: administering vaccines; administering vitamin A to a child	Lecture handouts Training modules for demonstration and simulation <ul style="list-style-type: none"> • Expired vaccine vials • Expired diluent • AD syringes • Cotton • Foil • File • Ice pack • Appropriate object (e.g. fruit) for injection simulation • Safety box 	Practicals for demonstrations to conduct at nearby clinic or at departmental facility	-	Answers to sample examination questions in Chapter 7, Topic 6.2, nos 1–7 Observation of students during simulated practice
						REFERENCES <i>Immunization in Practice</i> Module 2: The vaccines National training manuals of the host country Appendix 6 in this document: Immunization delivery and vaccine administration

Topic 6.3: Cold chain and vaccine handling – logistics support

» **LESSON OBJECTIVE**

Explain the role of cold chain; demonstrate cold chain equipment; interpret stock control system, opened vial policy and results of vaccine vial monitor and shake test.

» **TIME ALLOCATION**

Classroom session:
 - Theory – 90 minutes
 - Practicals – 0
 - Field placement – 2.5 days

SUB-TOPICS	LEARNING OBJECTIVES	TEACHING METHODS	TEACHING/LEARNING MATERIALS	PRACTICUM		STUDENT ASSESSMENT	REFERENCES
				Practical session	Field placement		
Cold chain management Vaccine management Logistics support	Describe the cold chain system from the time the vaccine leaves the manufacturer to the time it reaches target child or women Define criteria for selection of cold chain equipment Explain factors used for calculation of vaccine storage capacity of the cold chain Load and use the refrigerator/freezer Read, record and interpret the refrigerator temperature Handle cold chain emergencies Explain health worker tasks for cold chain maintenance Interpret WHO policy on the use of opened vial multi-dose vaccines Interpret VVM changes Master technique of shake test Describe causes of vaccine wastage	Introductory lecture: teacher Individual reading by students Questions and answers Individual feedback on exercises Demonstration at classroom and by the cold chain manager at national/sub-national vaccine store during field placement	Lecture handouts on training modules, videos, slides Demonstration at national/sub-national vaccine store: <ul style="list-style-type: none"> Refrigerators and freezers Cold room Vaccine carriers/cold boxes Ice packs Cool pack Cold chain indicators Vaccine vial monitor/VVM Temperature monitoring chart/devices Injection equipment Vaccine supply record and movement forms 	Conduct a project on calculation of annual vaccine needs and vaccine stock levels for health facility X (as described in Chapter 5)	Field placement (2.5 days): at national/sub-national vaccine store Conduct a project on calculation of annual vaccine needs and vaccine stock levels for health facility X (as described in Chapter 5)	Answers to sample examination questions in Chapter 7, Topic 6.3, nos 1–12 Answers to individual exercises from MLM Module 8, Exercise 6 (homework) Observation during practical attachment Results in assessment check explain form for overall performance of tasks	MLM Module 7: Cold chain management Module 8: Vaccine management <i>Immunization in Practice</i> Module 3: The cold chain National training manual on immunization
	Explain data needed to forecast vaccine and other logistics (diluent, syringes, safety boxes, etc.) needs Explain three methods of estimating vaccine needs Calculate vaccine stock level and wastage rates Define when to order vaccines						

90 Topic 6.4 Immunization safety

» LESSON OBJECTIVE

Present safety as a central topic in immunization; describe AEFIs and response strategies; demonstrate some of important safety practices.

» TIME ALLOCATION

Classroom session:
 - Theory – 90 minutes
 - Practicals – 0
 - Field placement – 0

SUB-TOPIC	LEARNING OBJECTIVES	TEACHING METHODS	TEACHING/LEARNING MATERIALS	PRACTICUM		STUDENT ASSESSMENT
				Practical session	Field placement	
<p>Immunization safety: principles and practice</p> <p>Explain factors affecting the quality of vaccines (e.g. contamination, heat freezing of liquid vaccines, poor vaccine manufacturing practices, etc.) Provide basic information on vaccine diluents Describe safe injection practices State contraindications to immunization Describe adverse events following immunization (AEFI), causes of AEFIs and the appropriate action to be taken (reporting, investigation, public information, etc.) Describe the various vaccine administration methods/devices Describe how to use safety boxes Describe requirements for safe immunization waste segregation, and disposal/elimination</p>	<p>Introductory lecture: teacher Individual reading by students Questions and answers Role-play 2/Case study: Health worker from the health facility A reported a cluster of AEFI Demonstration of AD syringes, safety boxes in the classroom during role- play</p>	<p>Lecture handout MLM modules (CD or hard copy) Posters with AD syringes, safety boxes, incinerators Copy of the action chart (Figure 3) from MLM Module 10: Taking action by peripheral level health worker</p>	<p>Topic 6.5 Topic 6.6 -</p>	<p>Observe during field placement</p>	<p>MLM Module 9: Immunization safety <i>Immunization in Practice</i> Module 4: Ensuring safe injections National training manual on immunization</p>	<p>Answers to sample examination questions in Chapter 7, Topic 6.4, nos 1–7 Observation during role-play</p>

Topic 6.5: How to organize an immunization session

» **LESSON OBJECTIVE** » **TIME ALLOCATION**

- Demonstrate steps in preparation of vaccination session and observe level of accomplishment by students.
- Classroom session:
 - Theory – 60 minutes
 - Practicals – 1 hour
 - Field placement – 0

SUB-TOPICS	PRACTICUM				STUDENT ASSESSMENT	
	LEARNING/ENABLING OBJECTIVES	TEACHING METHODS	TEACHING/LEARNING MATERIALS	Field placement		
<p>Planning/preparing for an outreach immunization session</p>	<p>Explain all the materials/resources necessary for an immunization session</p> <p>Estimate the average number of immunization sessions to be held per month/week</p> <p>Estimate quantities of injection materials and vaccines needed</p> <p>Prepare vaccine carriers, cold boxes and ice packs</p> <p>Pack a vaccine carrier with vaccines and ice packs</p> <p>Keep vaccines at the correct temperature in a vaccine carrier</p> <p>Protect vaccines during transport</p>	<p>Introduction by teacher</p> <p>Individual reading by students</p> <p>Questions and answers</p> <p>Demonstration and simulation:</p> <p>Preparing an outreach immunization session</p>	<p>Lecture handouts</p> <p>Training modules</p> <p>For calculations: flipchart and markers</p> <p>For demonstration and simulation:</p> <ul style="list-style-type: none"> • Vaccine carrier • Ice packs • Thermometer • Expired vaccine vials • Expired diluents • Safety box 	<p>Practicals for demonstrations to conduct at nearby clinic or at departmental facility</p>	<p><i>Immunization in Practice</i> Module 5: Planning immunization sessions to reach every child Module 6: Holding an immunization session</p> <p>National immunization manual</p>	<p>Answers to sample examination questions in Chapter 7, Topic 6.5, nos 1–6</p> <p>Observation of students during simulated practice</p>

Topic 6.6: Conducting an immunization session

» **LESSON OBJECTIVE**

Demonstrate steps in conducting a vaccination session; highlight key messages to caregiver/parent.

» **TIME ALLOCATION**

- Classroom session:
 - Theory – 90 minutes
 - Practicals – 6 hours (1 day)
 - Field placement – 1 week

SUB-TOPICS	LEARNING / ENABLING OBJECTIVES	TEACHING METHODS	TEACHING/ LEARNING MATERIALS	PRACTICUM		STUDENT ASSESSMENT	
				Practical session	Field Placement		
Arrange and conduct an immunization session	Arrange a site for an immunization session and organize work areas Check and maintain correct temperature in the refrigerator/box Register new attendances Screen each client and identify correct action to be taken Weigh babies and provide mothers with nutritional advice; assess and treat sick children Immunize women and children according to immunization schedule Discard safely any used material Make proper records on performed vaccinations Give key messages to caretaker after immunization is performed Organize various areas of activity and staff	Introductory lecture: teacher Individual reading by students Questions and answers Demonstrate arrangements for immunization session Role-play 3: We now conduct an immunization session Practical session in the designated health facility	Lecture handouts Training modules For demonstration and role-play: <ul style="list-style-type: none"> • Tables and chairs • Registers • Scales and growth charts • Vaccine carrier • Ice packs • Thermometer • Expired vaccine vials • Expired diluents • Injection equipment • Immunization cards • Safety box 	Practicals for demonstration to conduct at nearby clinic or at departmental facility	Field placement Field placement 3 (1 week): at design-ated health facility Conduct a project on reaching every district (RED) strategy in the catchment area (as described in Chapter 5)	REFERENCES <i>Immunization in Practice</i> Module 6: Holding an immunization session National vaccination manual Handout on Enhanced Programme Implementation Volume: New vaccine introduction into the national EPI, NESI/WHO AFRO, 2005. Section on Vaccinating with combined vaccines	Answers to sample examination questions in Chapter 7, Topic 6.6, nos 1–4 Observation during role-play Observation during field placement Results in assessment checklist form for overall performance of tasks

Topic 6.7: Communication for immunization programmes

- » **LESSON OBJECTIVE**
 - Introduce the topic of communication as part of immunization operations and underline the role of communities in support of Immunization.
- » **TIME ALLOCATION**
 - Classroom session:
 - Theory – 90 minutes
 - Practicals – 0
 - Field placement – 2.5 days

SUB-TOPIC	LEARNING/ENABLING OBJECTIVES	TEACHING METHODS	TEACHING/LEARNING MATERIALS	PRACTICUM			STUDENT ASSESSMENT
				Practical session	Field placement	REFERENCES	
The role of communication in immunization programmes	Describe the role and importance of communication in immunization Explain basic communication skills and methods used in immunization Outline the role of communities and how to mobilize them for immunization Plan immunization activities with the community Provide information on immunization to population Explain and answer frequently asked questions (FAQ) about immunization Explain key messages to parents after immunization session Describe how to handle rumours and misinformation on immunization.	Introductory lecture: teacher <ul style="list-style-type: none"> • Individual reading by students • Questions and answers Role-play 4: We are communicators for immunization Case studies Brainstorming	Training modules Manuals on communication Local posters and pamphlets on immunization Communication equipment	-	Field placement 4 (2.5 days): Meeting with the community and community - based organizations Interviews with community members (as described in Chapter 5)	MLM Module 3: Communication for immunization programmes <i>Immunization in Practice</i> Module 8: Building community support for immunization National training manual on immunization	Answers to sample examination questions in Chapter 7, Topic 6.7, nos 1–5 Observation of students during role-play Observation during field placement Results in assessment checklist form for overall performance of tasks

Topic 7: Immunization programme management

Topic 7.1: Introduction to immunization programme management

- » **LESSON OBJECTIVE**
 Introduce problem solving as a key concept in the modern management practices; define the profile and the role of an EPI manager.
- » **TIME ALLOCATION**
 Classroom session:
 - Theory – 45 minutes
 - Practicals – 0
 - Field placement – 0

SUB-TOPICS	LEARNING/ ENABLING OBJECTIVES	TEACHING METHODS	TEACHING/LEARNING MATERIALS	PRACTICUM		REFERENCES	STUDENT ASSESSMENT
				Practical session	Field placement		
Problem-solving approach as a key to programme management	Describe the main steps of problem solving process to immunization service management	Classroom session shared between teacher and national EPI manager	Lecture handout MLM modules (CD or hard copy)	-	-	MLM Module 1: A problem-solving approach to immunization service management	Answers to sample examination questions in Chapter 7, Topic 7.1, nos 1–4
The role of immunization programme manager	Describe the role, Responsibilities and qualities of a national EPI manager Explain the management of EPI human resources for optimizing EPI team's output Describe the leadership responsibilities assigned to each level of the national health system	Introduction by teacher and national EPI manager Individual reading by students Questions and answers with the national EPI manager Homework	Organogram of the national immunization programme/unit Job description (see Part 1 section 2.3.1)	-	-	Module 2: Role of the EPI manager (2013 edition) National training manual on immunization	Answer to individual exercise from Module 2, Exercise 3, the last bullet "Explain the qualities of an EPI manager you wish to see in yourself as a leader of your team" (homework)

Topic 7.2: Planning immunization activities and financial management

- » **LESSON OBJECTIVE**
- Introduce planning and budgeting as a basis for sustainability of health programmes including EPI; present the concept of micro-planning.
- » **TIME ALLOCATION**
- Classroom session:
 - Theory – 90 minutes
 - Practicals – 0
 - Field placement – 0

SUB-TOPICS	LEARNING/ENABLING OBJECTIVES	TEACHING METHODS	TEACHING/LEARNING MATERIALS	PRACTICUM		STUDENT ASSESSMENT	
				Practical session	Field placement		
Planning immunization activities Financial management and sustainability	Explaining fundamental principles/basic concepts in planning Participate in the following the steps when developing a plan: Situation analysis Selecting priority Problems Setting the objectives and targets Determining the strategies and activities Quantifying the resources and preparing relevant budget Monitoring implementation of the plan Describe the concept of the micro-plan Indicate source of financial resources for immunization services	Classroom session divided into two parts: Introductory lecture Simulation: Group work to develop micro-plans	Training modules Manuals on planning Flipchart Markers	Site visit for community diagnosis-	-	MLM Module 4: Planning immunization activities at national, provincial and district levels National training manuals and planning guidelines cMYP guide <i>Immunization in Practice</i> Module 5: Planning immunization sessions	Answers to sample examination questions in Chapter 7, Topic 7.2, nos 1–5 Observation during group work on micro-planning

Topic 7.3: Supervision by programme managers

» **LESSON OBJECTIVE**

Explain and interpret “supportive” and “integrated” approaches in supervision; arrange role-play to demonstrate its various styles.

» **TIME ALLOCATION**

Classroom session:
 - Theory – 60 minutes
 - Practicals – 0
 - Field placement – 0

SUB-TOPICS	LEARNING/ ENABLING OBJECTIVES	TEACHING METHODS	PRACTICUM		TEACHING/LEARNING MATERIALS	REFERENCES	STUDENT ASSESSMENT
			Practical session	Field placement			
The role of supervision in programme management	Describe the aim/objectives and main benefits of supervision	Introductory lecture: teacher	-	-	Training modules	MLM Module 16: Supportive supervision by EPI managers	Answers to sample examination questions in Chapter 7, Topic 7.3,nos 1–5
Supervisory visit/styles	Distinguish between the monitoring, supervision, evaluation and follow up concepts	Individual reading by students Questions and answers			Training manuals Supervisory check – explain	National training manuals and supervision guidelines	Observation during role-play on supervision
Supportive and integrated supervision	Describe different supervisory styles Outline advantages of supportive supervision Explain why integrated supervision is more appropriate for African countries Explain the main questions of a supervision checklist Describe arrangements for and the process of a supervisory visit Design a supervisory report Describe follow-up actions after the supervisory visit	Role-play 5: I am appointed as a supervisor at district level Revised MLM modules			A copy of a recent supervisory report from the EPI Unit Papers Pens/pencils	Handout: New Vaccine Introduction Enhanced Programme Implementation. Section on “Supervisory process” NESI/WHO AFRO, 2005	

Topic 7.4: Monitoring of immunization programme and data management

- » **LESSON OBJECTIVE**
- Introduce health information collection and management process; key monitoring indicators and tools; analysis and use of generated data.
- » **TIME ALLOCATION**
- Classroom session:
 - Theory – 60 minutes
 - Practicals – 0
 - Field placement – 1 week

SUB-TOPICS	LEARNING/ ENABLING OBJECTIVES	TEACHING/METHODS		TEACHING/LEARNING MATERIALS		PRACTICUM		STUDENT ASSESSMENT
		TEACHING METHODS	TEACHING METHODS	Practical session	Field placement	REFERENCES	REFERENCES	
Monitoring programme implementation Immunization coverage and dropout rates (DOR) Immunization data management and analysis	Identify information sources for monitoring routine immunization Select key indicators for monitoring and measuring progress Collect immunization data by target group, type, dose and month Prepare an immunization monitoring chart Calculate immunization coverage rates for different vaccines Calculate DOR between: BCG and measles; Penta1 and Penta 3, Penta 1 to measles Describe ways to reduce DOR. Explain most common surveys used in immunization programme (e.g. EPI cluster sampling survey) Analyse and interpret collected information Provide feedback to those who supplied data Use the results of monitoring to adjust actions and improve programme performance	Introductory lecture: teacher Individual reading by students Questions and answers Demonstration: Immunization monitoring chart and other tools Homework on Exercise 9 from MLM Module 20	Lecture handout Immunization monitoring chart Local charts, graphs on immunizations performed Copy of Exercise 9 for homework (MLM Module 15)	Practical session	Field placement (1 week): at designated health facility Conduct a project on reported data verification and validation (as described in Chapter 5)	MLM Module 16: Monitoring routine immunization and data management <i>Immunization in Practice</i> Module 7: Monitoring and using your data National training manuals	Answers to sample examination questions in Chapter 7, Topic 7.4, nos 1–6 Responses to exercises in Module 20, Exercise 5, under item 4.7 Observation during field placement Results in assessment checklist form for overall performance of tasks	

Topic 7.5: Evaluation of immunization programmes

- » **LESSON OBJECTIVE**
Present and discuss evaluation process and steps to conduct it; outline follow up measures to implement its recommendations.
- » **TIME ALLOCATION**
Classroom session:
 - Theory – 60 minutes
 - Practicals – 0
 - Field placement – 0

SUB-TOPICS	LEARNING/ ENABLING OBJECTIVES	TEACHING METHODS	PRACTICUM		REFERENCES	STUDENT ASSESSMENT
			TEACHING/LEARNING MATERIALS	Practical session		
Evaluation/ assessment of immunization programmes	Describe the purpose of evaluation/ assessment Describe preparatory activities for conducting an evaluation/assessment: <ul style="list-style-type: none"> • Compile basic information • Prepare data collection tools • Select field visit sites • Identify needed resources (evaluation team, material and financial resources) Explain steps for conducting an evaluation/ assessment: <ul style="list-style-type: none"> • Collect data • Analyse data (use SWOT method) • Interpret data • Prepare report with findings and recommendations • Outline measures for follow up of the implementation of recommendations 	Lecture Individual reading by students Questions and answers Case study	Lecture handouts Training modules	-	MLM Module 18: Conducting assessment of the immunization programme <i>Immunization in Practice</i> Module 7: Monitoring and using your data National training manuals Handout: Enhanced Programme Implementation Volume: New vaccine introduction into the national EPI. NESI/WHO AFRO, 2005. Section on assessing the immunization programme	Answers to sample examination questions in Chapter 7, Topic 7.5, nos 1–5

3. HOW TO USE THIS CURRICULUM

3.1 General outline

This is a generic curriculum. It is designed to re-orient the basic education of medical students to community health needs and to fill the gaps in the existing curriculum for immunization identified during training needs assessments conducted in the Region.

