



# MANAGING AN INJECTION SAFETY POLICY

*A framework to benchmark, assess, plan, implement and evaluate a national strategy for the safe and appropriate use of injections*



Final version – 14 March 2003

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## ***Rationale***

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Unsafe injection practices are common worldwide [1]. Due to the overuse of injections in many countries, unsafe injections cause a substantial proportion of infections with bloodborne pathogens [2]. At risk of infection are injection recipients and health care workers through contaminated needles and syringes and the community at large through exposure to contaminated sharps waste. A mathematical model has been used to estimate the burden of disease from unsafe injections in various regions (see Appendix A, Table 9). According to estimates using this model, unsafe injections accounted for 32% of hepatitis B virus infection, 40% of hepatitis C virus infection, 28% of liver cancer, 24% of cirrhosis and 5% of HIV infections in the year 2000 [3]. Overall, about 500 000 deaths per year are attributable to contaminated injections in health care settings worldwide [4].

## ***What is the objective of this document?***

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This guide is designed to assist in benchmarking, assessing, planning, implementing and evaluating a national strategy for the safe and appropriate use of injections.

## ***Who should use this document?***

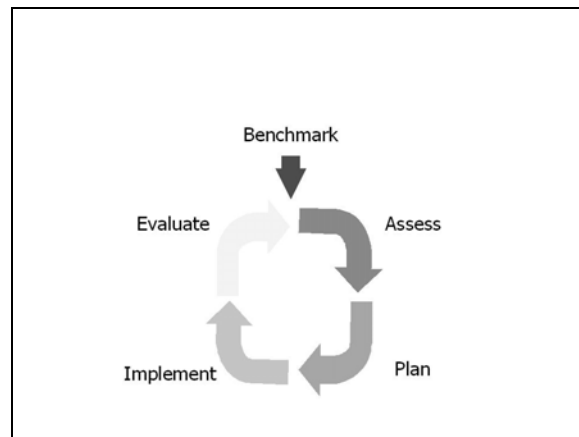
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This framework is to be used – and adapted – by national public health managers and their national and international partners.

## ***Elements of a national strategy for the safe and appropriate use of injections***

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A national strategy for the safe and appropriate use of injections should be viewed as a process by which a national standard is developed, the current situation is assessed, a plan is made, actions are implemented under continuous monitoring and an evaluation is done to measure progress. In fact, public health strategies can be seen as a "quality cycle" that includes five steps (see Figure 1):



**Figure 1: The quality cycle**

**Benchmarking** defines and re-defines the standard (the ideal system) and its indicators. **Assessing** consists of determining how the current system differs from the ideal one on the basis of selected indicators. **Planning** allows the setting of objectives and targets to reach the ideal system. **Implementing** is about conducting interventions to reach the targets and improve the system. **Evaluating** is done through measuring progress towards the objectives and targets.

## 1. Setting a national standard ("Benchmarking")

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### **Rationale**

Before engaging on an assessment of injection practices, it is useful to set a national standard. Injection practices may be described using a set of key indicators. Each of these indicators has an ideal value (see Table 1). The national standard will define a target value and the assessment determines how much the current situation differs from this target.

### **Objective**

A national standard for injection practices is defined that addresses (1) injection overuse, (2) injection safety, (3) the type of injection equipment to be used and (4) safe sharps waste management.

### **Who should set the national standard?**

Setting a national standard requires the participation of all stakeholders [5], including professional associations of health care workers (who prescribe and give injections, e.g., physicians and nurses), infection control practitioners (who define infection control standards), health system managers (who define standards of care) and procurement units (who purchase necessary equipment and supplies).

### **How to make it happen?**

#### *Injection use*

National standard treatment guidelines may be used to define the clinical situations for which injections are justified.

#### *Injection safety*

The “Best infection control practices for intradermal, subcutaneous and intramuscular injections” may be used as a basis to describe the steps that make an injection safe or unsafe (see Appendix B)[6].

#### *Injection equipment to be used*

The choice of injection equipment to be recommended (sterilizable, single use or auto-disable) may be an issue for which consensus is difficult to reach. Two elements should be taken into consideration. First, WHO best practices recommend single use injection equipment (standard or auto-disable) for all injections. Second, WHO, UNICEF, UNFPA and IFRC recommend that immunization services should exclusively use auto-disable injection equipment by the end of 2003 [7]. Sterilizable injection equipment should only be considered if (1) sufficient quantities of single use injection equipment cannot be made available and (2) if the quality of the sterilization is documented in registers with time, steam and temperature (TST) spot indicators for all injections. Experience in many developing and transitional countries indicates that the latter condition is rarely met and that only single use injection equipment made available in sufficient quantities can ensure the safety of injections.