To stimulate effective learning, it is desirable that, where possible, the topics be taught as a unit. In this way, classroom activities can prepare students for practicals where they can immediately practise their newly learned skills. However, immunization can also be taught in a staggered manner with community/public health, paediatrics, microbiology, obstetrics/gynaecology and other relevant departments.

According to the generic curriculum model, approximately 30 hours are required to cover all 17 content topics, including practicals, and four weeks for field placement as shown in Table 3.1.

TABLE 3.1
COURSE OUTLINE

TOPIC	CLASSROOM SESSIONS: THEORY				PRACTICUM	
	Lecture	Demonstrations	Role-plays	Simulations	Practical sessions	Field placements
1 Immunization systems and Operations	45 min					
2 Immunization policies, norms and standards	30 min					
3 Immunization service delivery strategies and innovative approaches	90 min	Map by EPI manager				
4 Target diseases for immunization and disease surveillance	90 min	Surveillance tools	An epidemic has been reported			1 week
5 Vaccinology and the Expanded Programme on Immunization vaccines	45 min	Vaccine samples				
6.1 General guidelines for vaccine administration	45 min	National EPI schedule				
6.2 How to administer EPI vaccines and vitamin A	60 min	Vaccines/ equipment		Administering vaccines	3 hours	
6.3 Cold chain and vaccine handling – logistics support	90 min	Cold chain equipment				2.5 days
6.4 Immunization safety	90 min		A cluster of AEFI reported			
6.5 How to organize immunization session	60 min	Vaccine carriers		Preparing an outreach session	1 hour	
6.6 Conducting an immunization session	90 min		We now conduct an immunization session		6 hours	1 week
6.7 Communication for immunization programmes	90 min		We are communicators for immunization			2.5 days

7.1 Introduction to immunization programme management	45 min	EPI unit organogram				
7.2 Planning immunization activities and financial management	90 min			Developing a micro-plan		
7.3 Supervision by programme managers	60 min		I am appointed as a supervisor			
7.4 Monitoring of immunization programme and data management	60 min	Immunization monitoring chart				1 week
7.5 Evaluation of immunization programmes	60 min					
TOTAL TIME REQUIRED	19 hours				10 hours	4 weeks

The main purpose of the curriculum is to ensure that after training, students are capable of fulfilling all the objectives of the curriculum. However, there may not be enough time to add all the recommended topics to the existing student-training curriculum. Field visits may also be difficult to arrange due to distances involved. Therefore, the following is proposed to adjust the curriculum to cover essential areas of the immunization programme. If all topics cannot be covered during the students training:

- Do not remove any topics from the curriculum with the anticipation that future arrangements can be made to accommodate them in the revised curriculum.
- Some topics may be suggested to students for home reading and can be covered during practicals or field placements.
- Include the following priority topics (Table 3.2) in the curriculum that essentially require contact with the facilitator.

TABLE 3.2
PRIORITY TOPICS

PRIORITY TOPICS	SUITABLE TEACHING LOCATION		
	Classroom sessions	Practical session at nearby facility	Field placement
3 Immunization service delivery strategies and innovative approaches	X		
4 Target diseases for immunization and disease surveillance	X		X
5 Vaccinology and the Expanded Programme on Immunization vaccines	X		
6.3 Cold chain and vaccine handling – logistics support		X	X
6.4 Immunization safety	X		
6.6 Conducting an immunization session		X	X
6.7 Communication for immunization programmes			X
7.1 Introduction to immunization programme management	X		
7.4 Monitoring of immunization programme and data management	X		X

Provide as much time as possible for practical work (exercises, demonstrations and role-plays). At least 50% of time should be allocated to practical work. This curriculum promotes the concept of training students in real professional settings. This requires teachers and students to deal with problems as they occur in real situations.

3.2 Curriculum design for various categories of medical students

The participants at the consensus workshop on the revised EPI curriculum prototypes for medical and nursing/midwifery schools (Abidjan, Côte d'Ivoire, 13–17 May 2013) considered all topics in the proposed prototype curriculum to be important for teaching the future medical profession. At the same time, they recommended allowing for differences in depth and time allocations for training for at least three categories of students: medical officers in general medicine, medical specialists and public health specialists. Based on these deliberations, the following weighting in EPI knowledge to be taught, and respective timings, were proposed:

TABLE 3.3
SUGGESTED WEIGHTING OF IMMUNIZATION TEACHING COURSE CONTENT FOR DIFFERENT CATEGORIES OF MEDICAL STUDENTS

CONTENT	MEDICAL OFFICER	MEDICAL SPECIALIST	PUBLIC HEALTH SPECIALIST
EPI policies/strategic documents	C	C	H
Vaccine-preventable diseases	C	C	H
Immunology of vaccines	H	C	H
Current and new vaccines	C	C	H
Logistics and cold chain	H	C	H
Immunization practice	C	C	H
Immunization safety	C	C	H
Waste disposal	C	C	H
Communication	C	C	H
Programme management	H	C	H

Notes: B Basic/introductory teaching; C Teaching on essentials/core aspects; H Higher /advanced teaching with full details.

TABLE 3.4
TIME ALLOCATION IN MINUTES

TOPICS	MEDICAL OFFICER	MEDICAL SPECIALIST	PUBLIC HEALTH SPECIALIST
1 Immunization systems and operations	45	30	60
2 Immunization policies, norms and standards	30	30	45
3 Immunization service deliver strategies and innovative approaches	90	60	90
4 Target diseases for immunization programmes and disease surveillance	90	60	120
5 Vaccinology and the Expanded Programme on Immunization vaccines	45	60	60
6.1 General guidelines for vaccine administration	45	30	30
6.2 How to administer EPI vaccines and vitamin A	30	30	30
6.3 Cold chain and vaccine handling – logistics support	90	90	90
6.4 Immunization safety	60	60	60
6.5 How to organize an immunization session	15	15	15
6.6 Conducting an immunization session	90	60	60
6.7 Communication for immunization programmes	90	90	90
7.1 Introduction to immunization programme management	45	45	60
7.2 Planning immunization activities and financial management	90	60	90
7.3 Supervision by programme managers	45	60	90
7.4 Monitoring of immunization programme and data management	60	60	90
7.5 Evaluation of immunization programmes	45	60	90
TOTAL TIME ALLOCATION TO EPI (theory and field placement)	17 hours	15 hours	20 hours

4. PRACTICALS AND HOW TO ORGANIZE THEM

Practical sessions serve as an essential complement to teaching/learning activities and may include short visits and demonstrations at a nearby health facility or outpatient department of the training institution. Their overall objective is to allow students to practise skills learned in the classroom or to observe the execution of a specific task in a real-life situation. To make sessions effective, it might be better to organize a limited number of visits with a small group of students. When organizing a visit, the following factors should be taken into consideration:

- Were the authorities warned?
- Is the visit for observation by students or for practising?
- Location (distance) of the visit site.
- Number of students involved.
- Capacity of the health facility to accommodate students without interfering with routine activities of the facility.
- Availability of qualified health facility staff to assist during the visit.
- Whether the facility has necessary supplies and equipment relevant to the objectives of the visit.
- Whether the facility has the relevant activity the students are supposed to attend during the day of the visit (e.g. immunization session).
- Possibility of combining visits with other programmes related to EPI (e.g. IMCI).
- Availability of transportation means to take students to the site.

When conducting a practical session, it is helpful for students to have a checklist to assist them in their observations or practice. The teacher should try to organize the visit as soon as possible after the corresponding classroom session. They should inform students the objectives and arrangements that have been made for the visit. During the visit, the teacher should observe student activities and ensure there are no practical problems and whether the technical questions are answered in a satisfactory way. After the visit, the teacher should ask each group to briefly summarize the visit and describe any problems encountered and comment on benefits of the exercise.

In the curriculum chart, three visits are proposed, to reinforce practising specific tasks related to some priority areas of the immunization programme (see Table 4.1).

TABLE 4.1
PRACTICALS IN THE CURRICULUM

PRACTICAL SESSION	TOPIC	PROPOSED DURATION
1	6.2 How to administer EPI vaccines and vitamin A	3 hours
2	6.5 How to organize immunization session	1 hour
3	6.6 Conducting an immunization session	6 hours

Practical session 1: How to administer EPI vaccines and vitamin A (Topic 6.2)

» Objectives of the session:

- To display current EPI vaccines and their diluents.
- To observe conditions of these vaccines and their reconstitution techniques, if applicable.
- To observe the administration of EPI vaccines **with sometime integration of high impact interventions**.
- To observe waste disposal practice after injection.

» Allocated time: 3 hours.

» Prerequisite knowledge:

Topics “General guidelines for vaccine administration”, “How to administer EPI vaccines and vitamin A” on the curriculum chart; *Immunization in Practice* Module 2 (vaccines); and Appendix 6 in Part 1 of this document, “Immunization delivery and vaccine administration”.

» Teacher’s tasks:

- Inform the health facility or outpatient department about the objectives of the visit.
- Accompany students to the health facility.
- Ask students to write down their observations to be discussed after the visit.
- Ask supervisor how they want the student groups to work so as to cause as little disturbance to the health facility’s routine activities as possible.
- Make sure that student groups follow the pre-arranged rotation to give all groups an opportunity to observe all tasks being executed by health workers during the immunization session.
- Ensure that students record their observations on the administration of each vaccine and vitamin A as well as waste disposal after injections.
- After the visit, discuss with students their findings and observations. Ask them to describe any problems they encountered during the visit and to summarize the session.

Practical session 2: How to organize an immunization session (Topic 6.5)

» Objective of the session:

- To observe the preparations for an immunization session.

» Allocated time: 1 hour.

» Prerequisite knowledge:

- Topics “General guidelines for vaccine administration”, “Preparing for an outreach session” on the curriculum chart; *Immunization in Practice* Modules 2 (vaccines) and 5 (planning immunization sessions); and Appendix 6 in Part 1 of this document, “Immunization delivery and vaccine administration”.

» Teacher’s tasks:

- Inform the health facility or outpatient department about the objectives of the visit.
- Prepare a checklist on the visit based on the objectives of the session to be used by students.
- Accompany students to the health facility.
- Ask students to write down their observations to be discussed after the visit using the checklist you have prepared in advance (see sample below).
- Ask the supervisor how they want the student groups to work so as to cause as little disturbance to the health centre’s routine activities as possible.
- Make sure that student groups follow the pre-arranged rotation to give all groups an opportunity to observe tasks being executed by health workers during preparations for the immunization session.

- Ensure that students use the checklist to record their observations on the health workers' performance.
- After the visit, discuss with students their findings recorded on the checklists. Ask them to describe any problems they encountered during the visit and to summarize the session.

» **Sample checklist for practical session 2**

Practical session topic: Organizing an immunization session

Health facility:

Student name:

Date of visit:

PROCEDURES TO BE PERFORMED BY HEALTH FACILITY STAFF	DONE	NOT DONE	NA
1. Prepare all necessary immunization cards/registers			
2. Estimate the number of children and mothers for the session			
3. Create work stations, provides sufficient tables/chairs for staff and clients			
4. Assign staff to stations, explains their tasks and provides necessary supplies			
5. Prepare sufficient injection equipment and ensures their sterility/cleanliness			
6. Prepare sufficient equipment for injection waste (e.g. safety boxes)			
7. Prepare sufficient vaccines (and diluents if applicable) checking expiry dates			

Practical session 3: Conducting an immunization session (Topic 6.6)

» **Objectives of the session are to observe how health workers:**

- Prepare and conduct an immunization session.
- Interact with the caregiver/parent.
- Administer vaccines.
- Act after vaccination is performed.

» **Allocated time:** 6 hours.

» **Prerequisite knowledge:**

- Topics "General guidelines for vaccine administration", "Preparing for an outreach session", "How to administer EPI vaccines and vitamin A" and "Conducting an immunization session" on the curriculum chart; *Immunization in Practice* Modules 2 (vaccines), 5 (planning immunization sessions), 6 (holding an immunization session); and Appendix 6 in Part 1 of this document "Immunization delivery and vaccine administration".

» **Teacher's tasks:**

- Inform the health facility about objectives of the visit.
- Prepare a checklist on the visit based on the objectives of the session to be used by students.
- Accompany students to the health facility.
- Ask students to write down their observations to be discussed after the visit using the checklist you have prepared in advance (see sample below).
- During the visit, ask the health facility supervisor to describe the organization of the immunization session.
- Ask the supervisor how they want student groups to work so as to cause as little disturbance to the health centre's routine activities as possible.
- Make sure that student groups follow the pre-arranged rotation to give all groups an opportunity to observe all tasks being executed by health workers during the immunization session.
- Ensure that students use the checklist to record their observations on the health workers' performance.

- After the visit, discuss with students their findings recorded on the checklists. Ask them to describe any problems they encountered during the visit and to summarize the session.

» **Sample checklist for practical session 3**

Practical session topic: Organizing and conducting an immunization session

Health facility:

Student name:

Date of visit:

PROCEDURES TO BE PERFORMED BY HEALTH FACILITY STAFF	DONE	NOT DONE	NA
1. Prepares all necessary immunization cards/registers			
2. Estimates the number of children and mothers for the session			
3. Creates work stations, provides sufficient tables/chairs for staff/clients			
4. Assigns staff to stations, explains their tasks and provides necessary supplies			
5. Prepares sufficient injection equipment and ensures their sterility/cleanliness			
6. Prepares sufficient equipment for injection waste (e.g. safety boxes)			
7. Prepares sufficient vaccines (and diluents) checking expiry dates and VVM			
1. Identifies the children/women to receive the immunizations as per schedule			
2. Approaches clients with confidence and courtesy (greeting, talking, etc.)			
3. Ensures client waiting time is kept to a minimum			
4. Follows the EPI guidelines on contraindications to avoid missed opportunities			
5. Explains about the vaccines to be given, side-effects, what to do about them			
6. Takes care of vaccines during immunization (cold conditions, out of sunlight)			
7. Administers oral vaccine first if an injection is also to be given			
8. Uses one sterile needle and one sterile syringe for each injection			
9. Reconstitutes vaccine (if applicable) using sterile procedure and cold diluents			
10. Fills syringe only after child (or woman) arrives at table			
11. Aspirates the vaccine into the syringe and prepares appropriate injection site			
12. Inserts needle at correct angle: i/m – 90°; s/c – 45°; i/dermal – parallel with skin			
13. Injects total dose and withdraws the needle			
14. Provides TT immunization to women when appropriate			
15. Thanks the client and tells when/where to return with the child or for herself			
16. Answers any questions from clients			
17. Disposes used syringe, needle into the safety box without recapping needle			
18. Takes appropriate measures when injury happens (e.g. finger prick).			
19. Properly disposes reconstituted vaccines after the session (or after six hours)			
20. Returns vials of unused or liquid vaccines to fridge and marks “use first”			
21. Thanks the staff and discusses with them any need for follow-up activities			
22. Makes arrangements for the next session			

5. FIELD PLACEMENTS AND STUDENTS

Field placement enables students to practise skills and attitudes by working as a trainee alongside a qualified health worker. At the start of each field placement, students need to have a clear understanding of why they are being assigned to a specific health centre, clinic or district hospital. Therefore, at the beginning of the course, students should be given the list of topics and learning objectives related to the course. Field placement related to immunization activities is an integral part of community health where the student would also practise skills in epidemiology, disease control, IMCI, control of malaria, vector control etc. It is important to harmonize the requirements and especially the selection of placement sites, duration and timing of the field placement as regards the entire community health package. In view of this, a selection of five key topics has been made for field placement of students relating to immunization, as shown in Table 5.1.

TABLE 5.1
KEY TOPICS FOR FIELD PLACEMENT AND DURATION

FIELD PLACEMENT NUMBER	TOPIC FOR FIELD PLACEMENT	DURATION
1	Topic 4 Target diseases for immunization and disease surveillance	1 week
2	Topic 6.3 Cold chain and vaccine handling – logistics support	2.5 days
3	Topic 6.6 Conducting an immunization session	1 week
4	Topic 6.7 Communication for immunization programmes	2.5 days
5	Topic 7.4 Monitoring of immunization programmes and data management	1 week

Learning objectives explained under each of these five topics form the bases for the selection of placement sites to meet these objectives. The selection process will include the following considerations:

- The type of health facility that can best meet the objectives of the curriculum (health centre, district hospital or outpatient department of a teaching hospital).
- Distance of the site from the training institution.
- Number of sites to be selected. This will depend on the number of students in the group and the capacity of the health facility to absorb these numbers. If the capacity is low, two or more sites could be selected.
- Availability of qualified staff (trained on immunization) to supervise the students during placement.
- Availability of immunization equipment and supplies at the health facility.

For the final selection of site(s), a visit to the health facility can be made to verify the quality of the site and the maximum number of students that can be placed at the site. For the site selected, a collaboration plan should be made indicating time of the visit, responsible supervisor, method of assessment of the students and other details.

Apart from student assessment during the field placement, it is proposed that they prepare a project in relation to the objectives of each placement. The supervisor should allocate one or more students to a project and provide the documents necessary to complete it. Below are some examples of possible projects that can be modified or replaced, depending on local circumstances and allocation of time by the institution.

Field placement 1: Target diseases for immunization and surveillance (Topic 4)

» Objectives of the session:

- To enable students to practise skills in data collection and analysis for disease surveillance through:
 - - Reviewing and extracting relevant surveillance information from patients' registers.
 - - Preparing disease maps and graphs.
 - - Analysing and interpreting disease trends.

» Allocated time: 1 week.

» Prerequisite knowledge:

- Appendix 4 in Part 1 of this document; annexes 6 and 8; "Technical Guidelines for Integrated Diseases Surveillance and Response", WHO AFRO.

» Field supervisor's tasks:

- Review with students the objectives of the assignment.
- Assign tasks to students, for example:
 - Students A and B look for suspected/confirmed cases of neonatal tetanus in patient register.
 - Students C and D look for suspected/confirmed cases of polio in patient register.
 - Students E and F ask the health facility to provide monthly reports for a complete year (last year) and prepare graphs to interpret seasonal variations of measles cases.
 - Students G and H, in collaboration with health facility staff, prepare a map showing distribution of a disease. Include other data related to transmission of the disease you have selected, etc.
- Ask other colleagues in the health facility to cooperate with students and provide necessary information, reports and patient registers to accomplish the objectives of the session.
- Describe how disease surveillance is conducted at this health centre.
- Make sure that all students are clear about how to perform the tasks that they have been assigned.
- Observe students' work and make notes for the assessment.
- After the session, discuss with students their findings. Ask them to describe any problems they encountered during the visit. Share with them your assessment results and summarize the session.

» Sample project in relation to Topic 4: Target diseases for immunization and surveillance

PROJECT TITLE: Measles profile in district X

(This project assumes that the placement is at the district hospital or district health office. If the placement is in a health facility, the data should refer to it and the title should be changed accordingly: "Measles profile in the catchment area of health facility X").

Steps to proceed for the preparation of the project:

1. Give a title to the project: for example "Measles in district X".
2. Give the number of cases for the past 5–10 years in the district.
3. If the population data for the past 5–10 years are available, relate the cases to 10 000 population of the district to reach to the incidence rate of measles in the district. If population data are not available, proceed with number of cases.
4. Prepare a curve showing the trends of measles cases during the period you have covered (five or more years).
5. Observe periodic occurrence of cases throughout the period you have covered to see periodic variations of cases, if any. (Measles can have increased every two/three/four years when vaccination coverage of target children is poor.)
6. Give geographical distribution of measles cases by dots for the past one or more years using a district map. Show different colour dots for cases in different years.

7. Give monthly distribution of measles cases for at least last three years.
8. Give sex distribution of measles cases for at least last three years.
9. Give age distribution of measles cases using the following scale: <1 year, 1–4 years, 5–14 years, >15 years.
10. Give proportion of children among cases that have been immunized against measles.
11. Review, analyse and interpret above data and prepare a short conclusion of the study.

Field placement 2: Cold chain and vaccine handling – logistics support (Topic 6.3)

» Objectives of the field placement for cold chain and vaccine handling:

- To understand the role of vaccine store, where the vaccines come from, and how they are distributed from the store.
- To become familiar with different pieces of equipment for the cold chain and know how they operate.
- To see and understand how vaccine stock management is carried out, and the use of various forms to record vaccine movement in and out of store.

» **Allocated time:** 2.5 days.

» Prerequisite knowledge:

- Topic “Cold chain and vaccine handling – logistics support” on the curriculum chart; *Immunization in Practice* (cold chain) Module 7; MLM Modules 8 (Cold chain management) and 9 (Vaccine management).

» Field supervisor’s tasks:

- Inform the main vaccine store management about objectives of the session.
- Prepare a checklist on refrigerator loading by vaccines to be used by students during the visit.
- Accompany students to the vaccine store.
- Ask students to write down their observations to be discussed after the visit using the checklist you have prepared in advance (see sample below).
- During the visit, ask the principal storekeeper how they want the student groups to work so as to cause as little disturbance to the vaccine store activities as possible.
- Ask the principal storekeeper to:
 - Describe the role of vaccine store, where the vaccines come from, how they are distributed from the store.
 - Explain principles of vaccine stock management including minimum, maximum and reserve stock levels.
 - Demonstrate vaccine recording forms and registers for the follow up of vaccine movement.
 - Demonstrate the different pieces of equipment for the cold chain and explain how they operate.
 - Demonstrate how to check and record temperature of the cold chain equipment.
 - Demonstrate how to load and use the refrigerator.
- If the store has a refrigerator not in use, ask two students to practise loading the refrigerator with different vaccines under the supervision of the principal storekeeper.
- Ask other students in the group to make observations using the checklist for refrigerator loading prepared by you in advance.
- Make sure that student groups follow the pre-arranged rotation to give all groups an opportunity to observe all tasks being executed by the staff of the vaccine store.
- Ensure that students use the checklist or the attitude scale to record their observations on their classmates’ performance.
- After the visit, discuss with students the visit and their findings recorded on the checklists (peer review). Ask them to describe any problems they encountered during the visit and summarize the session.

» **Sample checklist for practical session 2**

Practical session topic: Cold chain and vaccine handling – logistics support

Health facility:

Student name:

Date of visit:

REFRIGERATOR LOADING PROCEDURES

TO BE PERFORMED BY STUDENTS AT THE VACCINE STORE DURING THE VISIT

	DONE	NOT DONE	NA
1. Checks the last refrigerator temperature reading to assure it is within the “safe range”			
2. Loads icepacks in the freezing compartment to freeze icepacks			
3. Checks the expiry dates of OPV and measles vaccines			
4. Loads first (close to posterior wall) on upper shelf (under the freezing compartment) OPV and measles vaccines with longer expiry date			
5. Loads on upper shelf (under the freezing compartment) and close to the door OPV and measles vaccines with shorter expiry date			
6. Leaves free space among vaccine boxes and between boxes and walls of refrigerator for free air movement			
7. Checks the expiry dates of BCG, DPT, TT, Hib and HepB vaccines			
8. Load first (close to posterior wall) on the first middle shelf with BCG, DPT, TT, Hib and HepB vaccines with longer expiry date			
9. Loads on second middle shelf and close to the door BCG, DPT, TT, Hib and HepB vaccines with shorter expiry date			
10. Leaves free space among vaccine boxes and between boxes and walls of refrigerator for free air movement			
11. Loads the second middle shelf with diluents to keep them cold before reconstitution			
12. Loads the lower shelf with “reserve” icepacks to keep them cold before they can be taken to the freezing compartment when needed			
13. Makes a special box marking it “use first” for opened vials of liquid vaccines returned from the field according to “opened vial policy”			
14. Leaves the door shelves free of vaccines or diluents			
15. Closes the refrigerator door			

» **Sample project in relation to Topic 6.3: Cold chain and vaccine handling – logistics support**

PROJECT TITLE: Calculation of annual vaccine needs and various stock levels for health facility X

The steps to follow in preparing for the project are in the following tables. The student should get initial (basic) data, such as number of target children, and make calculations, filling the empty boxes. After completing this project discuss the results with your supervisor and focal point for cold chain/vaccine handling.

» Calculation of annual vaccine needs for a health facility

	A	x	B	x	C	x	D	=	E
	Children 0–11 months (number)		Doses in the immunization schedule		Wastage factor (pre-determined)		Desired/target coverage rate (%)		Total doses required/year
BCG		x	1	x	2	x		=	
OPV		x	4	x	1.33	x		=	
DPT		x	3	x	1.33	x		=	
Measles		x	1	x	1.43	x		=	

» Calculation of quantity to be used during supply period

	E	x	F	=	G
	Total doses Required/year		Duration of storage (3 months) (3/12)		Total doses required for a given period (3 months)
BCG		x	0.25	=	
OPV		x	0.25	=	
DPT		x	0.25	=	
Measles		x	0.25	=	

» Determination of minimum stock

	G	x	H	=	I
	Total doses required for a given period (3 months)		Reserve stock that should always be at store (%)		Minimum or reserve stock (doses)
BCG		x	25%	=	
OPV		x	25%	=	
DPT		x	25%	=	
Measles		x	25%	=	

» Determination of maximum stock

	G	+	I	=	L
	Total doses required for a given period (3 months)		Minimum or reserve stock (doses)		Maximum stock (doses)
BCG		+		=	
OPV		+		=	
DPT		+		=	
Measles		+		=	

» Calculation of quantities to be ordered

	L	+	K	=	M
	Maximum stock (doses)		Quantity in stock (doses)		Stock to be ordered (doses)
BCG		+		=	
OPV		+		=	
DPT		+		=	
Measles		+		=	

Field placement 3: Conducting an immunization session (Topic 6.6)

- » **Objectives of the field placement to conduct immunization sessions are to observe how the students:**
 - Prepare and conduct an immunization session.
 - Interact with the caregiver/parent.
 - Administer vaccines.
 - Act after vaccination is performed.
- » **Allocated time:** 1 week.
- » **Prerequisite knowledge:**
 - Topics “General guidelines for vaccine administration”, “Preparing for an outreach session”, “How to administer EPI vaccines and vitamin A” and “Conducting an immunization session” on the curriculum chart; *Immunization in Practice* Modules 2 (vaccines), 5 (planning immunization sessions) and 6 (holding an immunization session); and Appendix 6 in Part 1 of this document, “Immunization service delivery and vaccine administration”.
- » **Field supervisor’s tasks:**
 - Inform the health facility about objectives of the field attachment.
 - Prepare a checklist based on these objectives to be used by field supervisor for student assessment (see a sample below).
 - Ask students to write down their observations to be discussed at the end of field attachment using the same checklist you have prepared (peer assessment).
 - Accompany students to the immunization site.
 - Ask the immunization team staff to describe the organization of the immunization session at this site.
 - Ask students to observe immunization sessions.
 - Ask students to conduct immunization session under your (or vaccination team) supervision during the last two or three days of the field attachment.
 - Use the checklist to record your observations on the students’ performance.
 - After the visit, discuss with students your and their findings recorded on the checklists. Ask them to describe any problems they encountered during the visit and summarize the results of field attachment.

» **Sample checklist for Topic 6.6: Conducting an immunization session****Practical session topic:** Organizing and conducting an immunization session

Health facility:

Student name:

Date of visit:

PROCEDURES TO BE PERFORMED BY STUDENT	DONE	NOT DONE	NA
1. Prepare all necessary immunization cards/registers			
2. Estimates the number of children and mothers for the session			
3. Creates work stations, provides sufficient tables/chairs for staff/clients			
4. Assigns staff to stations, explains their tasks and provides necessary supplies			
5. Prepares sufficient injection equipment and ensures their sterility/cleanliness			
6. Prepares sufficient equipment for injection waste (e.g. safety boxes)			
7. Prepares sufficient vaccines (and diluents) checking expiry dates			
8. Identifies the children/women to receive the immunizations as per schedule			
9. Approaches clients with confidence and courtesy (greeting, talking, etc.)			
10. Ensures the client waiting time is kept to a minimum			
11. Follows the EPI guidelines on contraindications to avoid missed opportunities			
12. Explains about the vaccines to be given, side-effects, what to do about them			
13. Takes care of vaccines during immunization (cold conditions, out of sunlight)			
14. Administers oral vaccine first if an injection is also to be given			
15. Uses one sterile needle and one sterile syringe for each injection			
16. Reconstitutes vaccine (if applicable) using sterile procedure and cold diluents			
17. Fills syringe only after child (or women) arrives at table			
18. Aspirates the vaccine into the syringe and prepares appropriate injection site			
19. Inserts needle at correct angle: i/m – 90°; s/c – 45°; i/dermal – parallel with skin			
20. Injects total dose and withdraws the needle			
21. Provides TT immunization to women when appropriate			
22. Thanks the client and tell when/where to return with the child or for herself			
23. Answers any questions of clients			
24. Disposes used syringe, needle into the safety box without recapping needle			
25. Takes appropriate measures when injury happens (e.g. finger prick)			
26. Properly disposes of reconstituted vaccines after the session (or after six hours)			
27. Returns vials of unused or liquid vaccines to fridge and marks “use first”			
28. Thanks the staff and discusses with them any need for follow-up activities			
29. Makes arrangements for the next session			

» **Sample project in relation to Topic 6.6: Conducting an immunization session****PROJECT TITLE: Reaching every district (RED)/reaching every community (REC) strategy in the catchment area**

This is a strategy to increase immunization coverage in the district and it applies equally at health facility level. The project aims to verify how the five operational components of the RED strategy are implemented at health facility level. Students should do a survey in collaboration with the supervisor to find out achievements and gaps and what can be done to meet the challenges.

The matrix below will help the student collect local data, analyse and interpret findings. If the RED strategy has not yet been introduced in the health facility catchment area, the projects can continue by reviewing implementation of activities against each topic in the table without referring to RED. For example, the first question can be modified as follows: “Are health workers trained to conduct outreach vaccination sessions?”

Operational components of RED strategy	What has the health facility (HF) done in response to this component?	Gaps identified in collaboration with the supervisor	What can be done to meet the challenges ahead?
Outreach vaccinations	Are health workers trained in RED strategy? Is there a plan for outreach visits at HF? Are visits made as per plan? Has the HF reliable transport to make outreach visits? Are vaccines, injection materials available for outreach visits?		
Supportive supervision	Is there a plan for supervision at HF? Is there a supervision checklist to check RED implementation? Are visits made as per plan? Has the HF reliable transport to make supervisory visits?		
Links with the community	Is community informed about RED strategy? Is community involved in promoting RED? When were last three meetings held with the community? What topics were discussed in these meetings?		
Monitoring for action	What is the DPT3 coverage in the community/HF catchment area: before RED was introduced? after RED was introduced?		
Planning and management of resources	Is there an annual plan/micro-plan of the HF for the current year? Has this plan been costed and resources allocated as per plan?		

Field placement 4: Communication for immunization programmes (Topic 6.7): Interview with community members

- » **Objective of the session:**
 - To enable students to practise skills related to communicating activities with a community.
- » **Allocated time:** 2.5 days.
- » **Prerequisite knowledge:**

Topic on the curriculum chart in section Topic 6.7 “Communication for immunization programmes”; MLM Module 3: “Communication for immunization programmes”; *Immunization in Practice* Module 8: “Building Community support for Immunization”; national training manual on immunization.
- » **Field supervisor’s tasks:**

This attachment is different from previous field attachments. It involves community-based interviews rather than student observations. The supervisor’s task, therefore, is:

 - To prepare in advance short interview questionnaires for the following respondents: mothers, community leaders, community health worker, health worker and the NGO person (see samples of all questionnaires below).

- Depending on the size of the student group, divide the group into sub-groups of two or three students and assign them interviews with the above respondents.
- Inform the health facility and the community about objectives of the field visit. (It will be more appropriate if the supervisor makes a pre-visit to the community where the students will carry out their interviews and discuss the purpose of the exercise).
- Accompany students to the community.
- Make sure that all students are clear about how to perform the tasks they have been assigned.
- During the visit, supervise student groups in the community.
- After the students have ended their interviews, debrief with the local community leaders and health centre staff.
- After the visit, discuss with students their findings. Ask them to describe any problems they encountered during the visit. Discuss with the students how they can use the experience of this field visit in their future interaction with communities and clients. Ask students to write a report of their project.

Sample questionnaires for students:

1. Interview mothers with questions such as:

- Do you think immunizations are useful?
- What diseases are prevented by immunization?
- Do you spend long hours waiting for immunization of your baby at the health facility?
- How about health staff at the clinic:
 - Do they treat you well during your visit?
 - Do they tell you which injection your baby receives?
 - Do they tell you when and where you should return for other injections?
- What will make it easier for you to take your child for immunization?

2. Interview with community leader (community head, teacher, etc.) with questions such as:

- Does the health clinic give you feedback on immunization in your community?
- In which way do you support health workers to immunize more children in this area?
- In your view, what should be done to improve immunizations in your community?

3. Interview with the community health worker with questions such as:

- What do you do to promote immunization in the community?
- Have you been trained by health workers on immunization?
- What other support do you receive from:
 - Health workers at the clinic?
 - Community leaders of your community?

4. Interview with the health worker at the health centre with questions such as:

- What are your methods of communication with the community?
- In which way does the community support you to improve immunizations in your area?
- Do you have suggestions on how to improve immunization coverage in the area?

5. Interview with the local NGO in the area with questions such as:

- Do you receive regular feedback on what is happening in immunization in this community?
- In which way do you support immunization in this community?
- How long you will provide your support to improve immunization in this community? Which are the most disadvantaged communities regarding their access and utilization of services?

Field placement 5: Monitoring of immunization programme and data management (Topic 7.4)

» Objective of the session:

- To enable students to practise skills related to data collection, analysis and interpretation using an immunization monitoring chart as a tool.

» Allocated time: 1 week.

» Prerequisite knowledge:

- Topic 7.4 on the curriculum chart “Monitoring of immunization programmes and data management”; MLM Module: 3: “Communication for immunization programmes”; *Immunization in Practice* Module 7: “Monitoring and using your data”; national training manual on immunization.