**Table 1: Key indicators to describe injection practices in a country \***

PROGRAMME INDICATORS (INPUT)	IDEAL VALUE	NATIONAL TARGET VALUE
I.1. HIV/AIDS prevention and care programme communicating the risk of HIV infection associated with injections	Yes	
I.2. National drug policy discouraging injection overuse	Yes	
I.3. Number of injectable medications on the national essential drug list	Lowest possible †	
I.4. Essential drugs programme supplying syringes, needles, diluent and safety boxes in quantities matching supplies of injectable medications	Yes	
I.5. Donor or lender-funded programmes such as immunization or family planning services supplying AD syringes and needles in quantities matching supplies of injectables (vaccines or contraceptives)	Yes	
I.6. Health care waste management plan established within the health care system	Yes	
DETERMINANTS OF INJECTION PRACTICES (PROCESS)	IDEAL VALUE	NATIONAL TARGET VALUE
<b><u>Injection Use</u></b>		
P.1. Proportion of the population reporting a preference for injections in the case of fever	< 15 %	
P.2. Proportion of prescribers reporting a preference for injections among patients in the case of fever	< 15% ‡	
P.3. Proportion of the population recalling that the last injection received has been given at home	< 10%	
<b><u>Injection Safety</u></b>		
P.4. Proportion of the population spontaneously reporting the risk of HIV infection associated with unsafe injections	100%	
P.5. Proportion of prescribers spontaneously reporting the risk of hepatitis C virus infection associated with unsafe injections	100%	
P.6. Proportion of health care facilities using sterilizable injection equipment	0%	
P.7. Proportion of health care facilities using single use injection equipment	100%	
P.8. Proportion of health care facilities using auto-disable injection equipment	100%	
P.9. Proportion of health care facilities with sufficient stocks of single use injection equipment (in the facility or in a nearby public or community pharmacy)	100%	
P.10. Proportion of injections administered by unqualified or family providers	0%	
INJECTION PRACTICES (OUTCOME) §	IDEAL VALUE	NATIONAL TARGET VALUE
<b><u>Injection Use</u></b>		
O.1. Proportion of prescriptions including at least one injection **	Lowest possible †	
O.2. Average number of injections per prescription (for prescriptions containing at least one injectable medication)	Variable †	
O.3. Average number of injections per person and year	< 1	
<b><u>Injection Safety</u></b>		
O.4. Proportion of health care facilities where injections are always given with a sterile syringe and needle	100%	
O.5. Proportion of health care facilities where used injection equipment can be observed in places where they expose health care workers to needle-stick injuries	0%	
O.6. Annual number of needle-stick injuries per injection provider	0	
O.7. Proportion of health care facilities where used injection equipment can be seen in the surrounding environment	0%	

\* The difference between the national target value and the observed value from the assessment will determine the objectives of the national injection safety strategy.

† Will vary according to many factors including health care settings, standard treatment guidelines, severity of illnesses when patients seek care.

‡ The value of P.2 should not exceed the value of P.1.

§ Estimation of the incidence of infection-associated infections as an outcome indicator of a strategy for the safe and appropriate use of injections requires substantial epidemiological expertise and resources.

\*\* Also referred to as "OT8 indicator" to monitor essential medicine policies.

## 2. Assessing practices

### Rationale

A base of evidence is needed to define the most common and important problems related to injection practices so that the plan of action can be developed and adapted to the local situation.

### Objective

Stakeholders are engaged in a process by which they describe injection practices on the basis of up-to-date evidence.

### Who should conduct the assessment?

Stakeholders' involvement in all steps of the assessment process will facilitate planning. However, the data collection step requires expertise in the design, implementation, analysis and interpretation of surveys.

### How to make it happen?

Key indicators (see Table 1) include programme indicators (input), determinants of injection practices (process) and indicators of injection practices (outcome). Two main tools are available to obtain information on these indicators: The "Rapid assessment and response guide" and the "Tool for the assessment of injection safety" (see Table 2). The methods they propose may be combined.

The "Injection practices: The rapid assessment and response guide" aims at engaging stakeholders in launching a planning process through the provision of a simple description of injection practices, their determinants and their consequences. It is based upon combined sampling of injection prescribers, injection providers and the general population. It offers a range of sampling strategies according to the level of precision required and resources available.

"The WHO tool for the assessment of injection safety" aims at estimating the proportion of health care facilities engaging in safe injection practices in a standardized way. It is based on a cluster sample of 80 health care facilities and provides representative data on injection practices predominantly in immunization and curative public health care services.