» Supervisor’s tasks:

- Prepare a blank immunization monitoring chart for distribution among student groups.
- Assign students to different tasks before the visit as follows:
 - A sub-group (two students) to collect and locate data on the immunization monitoring chart on BCG, DPT1 and DPT3 immunizations, interpret trends and calculate BCG to DPT3 and DPT1 to DPT3 dropout rates.
 - A sub-group (two students) to collect and locate data on the immunization monitoring chart on BCG, polio 1 and polio 3 immunizations, interpret trends and calculate BCG to polio 3 and polio 1 to polio 3 dropout rates.
 - A sub-group (two students) to collect and locate data on the immunization monitoring chart on measles immunization and interpret trends.
 - A sub-group (two students) to collect data from the above three sub-groups and calculate: (a) BCG to measles dropout rate; (b) DPT1 to measles dropout rate; (c) polio 1 to measles dropout rate.
- Inform the health facility about objectives of the field placement.
- Accompany students to the health facility.
- Ask health facility staff how they want the student groups to work so as to cause as little disturbance to the health centre’s routine activities as possible.
- Make sure that student groups follow the pre-arranged assignments.
- After the field placement, discuss with students their findings recorded on the immunization monitoring charts. Ask them to describe any problems they encountered during their work, and to interpret and summarize the group’s findings.

» Sample project in relation to Topic 7.4: Monitoring of immunization programme and data management

PROJECT TITLE: Reported data verification/validation

This project aims to develop skills in verification of data incoming or outgoing from the health facility or district health office. This project is more suitable for a district field placement as there are many health facilities reporting to the district health office. It can also be used in health facility sites with slight modification, especially where there are some sub-centres, health posts and other sub-units reporting to the major health centre. This is a sensitive project and the student should always work in collaboration with the supervisor.

Steps to proceed for the preparation of the project:

1. Ask supervisor to provide you with monthly reports received from the health facility for the last year for disease notification and immunization.
2. Start your study by checking the **completeness** of reporting. The completeness of reporting for the particular period is calculated on the basis of the total number of reports expected (**denominator**) and the number of reports received (**nominator**) from health centres or sub-centres. This proportion is expressed by a percentage. If reports are not complete for a district, the cumulative immunization coverage figure will drop and will not reflect the true situation.
3. **Timeliness** of reports. When reports arrive from the field at a district health office, an assessment of the timeliness of the reporting should be assessed. Check dates reports were sent to the district office or health centre to calculate the proportion (%) of the reports that have been received within the deadline for the reporting (**nominator**) out of all expected reports for the same period (**denominator**). Monitoring timeliness is very important. Late reports hinder timely response to outbreaks or other problems.
4. Check the **accuracy** of the report and **verify** if all parts of the reporting form are filled in.
5. Check whether the reports received are for the **particular period** under review (particular month for which reports are supposed to be sent).
6. The report should be **cross checked** to see if there are any miscalculations or misplacement of reported figures, and verify if they make sense. Some tips:
 - Compare BCG vaccination figure <1 year with the number of live births (hospital, clinic and at home) – the former should not be more than the latter.
 - Figures for DPT1 and OPV1 should be the same as these vaccines usually are given during the same visit. The same applies for the figures for the second and third doses of these vaccines.
 - In series vaccination (DPT, OPV, HepB, etc.), the initial doses should not be lower than the subsequent ones. The third doses may be lower due to dropout.
 - If vitamin A is given with the measles vaccine, then numbers of measles vaccination and vitamin A should generally match.
 - Countries in the yellow fever zone in the Region are advised to include the yellow fever vaccination in the EPI immunization schedule to be given with measles vaccine at nine months. If this combination is successfully implemented, the vaccination performance figures should also match.
7. After completing your work, review the results with your supervisor.

6. STUDENT ASSESSMENT/EVALUATION OPTIONS

This consists of various types of evaluations to be carried out at different stages of the course.

6.1 Diagnostic evaluation/assessment

Usually, the course should start with a **diagnostic evaluation** of the prerequisites and expectations of students, which will be done in informal discussions or in a verbal pre-test on a given subject from the immunization course. For example, teacher may ask students questions such as:

- What are the target diseases for immunization programme?
- Which target diseases are pinpointed for global eradication?
- Can you explain at least three vaccines used to immunize children in the African Region?
- Which administrative unit at the MOH is tasked to manage immunization programme in our country?

During this question and answer session, the teacher will make an initial assessment of the group as a whole and will identify some students in the group showing particular interest in the subject.

6.2 Formative evaluation/assessment

This course also applies **formative assessment** of the students' learning processes during daily lessons, which interactions in the synthesis stage at the end of the lesson will reinforce. This curriculum offers various tools for formative assessments of student performance described in various chapters of this document. They are summarized here:

- Assessment checklist – to be used by the teacher observing students' performance during field placement, practical sessions outside, or in the classroom during simulations and role-plays. Some sample checklists are presented above in conjunction with practicum on cold chain and vaccine handling – logistics support (Topic 6.3) and conducting an immunization session (Topic 6.6).
- Sample examination questions presented in the next section can be used for both summative as well as for formative evaluation by selecting appropriate questions related to the lesson.
- Exercises for a number of lessons to bring students closer to real-life situations.
- Case studies assigned to the student during their field placement.
- Projects students to carry out during field placement, supported by field supervisors or the teacher.
- The student record book is a formative assessment tool used by the teacher or field placement supervisor to systematically record students' achievements. It contains an explanation of tasks or skills that students should be able to learn and perform. If the supervisor or teacher thinks that student performance is good enough, he/she signs the book against each task. If the student fails, the errors are explained and the student can try again later. A sample fragment from a record book follows:

TASK	DATE	SIGNATURE Teacher/supervisor
26. Takes appropriate measures when injury happens (e.g. finger prick).		
27. Properly disposes of reconstituted vaccines after the session (or after 6 hours).		
28. Returns vials of unused or opened liquid vaccines to fridge and marks "use first".		

6.3 Summative evaluation

At the end of the course, a **summative (cumulative) evaluation** is proposed to assess the actual achievement of each individual student. This can be carried out in different ways.

- Reviewing and summarizing student achievements during the course of study based on formative assessment results recorded in the student record book.
- Giving written post-tests using sample examination questions. If marks are given, they may be recorded to decide whether the student eventually passes or fails, or the marks may be used only to guide the students.

For medical/nurse/midwife final evaluation, it is strongly recommended to use the objective structured clinical examination (OSCE) using standardized professional stations in accordance with the exit profile of the incumbent. Whatever system is followed, continual assessment offers important advantages in helping students to learn, and in making more accurate and reliable judgements about how much the students have learned.

7. SAMPLE EXAMINATION QUESTIONS AND EXERCISES

This section of the curriculum presents sample examination questions and exercises with an answer guide. The questions and exercises are designed to assist the teacher in the assessment of students by written examination throughout the training or at the end of the course. The presentation of the questions in a table permits students to relate them to the objectives of each topic. The table also takes the user directly to the answers, which saves time and makes the reference much easier.

7.1 Sample examination questions and answers

Topic 1: Immunization systems and operations

LEARNING/TEACHING OBJECTIVES	QUESTIONS/TASKS/EXERCISES	ANSWERS
Describe goals and orientations of immunization programme globally, in the African Region and in host country.	1. What are the global or regional orientations of immunization programmes?	Question 1 <ul style="list-style-type: none"> To achieve and sustain high immunization coverage among target population (90% and above) for all vaccines. To establish reliable disease surveillance for detection of disease cases and outbreaks and ensure an adequate response. Based on the above strategies to implement disease control, elimination and eradication initiatives.
Describe the role and relationship of external environment and health system with immunization programme.		
Outline five key immunization operations.		
Describe three supportive components of immunization programme.		
	2. Explain five key immunization operations and three supportive components of an immunization programme?	Question 2 Immunization operations are: service delivery, logistics, vaccine supply and quality, disease surveillance, advocacy and communication. Immunization services supportive components are: management; sustainable financing. Human and institutional resources strengthening.

Topic 2: Immunization policies, norms and standards

LEARNING/TEACHING OBJECTIVES	QUESTIONS/TASKS/EXERCISES	ANSWERS
Describe the aims and objectives of the national immunization policies.	1. What are the objectives of national immunization policies?	Question 1 <ul style="list-style-type: none"> To provide technically sound basis for immunization. To ensure good quality, safe and effective immunizations. To ensure that immunizations and disease surveillance activities are carried out with established norms and standards.
Describe the steps in the development of national immunization policies.		
Describe the three main directions for global vaccination policies.	2. Who should coordinate national immunization services? Tick the correct answer: a. All stakeholders b. Ministry of Planning c. Donor community d. Ministry of Health e. WHO.	Question 2 d
Interpret the following general norms and guiding principles on immunization:		
<ul style="list-style-type: none"> Community participation Integration of immunization with other child health services Accessibility and equity Quality and safety of immunizations Programme coordination and leadership Role of the national regulatory authorities Rights and responsibilities of service users. 		
	3. What are the most suitable programmes that can be integrated with immunizations?	Question 3 Growth monitoring, vitamin A supplementation, health education, malaria control, deworming and some others depending on country priorities.

Topic 3: Immunization services delivery strategies and innovative approaches

LEARNING/TEACHING OBJECTIVES	QUESTIONS/TASKS/EXERCISES	ANSWERS
<p>Describe the fixed, outreach, mobile and campaign strategies, their advantages and limitations.</p> <p>Decode GIVS and explain what is new in it.</p> <p>Decode RED/REC and describe its five strategic components and challenges.</p> <p>Decode GVAP and what is new in it.</p>	<p>1. What are the advantages and limitations of the following immunization delivery strategies?</p> <ul style="list-style-type: none"> • Fixed strategy • Outreach strategy • Mobile strategy • Immunization campaigns. 	<p>Question 1 <i>Fixed strategy:</i> Advantages: Ensures sustainability, quality and availability of services. Disadvantages: Coverage of remote areas may not be ensured; good results depend on level of motivation of users. <i>Outreach strategy:</i> Advantages: Brings services closer to hard-to-reach people, contributes to equity in health. Disadvantages: It is costly due to need for transport and per diem for staff, in rainy season outreach visits may experience disruption, additional care is needed for the cold chain, transportation of vaccines and other injection materials. <i>Mobile strategy:</i> Advantages: Brings services closer to hard-to-reach people, contributes to equity in health. Disadvantages: It is costly due to need for transport and per diem for staff, additional care is needed for the cold chain, transportation of vaccines and other injection materials. <i>Campaign:</i> Advantages: Ensures high coverage in a short time, interrupts circulation of the causative agent, promotes increased awareness of the immunization. Disadvantages: High cost of the campaign. Campaigns may also distract health workers from their day-to-day activities. Due to increased workload during a short period, the quality of immunizations may be compromised.</p>
	<p>2. What does GIVS/GVAP stand for? Explain at least two innovative approaches that it promotes.</p>	<p>Question 2 GIVS: Global Immunization Vision and Strategy. Among major innovations in this strategy are introduction of more vaccines into immunization programmes (against rotavirus and pneumococcal infection, malaria, HIV/AIDS and tuberculosis) and offering immunizations to children beyond one year of age. GVAP: Global Vaccine Action Plan is the new strategy for the period 2011–2020. It includes six strategic objectives. It is the continuation of GIVS with set indicators to improve monitoring and evaluation aspects.</p>
	<p>3. What does RED stand for? What are the five strategic components of RED?</p>	<p>Question 3 RED/REC: Reaching Every District/Reaching Every Community. The five strategic components are: reaching out to target populations; supportive supervision; links between community and service providers; monitoring for action; planning and management for action.</p>

Topic 4: Target diseases for immunization and disease surveillance

LEARNING/TEACHING OBJECTIVES	QUESTIONS/TASKS/EXERCISES	ANSWERS
<p>Assess the burden of target diseases for African countries and for the host country.</p> <p>Describe the signs and case definition for each of target diseases.</p> <p>Describe the mode of transmission of each target disease.</p> <p>Describe prevention and control strategies of target diseases.</p> <p>Outline diseases surveillance concept and methods/tools.</p> <p>Describe the role of surveillance in epidemic preparedness and response.</p> <p>Describe advantages of integrating different surveillance systems under IDSR.</p> <p>Analyse and interpret disease trends.</p> <p>Prepare disease maps and graphs.</p> <p>Review/extract relevant surveillance information from patient registers.</p> <p>Participate in specimen collection and dispatch to laboratory.</p> <p>Explain the role of disease recording and reporting.</p> <p>Interpret AFP (acute flaccid paralysis) rate as a key polio surveillance indicator.</p> <p>Complete a monthly surveillance report for the health facility visited.</p>	<p>1. Explain the target diseases that can be prevented by immunization.</p> <p>2. Describe three ways in which a newborn baby becomes infected with tetanus.</p> <p>3. What are the advantages of integrated disease surveillance?</p> <p>4. Why are case definitions of target diseases important?</p> <p>5. Which target diseases are under eradication or elimination in Africa?</p> <p>6. What should you do to be prepared for an epidemic of target diseases?</p> <p>7. What is AFP? Tick the correct answer:</p> <p>a. Activity for poliomyelitis b. Africa fights poliomyelitis c. Acute flaccid paralysis d. Action for prevention e. Antigen forming particles.</p>	<p>Question 1 Tuberculosis, poliomyelitis, diphtheria, pertussis, tetanus, measles, yellow fever, hepatitis B, <i>haemophilus influenzae</i> type b.</p> <p>Question 2</p> <ul style="list-style-type: none"> • The knife, razor or other instrument used to cut the cord is dirty. • Cow dung, ash, earth, herbs are placed on the cord stump. • The hands of the person who delivers the baby are not clean. <p>Question 3 Saving resources, sharing information among various programmes, joint monitoring and supervision, improving laboratory capacity in identification of various pathogens.</p> <p>Question 4 Case definitions help to make correct diagnosis and provide accurate reporting of target diseases to the next level of health services. They also facilitate early treatment of diseases and timely undertaking of control measures to prevent epidemics.</p> <p>Question 5 Poliomyelitis, neonatal tetanus, measles (also leprosy and guinea worm (dracunculosis)).</p> <p>Question 6 Planning, training of staff in epidemic response, piling up of an emergency stock including specimen collecting kits, laboratory reagents, establishing community surveillance.</p> <p>Question 7 c</p>

Topic 5: Vaccinology and the Expanded Programme on Immunization and vaccines

LEARNING/TEACHING OBJECTIVES	QUESTIONS/TASKS/EXERCISES	ANSWERS
<p>Describe different types of immunity and immune response mechanisms.</p> <p>Outline immunity in relation to immunization.</p> <p>Explain the different types of vaccines:</p> <ul style="list-style-type: none"> • Monovaccines and combination vaccines • Live and killed vaccines • Bacterial and viral vaccines • Sub-unit vaccines (toxoids, polysaccharides, etc.) • Liquid vaccines and lyophilized (dry) vaccines. <p>Explain most common new vaccines.</p> <p>Characterize vaccine of the future (ideal vaccine).</p> <p>Explain vaccines used in national immunization programmes.</p> <p>Differentiate vaccines from other drugs.</p>	<p>1. Explain different types of immunity and give examples.</p> <p>2. What is herd immunity? Tick the correct answer:</p> <ol style="list-style-type: none"> a. Immunity that develops when a group of people are vaccinated together b. Immunity induced by vaccines used in veterinary practice c. Immunity that develops in not-immunized persons who are in a community well covered (vaccinated) with a live vaccine d. Immunity developed in humans after using vaccines tested on animal herds. <p>3. Explain the types of vaccines and give examples.</p>	<p>Question 1 <i>Specific:</i> Developed by antigen, e.g. by vaccines; <i>non-specific:</i> general resistance of the body as a first-line protection. <i>Natural:</i> After measles infection; <i>artificial:</i> immunization against measles. <i>Active:</i> Induced by vaccines or toxoids; <i>passive:</i> acquired through gamma globulins or through the mother's blood.</p> <p>Question 2 c</p> <p>Question 3 <i>Live-attenuated vaccines:</i> OPV (Sabin), BCG and vaccines against measles, mumps, rubella, yellow fever. <i>Killed vaccines:</i> Killed polio (Salk) and pertussis vaccines. <i>Sub-unit vaccines:</i> Toxoids (tetanus or diphtheria toxoids) and acellular vaccines (acellular pertussis vaccine), genetically engineered vaccines (hepatitis B vaccine). <i>Viral vaccines:</i> OPV and vaccines against measles, mumps, rubella, yellow fever. <i>Bacterial vaccines:</i> Vaccines against cholera, pertussis. <i>Liquid vaccines:</i> DPT, polio vaccines. <i>Lyophilized (dry) vaccines:</i> BCG, measles vaccine. <i>Monovaccines:</i> Vaccine against measles, yellow fever, cholera. <i>Combination vaccines:</i> DPT, DT, polio (with 1, 2, 3 serotypes).</p>
	<p>4. Which diseases does the DPT vaccine protect against? Tick the correct answer:</p> <ol style="list-style-type: none"> a. Diphtheria, polio and tetanus b. Diphtheria, pertussis and tetanus c. Diphtheria, pertussis and tuberculosis. <p>5. Describe the characteristics of an “ideal vaccine”.</p>	<p>Question 4 b</p> <p>Question 5 The ideal vaccine must be immunogenic, safe, and stable in field conditions, combined with several antigens and should provide long-lasting immunity. It should also be affordable.</p>