**Table 2: Compared characteristics of the two WHO assessment tools available**

	<b>Rapid assessment and response guide</b>	<b>Tool for the assessment of injection safety</b>
<b>Aim</b>	<ul style="list-style-type: none"> <li>▪ Engage stakeholders to launch a planning process</li> </ul>	<ul style="list-style-type: none"> <li>▪ Estimate the proportion of safe injections as basis for planning</li> </ul>
<b>Focus</b>	<ul style="list-style-type: none"> <li>▪ Injection frequency</li> <li>▪ Injection safety</li> </ul>	<ul style="list-style-type: none"> <li>▪ Injection safety</li> </ul>
<b>Groups surveyed</b>	<ul style="list-style-type: none"> <li>▪ General population</li> <li>▪ Injection prescribers (e.g., physicians)</li> <li>▪ Injection providers (e.g., nurses)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Formal health care facilities, most often in the public sector</li> </ul>
<b>Precision</b>	<ul style="list-style-type: none"> <li>▪ According to sampling strategy</li> </ul>	<ul style="list-style-type: none"> <li>▪ <math>\pm 10\%</math> around the estimate</li> </ul>
<b>Representativity</b>	<ul style="list-style-type: none"> <li>▪ According to sampling strategy</li> </ul>	<ul style="list-style-type: none"> <li>▪ Good</li> </ul>
<b>Qualitative component</b>	<ul style="list-style-type: none"> <li>▪ More qualitative</li> </ul>	<ul style="list-style-type: none"> <li>▪ More quantitative</li> </ul>
<b>Potential users</b>	<ul style="list-style-type: none"> <li>▪ National essential medicine policy makers</li> <li>▪ Injection safety committee</li> </ul>	<ul style="list-style-type: none"> <li>▪ Expanded Programme on Immunization</li> <li>▪ Injection safety committee</li> </ul>
<b>Cost</b>	<ul style="list-style-type: none"> <li>▪ Around US\$ 10 000</li> </ul>	<ul style="list-style-type: none"> <li>▪ Around US\$ 20 000</li> </ul>

### 3. Planning for change

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#### **Rationale**

A successful strategy to achieve safe injection practices requires making deliberate efforts to engage all national programmes and services involving injections. Such a strategy will contain three elements (See "Aide Mémoire" for national safe and appropriate use of injection policies):

1. **Behaviour change** among patients and health care workers to reduce unnecessary injections and achieve safe practices (e.g., through interactional patient-provider group discussions);
2. **Equipment and supplies:** Provision of sufficient quantities of new, single use injection equipment and infection control supplies;
3. **Sharps waste management:** Safe collection and management of sharps waste.

#### **Objective**

Different national programme areas establish plans of action based on the assessment results in which they incorporate the three elements of the strategy for the safe and appropriate use of injections. These plans form the blueprint for the implementation of interventions.

#### **Who should formulate the national plan?**

Key Ministry of Health departments (including HIV prevention and care, essential medicines, immunization, family planning and health care system) and partners can gather in an initial national workshop. Its participants can then establish a multidisciplinary national committee on injection safety that meets regularly to follow up on the national policy and its implementation through the plan of action.

#### **How to make it happen?**

##### *Template agenda for the national workshop*

The national workshop can set priorities and define a plan of action on the basis of the assessment results. A template agenda for a national injection safety planning workshop is outlined in Appendix C.

##### *Template national plan*

A template may be used to generate a national plan of action (see Table 4). The proposed outline makes reference to specific programmes implementing specific activities. Behaviour change activities may be best conducted by the programmes on HIV prevention and care and the programme on essential medicines. Equipment and supplies may be best provided through the programme on essential medicines and the immunization and family planning programmes. Sharps waste management may be best implemented within the broader health care system. National blood transfusion services will monitor the prevalence of hepatitis B and C virus and of HIV infection and ensure safe blood donations. Other potential entry points include legislation, regulation and financing of health care services, quality management programmes, human resources training and health promotion. In practice, the actual distribution of tasks may differ according to the organizational chart of the Ministry of Health and the local situation. What matters is that all these activities are conducted regardless of who takes the lead in implementation so that health care workers and the general public receive consistent messages from all programmes.

##### *Setting a timeline*

Once a plan is formulated, setting a timeline with designated, time-bound milestones for progress will assist in implementation and monitoring.

### Costing, budgeting and financing

Cost estimates for each area of work will facilitate the inclusion of the required elements in the budgets of the various ministries (such as Ministries of Health, Education, Law, Environment) and programmes (e.g., HIV, essential medicines, immunization and health care services). Proper costing (Table 3) and budgeting will also help in identifying sources of funds.

**Table 3: Costing elements of a plan of action for the safe and appropriate use of injections**

INPUT	Activities					
	Behaviour change		Supplies		Waste management	
	US\$	% total	US\$	% total	US\$	% total
<b>Capital costs</b>						
Information, education and communication material development						
Curriculum development of training materials						
Good manufacturing practices and technology transfer to local producers of injection equipment and safety boxes						
Equipment for waste treatment (e.g., incineration) and waste disposal						
<i>Total capital costs</i>						
<b>Recurrent costs</b>						
Capacity building to use new equipment through pre-service and in-service training						
Revision of standard treatment guidelines and the essential drug list						
Appropriate injection equipment and safety boxes						
Supervision and in-service training on updating skills						
Transport for delivery of supplies and collection of waste						
Contracts for treatment and disposal of contaminated waste						
Fuel and supplies for incinerators						
Information, education, communication and mass media activities						
Interactional group discussions between patients and health care providers						
<i>Total recurrent costs</i>						
<b>TOTAL COSTS</b>						

For calculation of costs of injection equipment and injection control supplies refer to “Procuring single use injection equipment and safety boxes: a practical guide”. In countries not yet providing safe injection equipment to all programmes and services, costs for equipment will likely be the major cost elements of a plan of action for the safe and appropriate use of injections.

### Option appraisal

A comprehensive option appraisal should present both quantified and non-quantified costs and benefits. Besides the financial implications of a plan of action, other issues to be considered include the technical feasibility, the legal and administrative constraints and the long-term sustainability in terms of managerial and financial resources. Wider effects of an intended change on the traditional, social or power structure of communities, on employment, equity and gender as well as possible environmental effects need to be equally appraised.



**Table 4: Template for a plan of action for the implementation of the national policy for the safe and appropriate use of injections**

<b>1. BEHAVIOUR CHANGE</b>			
<b>HIV PREVENTION AND CARE PROGRAMME TO COMMUNICATE THE RISK OF HIV INFECTION ASSOCIATED WITH POOR INJECTION PRACTICES</b>			
<u>Objectives</u>	<u>Core interventions</u>	<u>Beneficiaries/ Target groups</u>	<u>Indicators</u>
Achieve safe injection practices	<b>Create consumer demand for new, single use injection equipment</b> <ul style="list-style-type: none"> <li>▪ Education materials</li> <li>▪ Mass media</li> </ul>	Patients	√ Proportion of the population spontaneously reporting the risk of HIV infection associated with unsafe injections (Indicator P.4)
	<b>Ensure use of new, single use injection equipment</b> <ul style="list-style-type: none"> <li>▪ Pre-service and in-service training</li> </ul>	Injection providers (e.g., nurses)	√ Proportion of health care facilities where injections are always given with a sterile syringe and needle (Indicator O.4)
	<b>Protect health care workers from needle-stick injuries</b> <ul style="list-style-type: none"> <li>▪ Endorsement of best practices by medical and nursing association</li> <li>▪ Pre-service and in-service training</li> </ul>	Injection providers (e.g., nurses)	√ Proportion of health care facilities where used injection equipment can be observed in places where they expose health care workers to needle-stick injuries (Indicator O.5)
<b>NATIONAL DRUG POLICY TO PREVENT INJECTION OVERUSE</b>			
<u>Objectives</u>	<u>Core interventions</u>	<u>Beneficiaries/ Target groups</u>	<u>Indicators</u>
Reduce injection overuse	<b>Promote oral medication</b> <ul style="list-style-type: none"> <li>▪ Education materials</li> <li>▪ Mass media</li> </ul>	Patients	√ Proportion of the population reporting a preference for injections in the case of fever (Indicator P.1)
	<b>Reduce prescription of injectable medications</b> <ul style="list-style-type: none"> <li>▪ Standard treatment guidelines</li> <li>▪ Policy statement from medical association</li> <li>▪ Interactional group discussions</li> <li>▪ Reduce financial incentive to provide injections</li> </ul>	Injection prescribers (e.g., physicians, medical assistants, including in the private sector)	√ Proportion of prescriptions including at least one injection (Indicator O.1. also referred to as OT8)
	<b>Reduce access to injectable medications</b> <ul style="list-style-type: none"> <li>▪ Remove unnecessary injectable medications from the essential drug list</li> </ul>	Health facilities, pharmacies and depots	√ Number of injectable medications on the essential drug list (Indicator I.3)

## 2. EQUIPMENT AND SUPPLIES

### ESSENTIAL MEDICINE PROGRAMME TO MAKE SYRINGES AND SHARPS BOXES AVAILABLE IN EVERY HEALTH CARE FACILITY

<u>Objectives</u>	<u>Core interventions</u>	<u>Beneficiaries/ Target groups</u>	<u>Indicators</u>
Ensure universal access to safe injection equipment and safety boxes	<b>Deliver injectable medications with matching quantities of injection equipment and injection control supplies when procuring and distributing essential drugs</b> <ul style="list-style-type: none"> <li>▪ Procure syringes, needles, diluents and safety boxes for the collection of sharps</li> <li>▪ Strengthen the national regulatory authority to ensure the quality of injection equipment</li> </ul>	Public and private health care facilities	√ Proportion of health care facilities with sufficient stocks of single use injection equipment (in the facility or in a nearby public or community pharmacy) (Indicator P.9)