Topic 6.1: Immunization service delivery and vaccine administration

LEARNING/TEACHING OBJECTIVES	QUESTIONS/TASKS/EXERCISES	ANSWERS
<p>Describe immunization schedule recommended by WHO and the host country:</p> <p>a) What vaccines children should have before their first birthday (fully immunized child – FIC)?</p> <p>b) When to give TT to women, the dosage, number of doses, period of protection?</p> <p>State target groups for immunization programmes in the African Region/host country?</p> <p>For each vaccine, state the number of doses to be given, the optimal age for each dose, the dosage and the route of administration.</p> <p>Specify the minimum interval between doses of the same vaccine.</p> <p>Explain basis for simultaneous administration of vaccines.</p>	<p>1. Describe immunization schedule recommended by WHO.</p>	<p>Question 1 <i>Schedule with traditional EPI vaccines:</i> At birth: BCG, OPV0 6 weeks: DPT1, OPV1 10 weeks: DPT2, OPV2 14 weeks: DPT3, OPV3 9 months: Measles. <i>Schedule with pentavaccine:</i> At birth: BCG, OPV0, (HepB0) 6 weeks: DPT-HepB/Hib1, OPV1 10 weeks: DPT-HepB/Hib2, OPV2 14 weeks: DPT-HepB/Hib3, OPV3 9 months: Measles.</p>
	<p>2. A two-month old child is brought to the immunization session for the first time. He has not yet received any vaccine. Which vaccine should the health worker give him at this first visit? Tick the correct answer:</p> <p>a. DPT, measles, OPV b. DPT, OPV, BCG c. BCG d. DPT and OPV e. DPT and measles.</p>	<p>Question 2 b</p>
	<p>3. What are the target populations for EPI in the African Region?</p>	<p>Question 3</p> <ul style="list-style-type: none"> • Children 0–11 months of age • Pregnant women • Women of child bearing age.
	<p>4. Who is a fully immunized child (FIC)?</p>	<p>Question 4 A child who completed his/her primary vaccination series, i.e. BCG, DPT3, OPV3 and measles.</p>
	<p>5. What is the minimum interval between DPT1 and DPT2? Tick the correct answer:</p> <p>a. Two weeks b. Three weeks c. Four weeks d. Six weeks.</p>	<p>Question 5 c</p>
	<p>6. Simultaneous administration of several vaccines. Tick the correct answer:</p> <p>a. It is harmful, not recommended b. It can disturb development of immunity against each vaccine, not recommended c. It produces as good immunity against each vaccine as the use of single vaccines, recommended injection.</p>	<p>Question 6 c Experience and studies have shown that the human body can successfully develop immune response to 10–12 and even more antigens given simultaneously or in a combination vaccine.</p>

LEARNING/TEACHING OBJECTIVES	QUESTIONS/TASKS/EXERCISES	ANSWERS
	<p>7. Why we should give five doses of TT to women?</p>	<p>Question 7 To induce immunity throughout her child-bearing age for the protection of her new born babies from neonatal tetanus.</p>
	<p>8. When should the first dose of TT in pregnancy be given? Tick the correct answer:</p> <ul style="list-style-type: none"> a. When foetal movements are felt b. As early as possible in pregnancy c. As early as possible during the second trimester d. At least two weeks before expected delivery. 	<p>Question 8 b Giving TT early in pregnancy, even during the first semester, will not harm the foetus. It will increase woman's chances to receive two doses of TT before delivery and ensure infant's protection against neonatal tetanus.</p>

Topic 6.2: How to administer EPI vaccines and vitamin A

LEARNING/TEACHING OBJECTIVES

QUESTIONS/TASKS/EXERCISES

ANSWERS

<p>Check conditions of vaccines and diluent before use. Reconstitute vaccines as appropriate. Administer the vaccine at correct site, using the correct technique (oral or by injection: intradermal, subcutaneous, intramuscular). Maintain sterile technique throughout vaccine administration. Apply correct waste disposal practice after injection.</p>	<p>1. Indicate at least three conditions when the health worker should discard the vaccine or the diluent.</p>	<p>Question 1 When vaccine is expired. When liquid vaccine has been frozen. When label of vaccine or diluent is detached. When VVM (vaccine vial monitor) has reached discard point. Reconstituted vaccines: BCG, measles etc., are discarded after 6 hours or at the end of vaccination session.</p>
	<p>2. How is BCG is administered? Tick the correct answer:</p> <p>a. Orally b. By intradermal injection c. By intramuscular injection d. By subcutaneous injection.</p>	<p>Question 2 b</p>
	<p>3. How should DPT vaccine be given? Tick the correct answer:</p> <p>a. Intramuscularly in the upper thigh b. Intramuscularly in the upper arm c. Subcutaneously in the upper thigh d. Subcutaneously in the upper arm.</p>	<p>Question 3 a</p>
	<p>4. What is the correct dose of measles vaccine? Tick the correct answer:</p> <p>a. 0.05 ml b. 0.5 ml c. 1 ml d. 1.5 ml.</p>	<p>Question 4 b</p>
	<p>5. When should a sterile syringe and sterile needle be used? Tick the correct answer:</p> <p>a. For the next child if the needle is changed between the children b. Until all the vaccine in the syringe is finished c. For all the vaccines but for one child only. d. For one injection only.</p>	<p>Question 5 d</p>
	<p>6. How full should a safety box be loaded with used syringes/needles? Tick the correct answer:</p> <p>a. 100% b. 75% c. 50%.</p>	<p>Question 6 b (to prevent finger pricks when loading)</p>
	<p>7. Name two infections that may be transmitted through re-use of non-sterile needles and syringes.</p>	<p>Question 7 HIV infection Hepatitis B and other hepatitis of viral origin.</p>

Topic 6.3: Cold chain and vaccine handling – logistics support

LEARNING/TEACHING OBJECTIVES	QUESTIONS/TASKS/EXERCISES	ANSWERS
<p>Describe the cold chain system from the time the vaccine leaves the manufacturer to the time it reaches target child or woman.</p> <p>Select appropriate cold chain equipment.</p> <p>Explain data used for calculation of vaccine storage capacity of the cold chain.</p> <p>Load and use the refrigerator/freezer.</p> <p>Read, record and interpret the refrigerator temperature.</p> <p>Handle cold chain emergencies.</p> <p>Explain health worker tasks for cold chain maintenance.</p> <p>Master the technique of the shake test.</p> <p>Interpret vaccine vial monitor (VVM) changes.</p> <p>Indicate causes of vaccine wastage.</p> <p>Indicate data needed to forecast vaccine and other logistics (diluent, syringes, safety boxes, etc.) needs. List three methods of estimating vaccine needs. Calculate vaccine reserve stock level.</p> <p>Define when to order vaccines.</p> <p>Interpret WHO policy on the use of opened vial of multi-dose vaccines.</p>	<p>1. Describe the cold chain system from the time the vaccine leaves the manufacturer to the time it reaches target child or woman.</p> <p>2. Explain types of cold chain equipment monitors and vaccine stock management forms.</p> <p>3. Explain factors used for calculation of vaccine storage capacity of the cold chain.</p> <p>4. Which of the EPI vaccines are damaged if frozen? Tick the correct answer:</p> <p>a. OPV b. DPT c. BCG d. Measles e. TT f. HepB.</p> <p>5. What is the maximum temperature for storage of EPI vaccines in a health centre? Tick the correct answer:</p> <p>a. at +4°C b. at +6°C c. at -2°C d. at +8°C e. at +10°C f. at +12°C.</p>	<p>Question 1 Manufacturer → Airplane → Airport cold room → Central vaccine store → Province/district vaccine store → Health centre refrigerator/Vaccine carrier → Immunization site → Target child or woman.</p> <p>Question 2 <i>Equipment:</i> Cold room, freezer, refrigerator, refrigerator-freezer, cold box, vaccine carrier, ice packs. <i>Temperature monitors:</i> Vaccine vial monitor (VVM), time/temperature tag (3M card), dispatch indicator for TT, freeze watch indicator, Stop watch thermometers. <i>Vaccine management forms:</i> Order form, vaccine arrival report (VAR), delivery form, vaccine register, vaccine stock sheets.</p> <p>Question 3 A: Total number of target population for the year. B: Targeted vaccination coverage rate. C: Number of doses for each vaccine as per schedule. D: Total number of doses needed for the year. E: Unit volume of each packed vaccine dose in cm³. The annual volume requirements then can be derived by multiplying D by E.</p> <p>Question 4 b, e and f</p> <p>Question 5 d</p>

LEARNING/TEACHING OBJECTIVES	QUESTIONS/TASKS/EXERCISES	ANSWERS
	<p>6. The shake test. Tick the correct answer:</p> <ol style="list-style-type: none"> Is used to thoroughly mix reconstituted measles vaccine Will reactivate vaccine that has passed the expiry date Will indicate if DPT or TT have been frozen Will reactivate DPT or TT that have been frozen Is used to mix different vaccines in a single vial Is used before the injection to mix sediment in the vial which has the active component of the vaccine. 	<p>Question 6 c</p>
	<p>7. One morning after a two-day holiday, you checked the vaccine refrigerator and find that it is not working. What must you do immediately?</p>	<p>Question 7</p> <ol style="list-style-type: none"> Check the temperature in the main compartment and if there are frozen ice packs in the freezer. If the temperature is below +8°C and there is ice in the freezer compartment, the vaccines are not yet damaged and can be transferred to another refrigerator or packed with the frozen ice packs in a vaccine carrier. If there are no frozen ice packs in the freezer or the temperature is above +8°C, the vaccines cannot be used as they may be damaged, and the supervisor should be informed immediately.
	<p>8. Explain six important rules to be followed when you store vaccines in a refrigerator at the health centre.</p>	<p>Question 8</p> <p>The answer should include six of the following rules:</p> <ul style="list-style-type: none"> Keep vaccines on the top and middle shelves of the main compartment. Stock vaccines in such a way that air can circulate between the boxes. Keep plastic bottles of water or spare ice packs on the lower shelf of the main compartment. Keep the diluent of measles vaccine and BCG in the main compartment with the vaccines because when warm diluent is used for reconstitution, the vaccine will quickly lose its potency. Keep a special box in the main compartment for vaccines “returned” from immunization session. Freeze ice packs and ice cubes in the freezer compartment. Do not put any food or drink in the refrigerator. Do not put any other drugs in the refrigerator. Do not store any vaccine in the door shelves. Do not keep expired vaccines in the refrigerator. Do not unnecessarily open the door of the refrigerator. Record temperature of the refrigerator twice daily on the temperature monitoring chart.

LEARNING/TEACHING OBJECTIVES	QUESTIONS/TASKS/EXERCISES	ANSWERS
	<p>9. Interpret vaccine vial monitor (VVM) changes.</p>	<p>Question 9 VVM is a heat-sensitive device for vaccine vials, which gradually and irreversibly changes colour from light to dark, as the vaccine is exposed to heat. It is a square within a circle made of heat-sensitive material. If the inner square is lighter than the outside circle, the vaccine can be used. The vial should be discarded when the inner square has the same colour or has become darker than the outside circle.</p>
	<p>10. What is the vaccine wastage rate? Tick the correct answer: a. A rate showing proportion of vaccines received from manufacturer against amount of vaccines ordered b. A rate showing how much vaccine has been used during an immunization session c. It is an amount (proportion) of vaccine lost for various reasons: poor vaccination technique, cold chain breakdown, passed expiry date, freezing liquid vaccines, etc. d. A rate showing amount of vaccine you have misplaced and can not find to use for the immunization session.</p>	<p>Question 10 c</p>
	<p>11. From the list below, select at least four key items needed to forecast your measles vaccine needs for the next year: a. Total population of the country for the next year b. Number of measles cases in the current year c. Number of mothers/caregivers who refuse to bring their children for measles vaccination d. Number of pre-school children for the next year e. Desired level of measles immunization coverage for the next year f. Wastage rate for measles vaccine g. Number of doses required for measles immunization as per national immunization schedule h. Estimated number of contraindications for measles immunization during the next year.</p>	<p>Question 11 a, e, f and g</p>

LEARNING/TEACHING OBJECTIVES	QUESTIONS/TASKS/EXERCISES	ANSWERS
	<p>12. Which of the vaccines mentioned below can be used beyond six hours or in subsequent immunization sessions if certain conditions are met?</p> <p>a. OPV b. Measles c. BCG d. DPT e. TT f. HepB</p>	<p>Question 12 a, d, e and f</p> <p>Refer to the revised multi-dose vial policy 2014. (All opened WHO-prequalified multi-dose vials of vaccines should be discarded at the end of the immunization session, or within six hours of opening, whichever comes first, UNLESS the vaccine meets all four of the criteria listed below. If the vaccine meets the four criteria, the opened vial can be kept and used for up to 28 days after opening. The criteria are as follows:</p> <ol style="list-style-type: none"> 1. The vaccine is currently prequalified by WHO. 2. The vaccine is approved for use for up to 28 days after opening the vial, as determined by WHO. 3. The expiry date of the vaccine has not passed. 4. The vaccine vial has been, and will continue to be, stored at WHO- or manufacturer-recommended temperatures; furthermore, the vaccine vial monitor, if one is attached, is visible on the vaccine label and is not past its discard point, and the vaccine has not been damaged by freezing. <p>The revised policy does not change the normal procedures for handling vaccines such as BCG and measles or other freeze-dried vaccines that must be reconstituted before use.</p>

Topic 6.4: Immunization safety

LEARNING/TEACHING OBJECTIVES

Explain factors affecting the quality of vaccines (e.g. contamination, heat, freezing of liquid vaccines, etc.).
 Provide basic information on vaccine diluents.
 Describe safe injection practices.
 State contraindications to immunization.
 Describe adverse events following immunization (AEFI), causes of AEFIs and the appropriate action to be taken (reporting, investigation, public information, etc.).
 Explain advantages of AD (auto-disable) syringes versus sterilizable material.
 Describe how to use safety boxes.
 Describe requirements for safe disposal of immunization waste.

QUESTIONS/TASKS/EXERCISES

1. Explain factors affecting the quality of vaccines.
 - a. Any diluent can be used for reconstituting any vaccine
 - b. Diluents are specific for each vaccine
 - c. Diluent is sterile water used for reconstitution of freeze-dried vaccines
 - d. Diluents contain certain chemicals that enhance, stabilize or protect reconstituted vaccines from contamination
 - e. Diluent can be frozen with vaccines to be reconstituted
 - f. Diluent must not be frozen but cooled to below +8°C before reconstitution.
2. Diluents. Tick the correct answers:
 - a. AD syringe automatically disables itself after one injection and makes the syringe ready for another injection.
 - b. Sharps disposal boxes (safety boxes) must never be filled 100%, but 75% to prevent needle stick injuries while loading them.
 - c. No needle must ever be recapped after use – this practice leads to needle pricks.
 - d. To prevent damage to the safety box by sharp needles, the needle after injection should be carefully capped and put into safety box.
 - e. Never should the needle be left inserted in the vial cap.
 - f. Burn the safety boxes with syringes and needles in a pit and bury them deeply in the ground (0.5m below the surface).
3. Mark “false” or “true” against each statement below:
 - a. AD syringe automatically disables itself after one injection and makes the syringe ready for another injection.
 - b. Sharps disposal boxes (safety boxes) must never be filled 100%, but 75% to prevent needle stick injuries while loading them.
 - c. No needle must ever be recapped after use – this practice leads to needle pricks.
 - d. To prevent damage to the safety box by sharp needles, the needle after injection should be carefully capped and put into safety box.
 - e. Never should the needle be left inserted in the vial cap.
 - f. Burn the safety boxes with syringes and needles in a pit and bury them deeply in the ground (0.5m below the surface).

ANSWERS

- Question 1**
 Contamination, heat, freezing of liquid vaccines, use of inadequate dose, reconstitution of freeze-dried vaccines with improper diluent, reconstitution of vaccine stored in freezer with diluent that was kept at room temperature, use of expired vaccines/diluents.
- Question 2**
 b, d, f
- Question 3**
 a False
 b True
 c True
 d False
 e True
 f True

LEARNING/TEACHING OBJECTIVES	QUESTIONS/TASKS/EXERCISES	ANSWERS
	<p>4. Tick the true contraindications to immunizations from the following:</p> <ul style="list-style-type: none"> a. Minor illness with fever <38° C b. Malnutrition c. HIV infection d. HIV infection with symptoms (AIDS) for BCG e. HIV infection with symptoms (AIDS) for EPI vaccines except for BCG f. Child being breastfed g. History of jaundice after birth h. The vaccine whose previous dose has caused severe adverse event to the individual (anaphylaxis, collapse/shock). <p>5. What are the causes of adverse events following immunization (AEFI)?</p>	<p>Question 4 d and h</p> <p>Question 5 The causes are twofold: vaccine reaction and programmatic errors. MLM module 9. <i>Vaccine reactions:</i> associated with properties of vaccines: local reactions – redness, soreness at injection site; rare mild systemic reactions – fever, irritability; very rare severe systemic reactions – anaphylactic shock, convulsion. <i>Programmatic errors:</i> incorrect injection site or route, incorrect dose of vaccine, wrong diluent, contamination of vaccine vial or syringes/needles, reuse of disposable syringes/needles, etc.</p> <p>Question 6 Treatment, reporting, investigation, public information, corrective actions to minimize AEFIs (training of staff, provision of necessary supplies, staff rotation, etc.).</p>
	<p>6. Describe actions to be taken when AEFI occurs.</p> <p>7. Is the abscess at injection site a normal side-effect after immunization or an AEFI?</p>	<p>Question 7 AEFI</p>

Topic 6.5: How to organize an immunization session

LEARNING/TEACHING OBJECTIVES

QUESTIONS/TASKS/EXERCISES

ANSWERS

<p>Explain all the materials necessary for an immunization session.</p> <p>Estimate the average number of immunization sessions to be held per month/week.</p> <p>Estimate quantities of injection materials and vaccines needed.</p> <p>Prepare vaccine carriers, cold boxes and ice packs.</p> <p>Pack a vaccine carrier with vaccines and ice packs.</p> <p>Keep vaccines at the correct temperature in a vaccine carrier.</p> <p>Protect vaccines during transport.</p>	<p>1. Explain all the materials necessary for an outreach immunization session.</p>	<p>Question 1 <i>Vaccines and diluents</i> <i>Cold chain equipment:</i> Vaccine carrier/cold box, icepacks, thermometer. <i>Injection equipment:</i> AD syringes/needles for injections, syringes for reconstitution of dry vaccines, sterile forceps, safety box. <i>Equipment and medicine for other tasks:</i> Weighing scale, rope and bag, scissors, vitamin A capsule, paracetamol. <i>Health education materials:</i> Posters and leaflets. <i>Stationery:</i> Children’s clinic cards, tally sheets, pen.</p>
	<p>2. What are the common estimates of proportions of target populations to be vaccinated?</p>	<p>Question 2 Children 0–11 months estimated range: 3–4%. Pregnant mothers estimated range: 3–4%. Women of child-bearing age estimated range for various countries: 20–25%.</p>
	<p>3. What is your annual target population for children <1 year of age if your health centre covers a population of 8000 people? Tick the correct answer: a. 320 b. 375 c. 240 d. 275.</p>	<p>Question 3 $(8000:100) \times 3 = 240$</p>
	<p>4. Your target population of children <1 year is 250. Each child will come to your health centre for vaccination four times (for DPT1, DPT2, DPT3 and measles vaccine). Your immunization sessions can handle 20 children per session, so that you have enough time for each mother and child. How many immunization sessions should you hold per month in your health centre?</p> <p>5. At the end of a morning immunization session, which usually lasts more than six hours, any remaining reconstituted vaccine should be? Tick the correct answer: a. Kept carefully covered with aluminium foil and on ice for the afternoon session or the following day. b. Covered with foil to keep out contamination and used for the afternoon session or the following day. c. Carefully marked and put in the “return” box in the refrigerator, and used for the afternoon session or the following day. d. Thrown away and a new vial opened for the afternoon session or for the following day.</p>	<p>Question 4 4 sessions/month $(250 \times 4):(12 \times 20) = 4$ session per month (one session per week)</p> <p>Question 5 d (Once reconstituted, vials of these vaccines must be discarded at the end of each immunization session or at the end of six hours, whichever comes first).</p>
	<p>6. How should vaccines be kept cold at an immunization session? a. Opened vaccine vial that is being used b. Unopened vials.</p>	<p>Question 6 a. In a cap with ice cubes or on a frozen ice pack. b. Inside the closed vaccine carrier in the shade.</p>

Topic 6.6: Conducting an immunization session

LEARNING/TEACHING OBJECTIVES

Arrange a site for an immunization session.
 Organize work areas and staff.
 Check and maintain the temperature in the vaccine carrier at the correct level; protect vaccines from sunlight.
 Register new attendances.
 Screen each client and identify correct action to be taken.
 Weigh babies and provide mothers with nutritional advice; assess and treat sick children.
 Immunize women and children according to immunization schedule.
 Discard safely used materials.
 Make proper records on performed vaccinations.
 Give key messages to caregiver after first immunization is performed.

QUESTIONS/TASKS/EXERCISES

- 1. Explain three points you should remember when choosing a suitable immunization site for an outreach immunization session.**
- 2. Explain at least five activities to be undertaken by the health worker in conducting an immunization session.**

ANSWERS

- Question 1**
 The answer should include three of the following:
- Find a site with shade.
 - Find a site with more light.
 - Find a well-ventilated site.
 - Find a site with enough space.
 - Find a site protected from rain.
- Question 2**
 The answer should include five of the following:
- Greet the mother/caregiver.
 - Ask if the child has any symptoms or sickness.
 - Examine the child and treat if appropriate.
 - Weigh the child and give nutritional advice.
 - Check immunizations given (BGG scar and by the immunization card).
 - Ask the mother her TT status.
 - Decide which immunizations are due.
 - Explain about them.
 - Perform appropriate immunizations.
 - Record immunizations given (on tally sheet and immunization card).
 - Tell mother/caregiver about possible side-effects and what to do about them.
 - Tell mother/caregiver when the child should be brought again or when the mother should return for her next TT injection.
 - Thank the mother/caregiver and answer any questions they may have.
 - Safely dispose injection waste.
 - Discard reconstituted vaccines at the end of the session (or after six hours).
 - Take the open vials of liquid vaccines to the fridge for use during next session.
 - Clean up the immunization site.

LEARNING/TEACHING OBJECTIVES	QUESTIONS/TASKS/EXERCISES	ANSWERS
	<p>3. While checking vaccination cards of three children, the nurse noted the following dates for DPT immunizations:</p> <p>First child: DPT1: 3/1/2004 DPT2: 26/1/2004 DPT3: 26/2/2004</p> <p>Second child: DPT1: 20/3/2004 DPT2: 19/4/2004 DPT3: 23/7/2004</p> <p>Third child: DPT1: 5/6/2004 DPT2: 5/7/2004 DPT3: 5/8/2004.</p> <p>Which of these three children have successfully completed their DPT immunizations with valid doses of each vaccine?</p>	<p>Question 3 The second and third children have successfully completed their DPT series. The second child received their DPT3 after more than three months of DPT2, all of their shots are valid as there is no maximum interval between doses of the same vaccine. The immunization of the first child is not complete; their DPT2 was not valid because it had been given in less than the required four-week interval (the minimum interval). They needed another dose of DPT after 3 September 2004 to complete the DPT series.</p>
	<p>4. What are the five key messages that the health worker should tell the mother/caregiver?</p>	<p>Question 4</p> <ul style="list-style-type: none"> • The date and time of the next immunization. • Which vaccines were given. • The place of the next immunization. • The number of visits a child still needs to be fully immunized/women needs to complete her TT series. • What side-effects may occur? • How the side-effects can be treated?

Topic 6.7: Communication for immunization programmes

LEARNING/TEACHING OBJECTIVES	QUESTIONS/TASKS/EXERCISES	ANSWERS
<p>Describe the role and importance of communication in immunization.</p> <p>Explain basic communication methods used in immunization.</p> <p>Motivate a community for immunization.</p> <p>Factors to be considered when planning on communication.</p> <p>Plan immunization activities with the community.</p> <p>Provide information on immunization to groups and to individuals.</p> <p>Explain five key messages to care takers after immunization session.</p> <p>Describe how to handle rumours on immunization.</p> <p>Describe the role of Interagency Coordination Committee in communication and advocacy.</p>	<p>1. What is the role of communication in immunization?</p> <p>2. What are the burning issues in immunization that communication can address or intervene?</p> <p>3. What can the community contribute in communication for immunization?</p> <p>4. What are the barriers and challenges for communication in immunization?</p>	<p>Question 1 Communication is among key components of immunization operations. It promotes awareness, acceptance and demand for immunization among users. This helps EPI to achieve high coverage of immunization, reduction of morbidity/mortality from vaccine-preventable diseases, improved quality of services and resource mobilization through advocacy among stakeholders and partners.</p> <p>Question 2 Addressing high dropout from immunization. Addressing hard-to-reach populations through RED strategy. Involvement of communities in disease surveillance (community surveillance). Immunization campaigns (SIAs, NIDs). Immunization safety, AEFIs. Introduction of new vaccines, etc.</p> <p>Question 3 Providing communication site to address the community. Ensuring availability of caregivers/parents. Providing community volunteers. Providing incentives in money or in kind to community volunteers or health workers. Providing communication tools (e.g. radio, PA equipment, transport, etc.). Discussing communication issues in the health development committees. Participating in planning, monitoring and evaluation of communication programmes.</p> <p>Question 4 Insufficient information to users (on dates, place of immunization sessions, on side-effects of vaccines). Poor communication skills of health workers. Confusing messages on immunization. Lack of community involvement in planning communication activities. Resistance to immunization among certain population groups (“refusers”). Lack of communication materials in local languages. Rumours about immunizations, etc. Frequent missed opportunities for immunization.</p>

LEARNING/TEACHING OBJECTIVES	QUESTIONS/TASKS/EXERCISES	ANSWERS
	<p>5. Mark “false” or “true” against each of the following communication messages:</p> <ul style="list-style-type: none"> a. Immunization can help your child gain in body weight. b. One sterile syringe and one sterile needle for each injection. c. Polio vaccine can prevent your child from all kind of disabilities. d. Immunization is effective but still a few immunized children can be sunized, they will be the best student in the school in future. h. TT immunization to you will save your baby from neonatal tetanus and measles. 	<p>Question 5</p> <ul style="list-style-type: none"> a False b True c False d True e True f False g False h False

Topic 7.1: Introduction to immunization programme management

LEARNING/TEACHING OBJECTIVES	QUESTIONS/TASKS/EXERCISES	ANSWERS
<p>Explain aims and objectives of the Mid-level Management (MLM) course and its target audience.</p> <p>Comment on teaching methodology of the MLM course which emphasizes participatory training.</p> <p>Explain and make use of MLM course modules, EPI training and audio-visual materials and electronic media references.</p> <p>Describe the main steps of problem solving process to immunization service management.</p> <p>Identify roles, responsibilities and qualities of a national EPI manager</p> <p>Explain the management of EPI human resources for optimising EPI team's output.</p> <p>Describe the leadership responsibilities assigned to each level of the national health system.</p>	<p>1. Explain why management training is important to run immunization programmes.</p> <p>2. Explain at least five problems/constraints which can affect the execution of the immunization programmes.</p>	<p>Question 1 The management training improves planning, monitoring and evaluation of immunization programme. It also contributes to better coordination and communication among staff and various players. It is especially useful to newly appointed managers and teachers at training institutions.</p> <p>Question 2 The answer should include five of the following:</p> <ul style="list-style-type: none"> • Lack of human/financial resources • Vaccine stockout • Cold chain failure • Lack of training of staff • Low motivation of staff • High dropout rate • Episode of an AEFI • Unfavourable rumours about vaccines • Disease occurring among immunized children • Inaccessible populations • Lack of community support • Transport breakdown.
	<p>3. What are the general steps in the problem-solving process? Link them with the immunization programme.</p>	<p>Question 3 The problem-solving cycle:</p> <ul style="list-style-type: none"> • Step 1: Identify the problem (low DPT3 coverage) • Step 2: Document the problem (DPT3 <30%) • Step 3: Involve others (call for ICC meeting) • Step 4: Explain possible solutions (1: more funds; 2: more staff; 3: more outreach) • Step 5: Choose the best solution (more outreach) • Step 6: Implement (act on micro-plan) • Step 7: Evaluate the results (60% DPT3) • Step 8: Start over (aim at 80% of DPT3 next year).
	<p>4. Explain the titles of at least five officials in the health systems who are involved in management of immunization programmes in your country.</p>	<p>Question 4 The answer should include five of the following officials:</p> <ul style="list-style-type: none"> • Minister of health • Permanent secretary • Directors of technical departments • Head of human resources department • Head of finance/administration department • Head of MCH unit • Head of HMIS • National EPI manager • National cold chain manager • National disease surveillance officer • Head of central vaccine store.

Topic 7.2: Planning immunization activities and financial management

LEARNING/TEACHING OBJECTIVES	QUESTIONS/TASKS/EXERCISES	ANSWERS
<p>Explaining fundamental principles/ basic concepts in planning.</p> <p>Describe the steps when developing a plan:</p> <ul style="list-style-type: none"> • Situation analysis • Selecting priority problems • Setting the objectives and targets • Determining strategies and activities • Quantifying the resources and preparing relevant budget • Monitoring implementation of the plan. <p>Describe the concept of a micro-plan.</p> <p>Indicate conditions supporting financial sustainability of immunization services.</p>	<p>1. Describe the steps in developing an immunization plan.</p> <p>2. Qualify the following plans as “strategic” or “operational” and give your reasoning.</p> <ol style="list-style-type: none"> Country EPI plan for January 2015 to January 2016 District micro-plan to improve access to hard-to-reach communities for the 1st quarter 2015 Country EPI plan, 2015–2020 Country cold chain plan 2015 Financial sustainability plan 2015–2020. <p>3. Explain the basic criteria for selection of priorities in planning immunization activities. Use measles as an example.</p>	<p>Question 1</p> <ul style="list-style-type: none"> • Situation analysis to select priority problems. • Setting the objectives/targets. • Determining the strategies and activities. • Quantifying the resources and preparing relevant budget. • Monitoring/implementation. • Evaluating the plan. <p>Question 2</p> <ol style="list-style-type: none"> Operational Operational Strategic Operational Strategic.
	<p>4. What is a micro-plan? Tick the correct answer:</p> <ol style="list-style-type: none"> It is a tiny fragment of a macro-plan It is a plan to control a microorganism that causes EPI target diseases It is a detailed operational plan with clear indication of specific activities, responsible persons, resources, place and time of activities It is a plan that deals only with outreach visits to hard-to-reach areas. <p>5. What should the EPI manager do to achieve financial sustainability? Tick the correct answers:</p> <ol style="list-style-type: none"> They should recruit a good finance officer in the EPI team They should prepare a sound strategic plan in consultation with stakeholders and partners They should exclude expensive vaccines from the immunization schedule to reduce programme costs They should encourage the government to progressively contribute to programme costs (e.g. cost of vaccines) to achieve full ownership of the programme in future. 	<p>Question 3</p> <p><i>Magnitude of the problem (e.g. high mortality from measles). Seriousness of the problem (contributes to high child mortality). Socioeconomic impact (loss of future working force affecting the trust in health services). Population at high risk (children <5). Technical feasibility for control (very high). Availability of cost-effective interventions (measles vaccine is highly cost-effective). Financial affordability (vaccine is cheap /affordable). Perception of beneficiaries (beneficiaries support immunization). Perception of actors/partners (highly supportive to measles immunization, they provide resources).</i></p> <p>Question 4</p> <p>c</p> <p>Question 5</p> <p>b and d</p>

Topic 7.3: Supervision by programme managers

LEARNING/TEACHING OBJECTIVES

Describe the aim/objectives and main benefits of supervision.
 Distinguish between the monitoring, supervision, evaluation and follow up concepts.
 Comment on different supervision styles by supervisors.
 Comment on benefits of supportive supervision.
 Explain why integrated supervision is more appropriate for African countries.
 Explain the main questions of a supervision checklist.
 Describe arrangements for and the process of a supervisory visit.
 Design a supervisory report.
 Describe follow up actions after the supervisory visit.

QUESTIONS/TASKS/EXERCISES

1. Why supervision is necessary?

ANSWERS

Question 1
 • To ensure achievements of work objectives.
 • To assist health workers provide quality services.
 • To ensure uniformity of performance with established standards.
 • To identify specific needs in staff training, supplies, technical information, etc.
 • Maintaining the administrative and technical links between higher and lower level of health-care system.

2. What are the benefits of a supportive supervision?

Question 2
 Supportive supervision:
 • Builds skills
 • Focuses on performance improvement through positive interaction between supervisor and supervisee
 • Includes on-the-job training
 • Ensures proper feedback which includes lessons learnt from other experiences
 • Increases accountability and helps health workers to see the progress in their work.

3. How is integrated supervision carried out?

Question 3
 Integrated supervision is carried out by well-trained multi-purpose teams using supervision tools that include key issues of essential programmes in line with PHC strategy. It strengthens internal relationships in the health system and collective solution of identified problems.

4. Which are the elements of the supervision process?

Question 4
 Supervision plan, supervision checklist, supervisory visit and supervisory report.

5. Please indicate which style of supervision is represented in the following addresses by various supervisors? Use “D” for democratic style; “A” for autocratic; and “C” for causal style against each request.

Question 5
 a A b C c A
 d D e D f C

- a. Bring me your report on TT coverage that I asked you to prepare during my last visit.
- b. You guys, you have asked me to explain how to calculate vaccine wastage rate. I am here for you!
- c. Why did you not include this measles case in your January report?
- d. I am sure you have accomplished the task that we discussed together during my last visit.
- e. I have taken note on your needs for a new refrigerator. I will come back to you as soon as I find a solution to it.
- f. Bravo, nurse, work well done!