### IMMUNIZATION AND FAMILY PLANNING PROGRAMMES TO DELIVER INJECTABLES WITH AUTO-DISABLE SYRINGES AND SAFETY BOXES

<u>Objectives</u>	<u>Core interventions</u>	<u>Beneficiaries/ Target groups</u>	<u>Indicators</u>
Make all injectable vaccines and contraceptives available with matching quantities of injection equipment and safety boxes	<b>“Bundle” injectable vaccines and contraceptives procured by donors and lenders with essential injection equipment and supplies, including:</b> <ul style="list-style-type: none"> <li>▪ Auto-disable syringes and needles</li> <li>▪ Appropriate diluents</li> <li>▪ Safety boxes</li> </ul>	<ul style="list-style-type: none"> <li>▪ Immunization services (EPI programme)</li> <li>▪ Family planning services</li> </ul>	√ Donor or lender-funded programmes such as immunization or family planning services supplying AD syringes and needles in quantities matching supplies of injectables (vaccines or contraceptives) (Indicator I.5)

## 3. SHARPS WASTE MANAGEMENT

### HEALTH CARE SYSTEM TO PROPERLY MANAGE SHARPS WASTE

<u>Objectives</u>	<u>Core interventions</u>	<u>Beneficiaries/ Target groups</u>	<u>Indicators</u>
Integrate sharps waste management into a comprehensive national health care waste management plan	<b>National health care waste management plan</b> <ul style="list-style-type: none"> <li>▪ National policy with regulatory framework</li> <li>▪ Plan from waste production to disposal</li> <li>▪ Training at all levels</li> <li>▪ Procurement of waste treatment options</li> </ul>	<ul style="list-style-type: none"> <li>▪ Health care facilities</li> <li>▪ Injection providers</li> <li>▪ Communities</li> </ul>	√ Proportion of health care facilities where used injection equipment can be seen in the surrounding environment (Indicator O.7)

## 4. Implementing multidisciplinary interventions

### Rationale

Interventions to decrease both the unnecessary use (i.e., through patient-provider interactional group discussions) and the reuse (i.e., through provision of single use equipment) of injections have been shown to be a very cost-effective investment in health: the cost-effectiveness ratio is less than the annual gross domestic product per capita (Appendix D, Table 10). Implementation of the strategy for the safe and appropriate use of injections across all programmes or services involved in injections will achieve the required consistency in the practices of health care workers.

### Objective

Positive changes towards the safe and appropriate use of injections are brought about through (a) effective communication and behaviour change interventions, (b) the sufficient and continuous provision of injection equipment and infection control supplies and (c) an appropriate sharps waste management that eliminates contaminated sharps from the environment.

### Who can assist in implementation?

1. Communication and behaviour change will require communication experts to formulate a communication strategy, photographers, graphic designers, writers and other public relations experts to design information, education and communication materials;
2. Provision of supplies will require pharmacists or administrators familiar with procurement procedures;
3. Sharps waste management will require health systems specialists to manage the plan, engineers for the construction of the waste treatment options and logisticians for implementation.

### How to make it happen?

#### *1- Communication and behaviour change strategy*

WHO designed a template communication and behavioural change strategy for the safe and appropriate use of injections. This strategy proposes to develop six essential behaviours among patients, prescribers and injection providers (see Table 5). Further tools and details to implement the proposed communication strategy may be found in the "Communication toolbox for the safe and appropriate use of injections".

**Table 5: Communication strategy for the safe and appropriate use of injections**

<i>Four problems</i>	<i>Three participant groups</i>	<i>Six key actions</i>
THERAPEUTIC INJECTION OVERUSE	PRESCRIBERS	1. Prescribe oral medications wherever possible
	PATIENTS	2. If prescribed an injection, ask if medication can be given orally instead
REUSE OF INJECTION EQUIPMENT WITHOUT STERILIZATION		3. Demand that a syringe and needle be taken from a new, sealed and undamaged package
	INJECTION PROVIDERS (Health Care Workers)	4. Use a syringe and needle from a new, sealed and undamaged package for every injection
UNSAFE SHARPS COLLECTION		5. Without recapping, place syringes and needles in a safety box immediately after use
UNSAFE MANAGEMENT OF INJECTION WASTE		6. Manage injection waste safely and appropriately

## 2 - Provision of equipment and supplies

### a) Curative health care system

Since lack of supplies of injection equipment leads to unsafe practices [8], the WHO expert committee for essential medicines recommended that "those who supply injectable medications should also procure the equipment to administer them safely" [9]. Thus, national procurement officers purchasing pharmaceuticals should ensure that orders and deliveries of injectable substances also include matching quantities of (1) single use syringes and needles, (2) single-dose vials of diluents and (3) safety boxes for the collection of sharps waste. In some settings characterized by a high level of reuse of injection equipment, auto-disable syringes may be required instead of standard, single use syringes. Key steps to facilitate the procurement of equipment and supplies required to ensure injection safety are summarized in Table 6 and described in more detail in "Procuring single use injection equipment and safety boxes: A practical guide".