Topic 7.4: Monitoring of immunization programme and data management

LEARNING/TEACHING OBJECTIVES	QUESTIONS/TASKS/EXERCISES	ANSWERS
<p>Identify information sources for monitoring routine immunization.</p> <p>Select key indicators for monitoring and measuring progress.</p> <p>Collect immunization data by target group, type, dose and month.</p> <p>Prepare an immunization monitoring chart.</p> <p>Calculate immunization coverage rates for different vaccines.</p> <p>Calculate dropout rates from immunization between various vaccines.</p> <p>Explain most common surveys used in immunization programme (e.g. EPI cluster sampling survey).</p> <p>Analyse and interpret collected information.</p> <p>Use the results of monitoring to adjust actions and improve programme performance.</p>	<p>1. Explain five information sources for monitoring routine immunization.</p> <p>2. What are the selection criteria for indicators?</p>	<p>Question 1 The answer should include five of the following sources: Population census data Child health card Immunization tally sheets Monthly immunization summary sheets Immunization register Cold chain temperature monitoring chart Vaccine order forms Vaccine register/stock cards Outpatient and inpatient registers Supervisory reports Programme review reports, etc.</p> <p>Question 2 Indicators should be: pertinent, sensitive, specific, technically valid, feasible to collect, simple and understandable, and verifiable.</p>
	<p>3. Review the following explain lists and circle the item which is:</p> <p>a. Input indicator</p> <p>a.1: DPT1 to DPT3 dropout rate</p> <p>a.2: Proportion of districts with EPI focal person</p> <p>a.3: Annual number of new cases of polio.</p> <p>b. Process indicator</p> <p>b.1: Proportion of countries with immunization safety plan</p> <p>b.2: Proportion of countries certified polio-free</p> <p>b.3: Percentage of government funding for vaccine costs.</p> <p>c. Impact indicator</p> <p>c.1: Vaccine wastage rate (%)</p> <p>c.2: <5 measles mortality rate</p> <p>c.3: Proportion of children immunized with DPT1.</p>	<p>Question 3 Input indicator: a.2 Process indicator: b.1 Impact indicator: c.2</p>

LEARNING/TEACHING OBJECTIVES	QUESTIONS/TASKS/EXERCISES	ANSWERS
	<p>4. Explain five tools used for monitoring immunization programmes.</p>	<p>Question 4</p> <ul style="list-style-type: none"> • Immunization monitoring chart • Maps with location of disease cases • Graphs/charts showing disease trends • Target diseases database on age distribution • Cold chain inventories • Routine immunization reports • Immunization report completeness and timeliness table • Vaccine vial monitors • Cold chain temperature monitoring chart • Forms on vaccine stock movement • EPI surveys (e.g. cluster sampling survey), etc.
	<p>5. Describe the immunization monitoring chart.</p>	<p>Question 5</p> <p>This chart is the most important monthly monitoring tool at health facility and district levels. It shows whether the programme is in line with the national and district targets for immunization coverage as well as for dropout rates. This chart should be on display in health facility and district health office.</p>
	<p>6. You have 1800 target children under one year in your catchment area. At the end of year, you analysed your data and found that you only vaccinated a proportion of them as follows: 1200 had DPT1 800 had DPT3. Answer the following questions: a. What is your DPT3 coverage? b. What is your DPT1 to DPT3 dropout rate? c. If your dropout rate is > 10% what does it tell you?</p>	<p>Question 6</p> <p>a. DPT3 coverage = $(1200 \times 100) : 1800 = 67\%$.</p> <p>b. DPT1 to DPT3 dropout rate (DOR) = $[(DPT1 - DPT3) : DPT1] \times 100 = 33\%$.</p> <p>c. DOR is > 10% which is beyond acceptable level (10%). Health staff should take appropriate action (defaulter tracing) to reach more children for completing their DPT3 series.</p>

Topic 7.5: Evaluation of immunization programmes

LEARNING/TEACHING OBJECTIVES	QUESTIONS/TASKS/EXERCISES	ANSWERS
<p>Describe the purpose of evaluation. Describe preparatory activities for conducting an evaluation:</p> <ul style="list-style-type: none"> • Initiate and plan the evaluation • Compile basic information • Prepare data collection tools • Select field visit sites <p>Identify needed resources:</p> <ul style="list-style-type: none"> - Evaluation team - Material and financial resources. <p>Explain steps for conducting an evaluation:</p> <ul style="list-style-type: none"> • Collect data • Analyse data (use SWOT analysis) • Interpret data • Prepare report with findings and recommendation • Outline measures for follow up of the implementation of recommendations. 	<p>1. Explain preparatory activities for conducting an evaluation.</p> <hr/> <p>2. Outline the steps for conducting an evaluation.</p> <hr/> <p>3. What is SWOT analysis?</p>	<p>Question 1</p> <ul style="list-style-type: none"> • Initiate and plan the evaluation. • Compile basic information. • Prepare data collection tools. • Select field visit sites. • Identify needed resources: <ul style="list-style-type: none"> - Evaluation team material and financial resources. <p>Question 2</p> <ul style="list-style-type: none"> • Collect data. • Analyse data (use SWOT method). • Interpret data. • Prepare report with findings and recommendations. <p>Question 3 SWOT stands for Strengths, Weaknesses, Opportunities and Threats. It is a standardized framework for showing achievements and gaps in the implementation of projects or programmes as well as potential positive and negative factors that may affect their execution. Based on SWOT analysis, solutions to problems are suggested and recommendations for strengthening the programme in key components are developed.</p>

LEARNING/TEACHING OBJECTIVES	QUESTIONS/TASKS/EXERCISES	ANSWERS
	<p>4. Categorize the following statements under SWOT components (<u>S</u>trengths, <u>W</u>eaknesses, <u>O</u>pportunities and <u>T</u>hreats).</p> <ol style="list-style-type: none"> With approaching rainy season some of the selected districts for RED strategy may not be accessible. RED strategy has been introduced in 10 districts in the country and DPT3 coverage shows increasing trends in these districts. In three of the RED districts the local NGOs are not participating in activities saying that the indicators for measuring RED impact are not well defined. In the last meeting on the expansion of RED, some partners expressed interest to support it subject to government request. The District Development Committee in newly selected districts already allocated a budget to support RED. In RED districts, the dropout rate for DPT1 to DPT3 has substantially decreased. EPI manager reported army helicopters may be available to reach hard-to-reach villages for RED. There is only one health worker in four of newly selected districts to carry out activities. 	<p>Question 4 <u>S</u>trengths: b, e, f <u>W</u>eaknesses: c and h <u>O</u>pportunities: d and g <u>T</u>hreats: a</p>
	<p>5. Outline the content of the final report on programme evaluation/assessment.</p>	<p>Question 5 Objectives of the evaluation. Methodology of the evaluation. The environmental context. Findings/discussions. Conclusions and recommendations.</p>

7.2 Exercises and answers

Exercise 6 MLM Module 8 referred to in Topic 6.3: Cold chain and vaccine handling – logistics support

MLM Module 8, Section 6, item 6.4, Exercise 6: “Identification of problems and solutions”. (This exercise requires problem-solving approach applied to cold-chain management.)

Answer: Job card 1

Possible causes may include but are not limited to the following:

- District store was not supplied with vaccines from the province/central store.
- A transport breakdown or lack of fuel at higher levels prevented vaccines from being delivered in time.
- District cold chain officer/focal person did not make a timely order to replenish his/her vaccine stock.
- District cold chain officer/focal person did not know when to order vaccines.
- District cold chain officer/focal person was not trained in vaccine management, etc.

Possible solutions may include but are not limited to the following:

- Health worker should inform their immediate supervisor at district level about the problem.
- They may modify health facility plan to prioritize urgent immunizations (e.g. confirmed outreach sessions).
- If the reason for the vaccine shortage is the lack of training of the storekeeper, the district manager should ask for or arrange job training as soon as possible.
- District manager should bring this issue to the attention of the provincial/central level EPI manager.

Answers: Job card 2

Possible causes may include but are not limited to the following:

- Health worker did not make proper preparations for the outreach vaccination sessions regarding icepacks.
- They should have frozen all icepacks at least 10 hours in advance (they did not know that requirement!).
- There were not enough icepacks in the health centre.

Possible solutions may include but are not limited to the following:

- Ensure that the health facility is supplied with adequate quantity of icepacks.
- Train health worker (on the job) on use of icepacks for outreach sessions.
- To decide on validity of immunizations already performed, the supervisor should check the VVM status and determine if reconstituted vaccines have been used beyond six hours from the time they were taken out of the refrigerator.

Answer: Job card 3

The boxes under this card should be filled in conjunction with the students’ field visits.

Exercise 3 in MLM Module 2 referred to in Topic 7.1: Introduction to immunization programme management

MLM Module 2, Section 3, Exercise 3, last bullet: “Explain the qualities of an EPI manager you wish to see in yourself as a leader of our team”.

Answer:

This is a free-answer exercise. However, the response should include basic management functions of an EPI manager described in the module. These are:

a. Continuous functions: Problem analysing, decision-making and communicating.

b. Periodic functions: Planning, implementation and evaluation.

It is suggested that this exercise be offered as homework. The tutor will review the responses and arrange a short discussion with the group.

Exercise 5 in MLM Module 18 referred to in Topic 7.5: Evaluation of immunization programmes

MLM 20, Section 4, item 4.7, Exercise 5: “Ask participants to answer (tick) the following true or false questions”.

Answer as per items:

1: False (however, if FIC is not available, DPT3 can substitute for it)

2: First line: true, second line: false

3: False

4: True

5: True

6: False

7: False

8. USING ACTIVE TEACHING AND LEARNING METHODS

The teaching and learning methods and techniques recommended in this curriculum comprise the problem-solving approach and other participatory methods and techniques. The objectives of the training based on the problem-solving approach are to motivate participants to learn and assist them to develop efficient reasoning skills, develop self-tuition capacities and use the information methodically. It helps to identify the concepts and general principles that may be applied to many other situations, thus constituting a long-term learning investment. The success of this method depends greatly on the ability of the teacher and their interpersonal relations. This method requires more resources and better preparation.

A detailed description of the problem-solving approach is presented in Module 1 of the MLM course entitled “Problem solving approach to immunization services management”.

Lecture with audio-visual presentations

The advantage of lectures is that they reach a large number of students. However, they do not promote active learning or practice of skills. It is proposed to make selective use of audio-visual techniques to accompany teacher’s lectures: flipchart, computer projector, transparencies, slides and videotapes.

Discussions

They constitute the main method of interaction among students as well as with the teacher. Discussion techniques such as brainstorming and discussions in small groups are particularly recommended to encourage exchange of ideas.

Exercise followed by group discussions

Students are asked to write down their answers and, at the end of the exercise, the teacher will lead a short group discussion to analyse the answers.

Demonstrations and practical exercises

Some of the lessons, especially those on cold chain and logistics management, involve demonstrations, which help students visualize described items. Teacher may sometimes ask students to repeat the demonstration.

Role-playing followed by group discussions

This method implies that students play the role of a person in a situation that may occur when performing health worker duties. Students could, for example, play the role of a health worker having discussions with a woman who needs TT immunization. During the play, the teacher observes how students apply their knowledge and skills. After the psychodrama, the teacher will lead a short group discussion and highlight good points or shortcomings of the students’ performance.

Simulations

In the course of certain lessons the students may be asked to resolve real problems or perform duties related to immunization activities (e.g. immunizing a child against measles).

Field visits and field placements

These are important components of the active teaching/learning process that provide learning through practice. Field visits and placements develop qualities of observation and decision-making, ensure closer contact with reality and permit comparisons between practice and theory. The field visit and the field placement are the first steps in the teaching/learning process when students relate lessons to their future job. After the student groups have completed their visits or field placement, the teacher should reassemble them and ask each group to briefly summarize their findings, reinforcing students who discuss or ask questions about practical application of skills.

Self-directed learning

By this, the learner (student/worker) on their own, takes the initiative, with or without the assistance of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes. The learner may select one or more modules from the curriculum on the basis of identified needs, and go through the relevant MLM modules and accompanying exercises systematically to improve competence.

9. TEACHER PROFILE FOR TEACHING IMMUNIZATION

The teacher who is teaching immunization should have the following background and qualities:

- Had recent training in immunization (within the last three years), preferably in the EPI Mid-level Management course and immunization service delivery.
- Thorough knowledge and understanding of immunization programmes, including:
 - Programme's global, regional and national goals and strategic objectives;
 - Programme strategies and policy orientations. This should include both the national and recent global strategies and policies (GIVS, RED, etc.);
 - Immunization programme norms and standards.
- Master active teaching methodology including simulations, role-play, individual and group discussions, demonstrations, audio-visual display and others.
- Be familiar with problem-solving approach and apply it in their teaching.
- Be able to correctly interpret immunization management process in their teaching to medical students – future managers of immunization or other child health-care programmes.
- Have the pedagogical and communication skills required to teach a complex programme such as immunization. The skills required, but not limited to, are:
 - Preparing appropriate lesson plans for each topic of the course;
 - Using participatory approach in teaching by involving students in individual or group discussions, question and answer dialogue, peer observations and interpretations of each other's performance, etc.;
 - Sharing presentations on certain topics with service providers (e.g. EPI manager);
 - Supervising the practical exercises and providing the necessary technical backup when required;
 - Encouraging students to come to the teacher at any time with questions or comments;
 - Evaluating the progress of students and praising good conduct or helping overcome performance gaps.

10. CONDITIONS CONDUCIVE TO TEACHING AND LEARNING

A number of conditions can support or hamper teaching and learning the course on immunization. The answer “yes” to the following questions will ensure proper teaching of immunization in training schools.

Do the deans, teachers, administrators and staff at field visit and field placement sites support the new changes in teaching immunization?

Does the teaching in immunization correspond with what is taught in other related courses (epidemiology, immunology, paediatrics, community health, etc.)?

Are necessary resources and equipment available for teaching (course materials in sufficient quantities, demonstration materials, reference literature, and audio-visual equipment)?

Were all relevant teachers trained in modern immunization theory and practice? Did the training prepare teachers to use active training methods to teach immunization?

Were tutors/staff at field visit and field placement sites trained in modern immunization theory and practice (e.g. in EPI MLM or *Immunization in Practice* courses)?

Does the facility for field visits or field placement of students have sufficient supply of vaccines, AD syringes, safety boxes and other injection materials to support teaching in modern immunization practices?

Is time allocation sufficient to cover key priority areas of immunization programme as outlined in the curriculum?

Is there a proper balance of time between theoretical teaching and field assignments?

Is the teaching environment supportive for training (optimal classroom size, enough light and space, not noisy, etc.)?

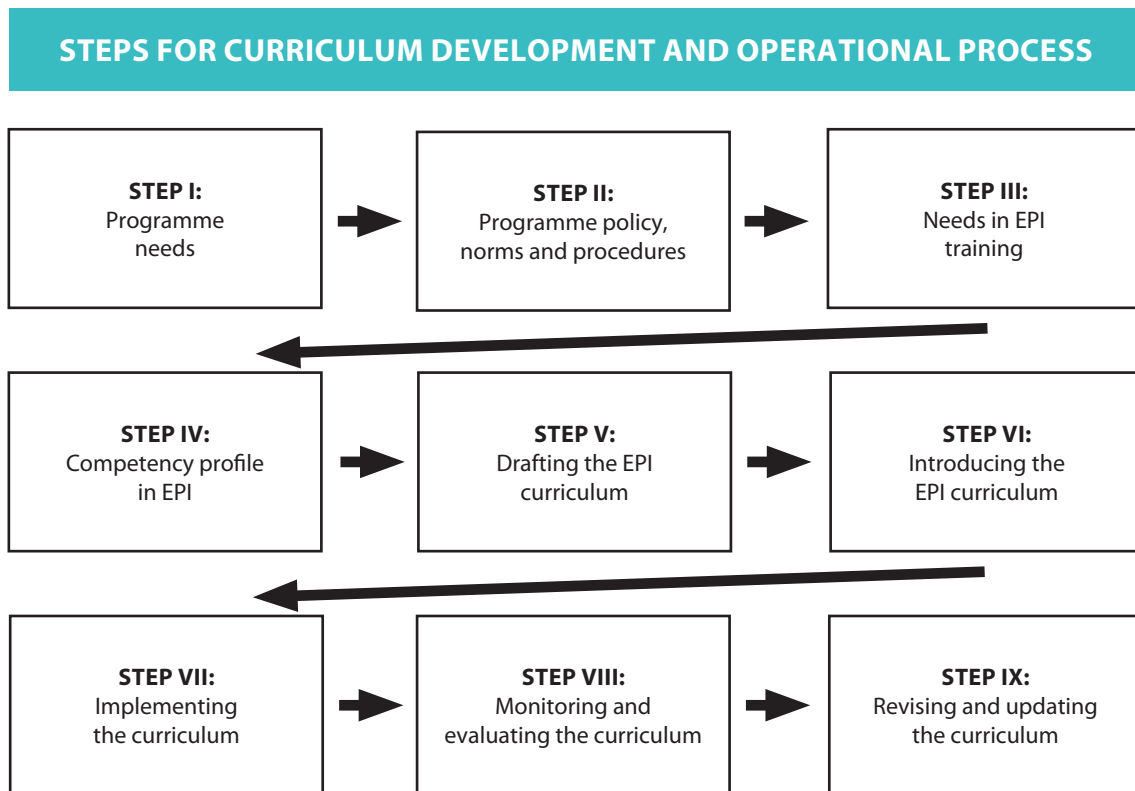
Is Immunization content well covered within the curriculum prototype as proposed by Regional Economic Entities (ECOWAS, SADC, CEMAC)?

Sometimes the course schedule, class size, or other factors might not permit the use of teaching methods recommended in the module. Then the teacher will need to select an alternative. If a class is too large for the teacher to evaluate written exercises and also give frequent individual feedback, they will need to select another method to provide practice and feedback. For example, if role-plays are appropriate to use to practise a skill, the teacher will be able to observe students in role-plays in small groups and encourage feedback among students themselves.

11. INTRODUCTION AND IMPLEMENTATION OF THE CURRICULUM

FIGURE 11.1

ILLUSTRATES THE ENTIRE PROCESS OF CURRICULUM DEVELOPMENT IN GENERAL TERMS. SO FAR WE HAVE COVERED STEPS I TO V – THE INITIAL STEPS OF THE PROCESS.



Source: Adapted from the report of Dr Mutabaruka “Development du Curriculum SR Generalities”, Abidjan, 2000.

11.1 Establishing a focal person and working group for introduction of the curriculum

This section describes steps VI and VII with the following detailed sub-steps.

At the teaching institution level, appointment of a focal person for immunization training is essential. He or she should be an active teacher, trained in the immunization management course. However, this person needs the support and assistance of a larger immunization working group to plan, coordinate and sustain EPI teaching. The objectives of creating an immunization working group within a teaching institution include:

- Encourage full participation of relevant staff in planning, implementing, reviewing and re-planning immunization teaching.
- Facilitate key activities for planning, preparing, implementing, reviewing and re-planning immunization teaching.
- Coordinate immunization teaching between different courses, departments and field placement sites.