### b) Immunization, family planning and other donor- and lender-supported programmes

In the immunization field, the "bundling"\* policy statement recommends that donors and lenders who supply injectable vaccines should also supply auto-disable syringes and safety boxes for the collection of sharps. Family planning services, tuberculosis control and other donor- and lender-supported programmes making use of injections should also procure the equipment to administer injections safely. These programmes can use the immunization "bundling" policy statement as a template for the formulation of their own injection safety policy. [7]

**Table 6: Steps to follow to procure injection equipment and safety boxes at country level**

Step	Objective	Tasks
<b>Step 1</b>	<b>Select products</b>	<ul style="list-style-type: none"> <li>▪ Select the type of injection equipment and safety boxes required to be procured according to the purpose of use</li> </ul>
<b>Step 2</b>	<b>Estimate injection equipment needs</b>	<ul style="list-style-type: none"> <li>▪ Estimate needs of injection equipment and sharps boxes in preventive and curative services</li> <li>▪ Calculate costs and funds required</li> </ul>
<b>Step 3</b>	<b>Prepare for procurement</b>	<ul style="list-style-type: none"> <li>▪ Define procurement or tender specifications</li> <li>▪ Establish injection equipment specifications</li> <li>▪ Prepare bidding documents</li> <li>▪ Select potential suppliers</li> </ul>
<b>Step 4</b>	<b>Process tender</b>	<ul style="list-style-type: none"> <li>▪ Choose a tender format</li> <li>▪ Prepare bidding documents for selective tender</li> <li>▪ Solicit and receive offers for selective tender</li> <li>▪ Select suppliers</li> <li>▪ Issue contract</li> <li>▪ Assess contract performance</li> <li>▪ Evaluate product performance</li> </ul>

\* "Bundling" refers to the inclusion of the costs of auto-disable syringes and safety boxes in the costs of good quality vaccines provided by donors and lenders as described in the WHO/UNICEF/UNFPA/IFRC 1999 policy statement [5]. "Bundling" has no physical connotation and does not imply that items must be "packaged" together.

### 3 - Sharps waste management

While sharps waste constitutes a small proportion of all health care waste, it is associated with one of the highest hazards. Management of sharps waste within the broader context of health care waste management, as described in the "Aide Mémoire" for national safe health care waste management, improves effectiveness and sustainability. The key to success is the locally adapted combination of the managerial (see Table 7) and technology aspects (see Table 8).

**Table 7: Key elements of safe health care waste management**

#### **National policy for safe health care waste management**

- Designation of responsible authority
- Regulatory framework and guidelines
- Initial assessment
- Integration into overall waste management plan
- Monitoring and evaluation

#### **Comprehensive system of health care waste management**

- Assignment of waste management responsibilities to personnel
- Allocation of resources
- Minimization of waste
- Segregation of waste
- Safe collection, handling and storage
- Safe treatment and disposal

#### **Awareness and training**

- Inclusion of waste management in the curricula of health care personnel
- National training package
- Train the trainers programme
- Education on health risks
- Education on safe practices

#### **Selection of options for the management of health care waste**

- Review of available options (see Table 8)
- Checks of safety and environment-friendliness
- Ensure workers' safety
- Evaluation of sustainability
- Assessment of acceptability
- Monitoring of safety and efficiency