The working group should include representatives of relevant teaching units, departments and the outpatient facility used for practical sessions and field placement. The group should include representatives from the departments of paediatrics/child health, community health, infectious diseases, immunology, epidemiology and social medicine.

The proposed activities of the group are as follows:

- Brief decision-makers within and outside the teaching institution on the status of development of the curriculum, which can be achieved through a national workshop to conceptualize the curriculum.
- Identify where and how immunization course may be incorporated into existing academic programmes.
- Develop a plan of action for introducing immunizations into relevant academic programmes.
- Train teachers and relevant staff at field placement sites.
- Develop/adapt materials for immunization teaching, learning and student assessment.
- Prepare sites for immunization practice.
- Coordinate immunization teaching between different teaching units/sub-units.
- Review and monitor the progress of implementation of the curriculum implementation plan.

11.2 Developing an action plan for introduction and implementation of the curriculum

The plan for introducing EPI teaching should:

- Be tailored to the needs and resources of teaching institutions.
- Explain the key teaching units, departments and field placement sites that should be involved in EPI teaching.
- Identify feasible entry points for immunization within a relevant academic programme.
- Indicate quota of education units, departments and key placement sites in the field that should be involved in teaching EPI.
- Describe how students will be assessed for EPI knowledge and skills, including formative and summative assessments.
- Identify how teachers and relevant clinical staff will be trained in modern EPI theory and practice.
- Indicate how materials for teaching, learning and student assessment will be developed or adapted.
- Identify mechanisms for creating a sustainable supply of materials.
- Outline how the implementation of the plan will be monitored and reviewed.
- Indicate whether or not the formal written curriculum should be revised, and if so, when and how.
- The plan should also include a budget, timeline and possible funding sources.

The immunization working group should be tasked to develop the above plan.

Appendix 1 presents an outline of the plan for introducing immunization teaching into the existing academic programme. **Appendix 2** on implementation strategies and a plan of action for revised EPI curriculum introduction for 2014–2020 has been developed by participants of the consensus workshop on EPI prototype curricula for medical and nursing/midwifery schools in Abidjan, Côte d'Ivoire, 13–17 May 2013.

11.3 Conducting a consensus workshop on the curriculum content and implementation plan

This is an important activity that brings together main stakeholders from teaching institutions, MOH, representatives from national regulatory authorities, immunization programme managers, training experts and partners. The central topics in the programme are built around the new/revised immunization curriculum. The main objectives of the consensus workshop should be:

- Review the new/revised curriculum on immunization teaching.
- Make necessary adaptation of the new/revised curriculum to the country situation.
- Reach consensus about content and implementation of the new/revised curriculum.
- Review and endorse the implementation plan of the curriculum developed by the immunization working group.

During this workshop, a small discussion group with representatives from various agencies can be formed to review various parts of the curriculum as well as the implementation plan and come up with comments, suggestions and recommendations. Following this workshop, the secretariat and a group of rapporteurs will incorporate these suggestions and produce the final version of the curriculum and the implementation plan.

11.4 Endorsement of the new/revised immunization curriculum

Once the curriculum and the plan of action is finalized, the EPI focal person and the immunization Working group should carry out advocacy within and outside the training institution among decision-makers, stakeholders, partners and NGOs, including the private sector. This will be done by circulating the plan and the curriculum, requesting them to **endorse these documents and support their implementation**. The following organizations and groups will be critical to the implementation process:

- Within the training institution:
 - Principal of the school.
 - Heads of relevant teaching units.
 - Immunization working group members.
 - Administrators and supervisors of the immunization practice sites.
- Outside training institution:
 - Human resource department of the MOH.
 - Planning Department of the MOH.
 - Ministry of higher education.
 - Association of nursing/midwifery schools.
 - Nursing schools.
 - WHO, UNICEF and other interested international agencies.
 - Multilateral and bilateral partners, NGOs and private sector, etc.

It will be useful to approach some of these organizations and partners with project proposals using agency-specific formats.

12. MONITORING AND EVALUATION OF THE CURRICULUM

12.1 Monitoring process

The teaching staff needs to monitor the introduction of new curriculum. The objectives of monitoring in teaching are to:

- Assess whether teaching is being implemented according to the plan of action.
- Identify achievements and difficulties with new teaching.
- Specify actions needed to sustain achievements or overcome difficulties.

It is best to monitor teaching consistently throughout a year, term or course. Teachers themselves can monitor teaching. Additionally, immunization focal persons or working groups (both within and outside teaching institutions) may assist teachers in developing feasible methods and materials for monitoring.

Two main types of monitoring information can be collected:

- Quantitative data indicating, for example, how many students completed the term, how many hours were spent on EPI teaching, how many EPI sessions were conducted, and the results of student assessments.
- Qualitative data that include suggestions from students and teachers on how to improve the content, methods and materials used for EPI teaching, and what are the options for integrating EPI teaching with other programmes.

Data are usually collected on four aspects of teaching:

Content of teaching: Does the content build on existing knowledge and abilities of students? Do students believe the new knowledge and skills are useful?

Context of teaching: Do the deans, heads of departments and teachers support the new teaching? Is the new teaching supported by administrators and staff at practice sites? Does the teaching correspond with what is taught in other related courses? Are necessary resources and equipment available for teaching?

Process of teaching: How many students completed the term? How many hours were spent on EPI teaching? How many sessions were conducted? What was the ratio of students to instructors? Did students benefit from the methods used for teaching, learning and assessment? Was information presented in a clear and understandable way? Were appropriate teaching, learning and assessment materials used (i.e. adequate demonstration material, exercises or assessment checklists and examination questions)?

Immediate outcomes of teaching: Do students demonstrate expected levels of knowledge and skills?

The following methods can be used to collect information:

Discussions or interviews with students, teachers and former students: To reduce bias and increase the objectivity of the results, interviewers should be carefully selected. For example, students may feel intimidated and less inclined to provide candid responses if their own teachers interview them. For this reason, it may be more effective to recruit and train a student to conduct interviews with fellow students or with other teachers.

Questionnaires: Developed and administered to measure student and teacher satisfaction with the content, context, process and outcome of teaching.

Observation of teachers and students: Teaching sessions can be observed and recorded. It is important for the observer to determine, in advance, what questions they wish to answer about the teaching content, context and process

Review the results of examinations: Reviewing the results of written and practical examinations will help teachers determine the extent to which the new teaching has achieved its learning objectives.

Once information is collected, teachers should **review the results and identify needed actions**. Teaching staff may individually monitor and adjust their own teaching, or they may work in teams to share achievements and constraints, and to brainstorm about actions needed to overcome difficulties.

12.2 Evaluation process

Evaluation is concerned with the *periodic* assessment of the overall process and results of immunization teaching. There are four types of evaluations to apply to teaching: evaluation of the process, final outcomes, effectiveness and impact.

Process: Refers to the changes made in the way an academic programme is taught, the methods and materials used, and how teachers and students respond to those methods and materials.

Outcomes: Refer to the final results of teaching, particularly in terms of student knowledge, attitudes and skills (i.e. competence). Outcomes can be evaluated by testing the students through examination at the end of a course. This evaluation will confirm whether graduates actually possessed the expected competence at the end of the academic programme.

Effectiveness: Assesses the ability of students to apply knowledge, attitudes and skills to their work after graduation (i.e. performance). It can be evaluated by finding out how well students are doing after they have left the teaching institution and started work.

Impact: Concentrates on improvements in the health status of a population that may, or may not, be related to changes in the quality of care provided by graduates.

Most teaching institutions have experience in reviewing and evaluating the process and outcomes of teaching, particularly in relation to student competence at the end of an academic programme. Because evaluating the effectiveness and impact of teaching is difficult and costly, it is considered an optional task that should only be done as a part of a larger evaluation effort at national level.

An evaluation of the **process and outcomes** of new teaching should focus on:

- The changes made to the academic programme and to the methods and materials used for teaching, learning and student assessment. This includes the organization, flow and relationship of different courses within the academic programme; the settings where teaching is conducted; and the resources and equipment available for teaching. Sources of information are: teachers, administrators, students, course documents and student records.

- The key knowledge, attitudes and skills that students gain from the revised programme, methods and materials. For evaluation of these qualities, a group of students should be assessed in a key set of skills at the end of academic programme to measure how much students have learned and to what extent they have achieved the revised learning objectives. Evaluators should not rely on the results of assessments that were conducted earlier in the course of study.
- Gaps between what was expected and what was achieved. The evaluation should identify these gaps and their causes. It should also recommend what actions might be needed to address or reduce these gaps.

The **performance evaluation** involves the following methods for collecting information to measure and assess the graduates' performance in immunization:

- Direct observation of graduates on the job to see whether graduates are able to perform the skills they developed during the academic programme.
- Interviewing graduates through face-to-face interviews.
- Reviewing reports, presentations, plans and other documentations prepared by the graduates.
- Reviewing statistical information in the programme areas under the responsibility of the graduates.
- Interviewing supervisors of the graduates.
- Interviewing the community leaders or members within the graduates' service catchment area.
- Interviewing partners working with the graduates, etc.

The performance evaluation should occur after graduates have had sufficient opportunity and time to apply their knowledge, attitudes and skills on the job. For example: has the graduate been working in a position related to immunization? If yes, for how long? (The best time to apply the evaluation to an individual graduate is three to six months after graduation.)

It is critical to share evaluation results with all interested parties, funding agencies and relevant teaching institutions to demonstrate what was achieved and what is still needed. It is essential for teaching institutions to use evaluation results for strengthening their teaching.

12.3 Revision of the plan and the curriculum following evaluation

Teaching institutions should view evaluation as a learning process – that is, as a means for reflecting and demonstrating a commitment to achieving specific results. The aim of evaluation is not to produce a report, but to use the findings to identify strengths and weaknesses in a teaching programme and to plan for future action. An evaluation should show to what extent expected results were achieved and give clear indications about the elements of an intervention that need to be strengthened or changed in order to achieve the expected results. In addition to direct application to planning for future teaching, evaluation results can also help to justify the use of resources and technical support, and demonstrate a need for additional resources.

Teaching staff should review monitoring and evaluation data and take action to overcome difficulties that they can resolve themselves. Some difficulties, however, may require broader action by several teaching units, by the immunization working group, or by national authorities. The information collected should be used to improve the content, methods and teaching materials. If necessary, it could be used to revise the teaching institution's plan of action or introduce changes in the curriculum.

APPENDICES

Appendix 1: Outline plan of action for introducing an Expanded Programme of Immunization curriculum

Introduction

Background information about the faculty or school, its students, its methods of teaching and its teaching programmes.

Description of the ... [insert name of the certificate, diploma or degree programme where EPI will first be introduced]

Briefly describe the mission and objectives of the overall programme. Indicate the total number of years of study to complete the programme. Give total number of students who enter the programme each year. Briefly describe how child health is taught within the programme. For each year of study, give the total number of hours in child health rotations. For each year, indicate the number of hours of theory and the number of hours of clinical practice in child health.

EPI teaching/learning objectives

Give a broad description of what students will know and be able to do after learning EPI (attach detailed explain list of learning objectives as an annex).

Placement of EPI teaching within the ... [insert name of the certificate, diploma or degree programme where EPI will first be introduced]

Describe how EPI will be taught within the selected academic programme. Within each section or term of teaching activities, describe the main EPI teaching/learning objectives that will be achieved. Explain the teaching departments, sub-departments and field practice sites where EPI teaching will be introduced.

Teaching, learning and assessment materials needed for EPI

Explain the primary materials used by teachers and students (including the major textbook and reference books used) to teach and learn paediatrics or child health. Indicate which of the existing materials need to be *revised* in order to include or be made compatible with EPI.

Identify what types of new materials should be *developed or adapted*. Estimate the cost of revising and/or developing materials, and of reproducing and distributing the materials. Identify possible sources of funding and technical support. Describe how materials will be supplied in a sustainable way.

Teaching and learning methods and materials

For each year or term of teaching (e.g. theory, clinical practice, etc.), explain the types of teaching and learning methods that might be used, and the types of teaching and learning materials that would be needed.

Student assessment methods and materials

For each year or term of teaching, explain the types of methods that might be used for student assessment (e.g. assignments, exercises, written examinations, observation of practical skills, etc.), and the types of materials that would be needed to assess student knowledge and skills in EPI.

Training administrators, teachers and staff at field placement sites

Describe what types of staff members will need training in EPI, and how they would be trained. Remember to include relevant staff from practice placement sites as well as teachers and administrators from relevant departments and sub-departments such as community or social medicine, infectious diseases and epidemiology. Describe how new administrators, teachers and relevant staff, who join the school after EPI teaching has been introduced, would be trained in EPI.

Preparation of clinical training sites

Describe what will be needed to prepare field placement sites for EPI teaching.

Monitoring and evaluation

Explain how the teaching institution will monitor the implementation of the plan for introducing EPI teaching. Will staff hold regular meetings to discuss achievements and difficulties with the implementation of the plan of action? When will the meetings be held and who will attend? Will the plan of action be reviewed and revised based on initial experience with EPI teaching? If yes, who will review and revise the plan and when? Will EPI teaching be evaluated? If yes, how and when?

Budget

Estimate the cost for:

- Training administrators, teachers and other staff.
- Planning and coordination.
- Developing and supplying materials for teaching, learning and student assessment.
- Preparing practice sites.

Sample format for presentation of the specific items of the plan

ACTIVITY	EXPECTED RESULTS	DATE (DEADLINE) OF IMPLEMENTATION	RESPONSIBLE FOR IMPLEMENTATION	COST INVOLVED	EXPECTED SOURCE OF SUPPORT
Curriculum Development Conducting situation analysis. Establishing immunization working group (WG). Recruiting a training expert. Development of the training programme. Drafting the curriculum WG review meeting. WG planning meeting. Organizing a consensus workshop.	WG established. New/revised curriculum developed. Consensus reached on the new curriculum. Implementation plan approved.				
INTRODUCTION Initiating advocacy for endorsement of the new curriculum. Mobilizing resources. Training of teachers/field supervisors. Coordination meeting WG/departments. Duplicating training modules/handouts. Preparing demonstration materials. Preparing field visit/placement sites. Preparing student assessment tools. Reviewing/updating teaching methods. Using new curriculum in teaching.	New/revised curriculum endorsed. Resources mobilized as per plan. Teaching preparations Completed. New curriculum in operation.				
MONITORING/EVALUATION WG meeting on monitoring and evaluation tools/indicators. Monitoring/review of teaching methods and materials. Conducting process and outcome evaluation. Conducting evaluation on effectiveness of new teaching. Revising curriculum based on monitoring/evaluation results.	M&E tools and indicators developed. Monitoring in progress. Evaluations conducted. Revised curriculum in use.				

Appendix 2: Implementation strategies and plan of action for Expanded Programme of Immunization curriculum introduction 2014–2020

(Proposed by the consensus workshop on the EPI prototype curricula for medical and nursing/midwifery schools, Abidjan, Côte d'Ivoire, 13–17 May 2013).

STRATEGY/ INTERVENTION	ACTIVITY	RESPONSIBLE	WHEN	WHERE	BUDGET/MEANS	COMMENT
• Sensitization of Policy-makers	Reports to • MOH, MOE, deans, relevant departmental heads, WHO • Situation analysis/TNA	• Workshop participants • EPI managers	• By 2015		• WHO • MOH/MOE • ICC • UNICEF • NESI	
• Training of trainers/teachers	• Organize national MLM courses. • Participate in inter-country MLM	• MOH • EPI programme • Universities • Partners	• Starting Jan 2016; two courses a year	• Inter-country • National	• WHO • MOH/MOE • ICC • UNICEF • NESI	
• Harmonization of teaching	• Inter-departmental consensus meetings	• WHO • Deans • Workshop participants • EPI managers	• Starting Jan 2016/2017			• Form and train EPI teaching team to act as committee comprising all relevant departments
• Implementation of new curriculum	• Intra-departmental curriculum revision • Second inter-departmental consensus meeting • Introduction of updated curriculum	• Chairman of EPI Teaching team	• Jan 2016 • Mar 2016 • Following academic year		• Universities • National EPI and partners • NESI	• Advocacy for resource mobilization (budget proposals could be made to potential sponsors)
• Monitoring of the training	• Develop tools and indicators for monitoring • Monitor activities	• EPI teaching team • EPI manager	• Ongoing		• Universities • National EPI and partners • NESI	Indicators will be: • Follow-up meetings • Number of trained teachers • Updated curricula • Examination results
• Evaluation of the training	• Develop tools and indicators for evaluation • Undertake impact evaluation	• EPI teaching team • EPI manager	• Yearly • Twice yearly		• Universities • National EPI and partners • NESI	
• Re-planning	• Review meetings	• Chairman of EPI • EPI manager • WHO and partners	• Every two years after evaluation		• Universities • National EPI and partners	

This a revised prototype curriculum designed to fill the gaps in existing curriculum for immunization identified during training needs assessments conducted in the African Region. The consensus Workshop to revise EPI Prototype Curricula for Medical and Nursing/Midwifery Schools (Brazzaville, Congo 07–15 April 2015) reviewed and adopted by consensus both Curricula and recommended them for adoption by training institutions. These revised prototype curricula include 17 content topics covering various aspects of EPI. They also provide information on planning and implementation of the curriculum, as well as it's monitoring and evaluation. It contains lists of various strategic references plus didactic and audio-visual materials. To facilitate their utilization and adaptation, the revised EPI curricula are available in hard copies and are also posted on WHO/AFRO website for any consultation as needed.



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