**Table 8: Comparison of various methods for processing/disposal of sharps waste**

<b>Method</b>	<b>Strengths</b>	<b>Weaknesses</b>
<b>Waste burial pit or encapsulation</b>	<ul style="list-style-type: none"> <li>▪ Simple</li> <li>▪ Inexpensive</li> <li>▪ Low tech</li> <li>▪ Prevents sharps-related infections/injuries to waste handlers/scavengers</li> </ul>	<ul style="list-style-type: none"> <li>▪ Potential of being unburied</li> <li>▪ No volume reduction</li> <li>▪ No disinfection of wastes</li> <li>▪ Pit may fill quickly</li> <li>▪ Not adapted for non-sharp infectious wastes</li> <li>▪ Presents a danger to community if not properly buried</li> <li>▪ Inappropriate in areas of heavy rain or if water table is near the surface</li> </ul>
<b>Burning (&lt; 400°C), including:</b>  Brick oven burners Drum burners Pit burning	<ul style="list-style-type: none"> <li>▪ Relatively inexpensive</li> <li>▪ Minimum training required</li> <li>▪ Reduction in waste volume</li> <li>▪ Reduction in infectious material</li> </ul>	<ul style="list-style-type: none"> <li>▪ Incomplete combustion</li> <li>▪ May not completely sterilize</li> <li>▪ Results in heavy smoke</li> <li>▪ May require fuel or dry waste to start burning</li> <li>▪ High potential for toxic emissions (e.g., dioxins and furans), if waste stream is not properly managed</li> </ul>
<b>Incineration (≥ 800°C)</b>	<ul style="list-style-type: none"> <li>▪ Almost complete combustion and sterilization of used injection equipment</li> <li>▪ Reduces risk of toxic emissions</li> <li>▪ Greatly reduces volume of sharps waste</li> <li>▪ Greater compliance with local environmental laws</li> </ul>	<ul style="list-style-type: none"> <li>▪ Relatively expensive to build, operate and maintain</li> <li>▪ Requires trained personnel to operate</li> <li>▪ May require fuel or dry waste to start burning</li> <li>▪ Some potential for toxic emissions (e.g., dioxins and furans) if waste stream is not properly managed.</li> </ul>
<b>Needle removal/ Needle destruction</b>	<ul style="list-style-type: none"> <li>▪ Reduces occupational risks to waste handlers and scavengers</li> <li>▪ Plastic and steel may be safely recycled for other uses after treatment</li> <li>▪ Manual technologies available</li> </ul>	<ul style="list-style-type: none"> <li>▪ Potential risk of needle-stick injuries</li> <li>▪ Fluid splash back may create opportunities of bloodborne pathogen transmission</li> <li>▪ Used needles/syringes need further treatment for disposal</li> <li>▪ Safety profile is not conclusively established</li> </ul>
<b>Plastic recycling</b>	<ul style="list-style-type: none"> <li>▪ Environment-friendly</li> <li>▪ Makes use of prevailing market mechanisms</li> <li>▪ Provides revenue to local private sector (e.g., production of buckets and coat hangers)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Needs to be preceded by use of a safe needle removal system</li> <li>▪ Potential risk of needle-stick injuries during processing</li> <li>▪ Requires estimation of financial viability under different scenarios and contexts</li> </ul>
<b>Melting in industrial ovens</b>	<ul style="list-style-type: none"> <li>▪ Greatly reduces volume of sharps waste</li> </ul>	<ul style="list-style-type: none"> <li>▪ Expensive</li> <li>▪ Requires electricity</li> </ul>
<b>Autoclave steam sterilization followed by shredding</b>	<ul style="list-style-type: none"> <li>▪ Sterilizes used injection equipment</li> <li>▪ Environmentally friendly</li> <li>▪ May reduce waste volume</li> </ul>	<ul style="list-style-type: none"> <li>▪ High capital and operational costs</li> <li>▪ Requires electricity</li> <li>▪ High maintenance requirements</li> <li>▪ Less volume reduction than incineration</li> </ul>

Further information on sharps waste management is available at <http://www.healthcarewaste.org>.

## **5. Monitoring and evaluating impact**

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### **Rationale**

Monitoring and evaluation are required to document progress towards the targets laid out in the national standard for injection practices and to adapt implementation of interventions accordingly.

### **Objective**

The implementation of the national plan for the safe and appropriate use of injections is regularly monitored and intermittently evaluated using a combination of input, process and outcome indicators to obtain evidence of the progress achieved and a basis for the new planning process.

### **Who should conduct monitoring and evaluation?**

The easiest way to ensure monitoring and evaluation is to incorporate injection practices indicators into sets of indicators routinely used to monitor the technical quality of health systems.

### **How to make it happen?**

#### *Indicators*

The indicators to be used for evaluation are identical to the ones used for the initial assessment (see Table 1). The subset of indicators mentioned in the plan of action (see Table 4) are particularly suitable for monitoring purposes.

#### Input indicators

Input indicators reflect the human, financial and planning resources invested in the national strategy for the safe and appropriate use of injections.

#### Process indicators

Process indicators reflect the status of implementation of the various action points proposed in the national strategy for the safe and appropriate use of injections.

#### Outcome indicators

Outcome indicators reflect the evolution of injection practices in terms of frequency and safety following the implementation of the national strategy for the safe and appropriate use of injections.

#### *Data collection*

Data regarding these indicators may be collected regularly in the Ministry of Health and in different programme offices, during supervisory visits in health care facilities, in separate surveys and/or as part of the process of accreditation of health care facilities. In the latter case, the proposed indicators may be adapted. Additional resources regarding the use of supervision visits to monitor injection practices are available in the "Guide to supervising injection providers".

## **Appendices**

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Appendix A: Burden of disease from contaminated injections

Appendix B: Best practices

Appendix C: Template agenda for a national injection safety planning workshop

Appendix D: Cost-effectiveness of safe and appropriate use of injections

## Appendix A: Burden of disease from contaminated injections

As part of the 2000 update of the Global Burden of Disease study [3], WHO estimated the burden of disease that can be expected from contaminated injections in those 10 world regions, where reuse of injection equipment in the absence of sterilization is occurring. The annual number of injections per person ranged from 1.7 to 11.3 and the proportion of injections administered with reused equipment ranged from 1.2% to 75%. In these 10 regions, in 2000, unsafe injections may have caused 21 million hepatitis B virus infections, two million hepatitis C virus infections and 260 000 HIV infections, accounting for 32%, 40% and 5% of all new infections respectively.

**Table 9: Injection practices and their consequences in terms of viral hepatitis, HIV infection and disability adjusted life years (DALYs), by region, year 2000**

		Global Burden of Disease by region (see country list below)										
		AFR D	AFR E	AMR B	AMR D	EMR D	EUR B	EUR C	SEAR B	SEAR D	WPR B	World
<b>Injections per person and per year</b>		2.2	2.0	1.7	1.9	4.3	5.2	11.3	2.1	4.0	2.4	3.4
<b>Proportion of reuse</b>		19%	17%	1.2%	11%	70%	1.2%	11%	30%	75%	30%	39.8%
<b>Proportion of infections due to unsafe injections</b>	<b>Hepatitis B virus</b>	10.9% (8.2-13.9%)	9.2% (6.9-11.5%)	2.3% (0.0-16.3%)	9.3% (0.0-26.9%)	58.3% (26.2-82.4%)	0.9% (0.0-3.3%)	7.7% (1.8-15.0%)	22.4% (16.5-28.7%)	53.6% (21.6-79.9%)	33.6% (0.0-79.0%)	31.9% (9.4-56.9%)
	<b>Hepatitis C virus</b>	16.4% (12.3-20.8%)	13.0% (9.8-16.2%)	0.9% (0.0-6.4%)	9.2% (0.0-26.7%)	81.7% (52.1-95.0%)	0.9% (0.0-3.4%)	21.2% (6.1-34.7%)	30.8% (22.8-39.2%)	59.5% (40.4-93.6%)	37.6% (0.0-89.8%)	39.9% (18.2-66.7%)
	<b>HIV</b>	2.5% (1.9-3.1%)	2.5% (1.9-3.1%)	0.2% (0.0-1.5%)	1.5% (0.0-4.5%)	7.1% (5.7-8.5%)	0.0% (0.0-0.0%)	0.6% (0.2-1.2%)	7.0% (5.2-8.9%)	24.3% (18.3-30.1%)	2.5% (0.0-5.9%)	5.4% (3.9-7.0%)
<b>Total burden in DALYs 2000-2030</b>		555 644	1 668 583	9 083	27 332	559 702	3 479	64 733	280 789	4 720 866	1 287 470	9 177 679

**GLOBAL BURDEN OF DISEASE REGIONS:** **Afr D includes:** Algeria, Angola, Benin, Burkina Faso, Cameroon, Cape Verde, Chad, Comoros, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Madagascar, Mali, Mauritania, Mauritius, Niger, Nigeria, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Togo. **Afr E includes:** Botswana, Burundi, Central African Republic, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Eritrea, Ethiopia, Kenya, Lesotho, Malawi, Mozambique, Namibia, Rwanda, South Africa, Swaziland, Uganda, United Republic of Tanzania, Zambia, Zimbabwe. **Amr B includes:** Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Brazil, Chile, Colombia, Costa Rica, Dominica, Dominican Republic, El Salvador, Grenada, Guyana, Honduras, Jamaica, Mexico, Panama, Paraguay, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, Uruguay, Venezuela. **Amr D includes:** Bolivia, Ecuador, Guatemala, Haiti, Nicaragua, Peru. **Emr D includes:** Afghanistan, Djibouti, Egypt, Iraq, Morocco, Pakistan, Somalia, Sudan, Yemen. **Eur B includes:** Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Bulgaria, Georgia, Kyrgyzstan, Poland, Romania, Slovakia, Tajikistan, The Former Yugoslav Republic of Macedonia, Turkey, Turkmenistan, Uzbekistan, Yugoslavia. **Eur C includes:** Belarus, Estonia, Hungary, Kazakhstan, Latvia, Lithuania, Republic of Moldova, Russian Federation, Ukraine. **Sear B includes:** Indonesia, Sri Lanka, Thailand. **Sear D includes:** Bangladesh, Bhutan, Democratic People's Republic of Korea, India, Maldives, Myanmar, Nepal. **Wpr B includes:** Cambodia, China, Cook Islands, Fiji, Kiribati, Lao People's Democratic Republic, Malaysia, Marshall Islands, Micronesia (Federated States of), Mongolia, Nauru, Niue, Palau, Papua New Guinea, Philippines, Republic of Korea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu, Viet Nam





## Appendix B: Best practices

*Best infection control practices for skin-piercing intradermal, subcutaneous and intramuscular needle injections*









***A safe injection does not harm the recipient,  
does not expose the provider to any avoidable risk,  
and does not result in any waste that is dangerous for other people***

Eliminating unnecessary injections is the highest priority to prevent injection-associated infections. When injections are medically indicated, they should be administered safely. These best practices are measures that have been determined through scientific evidence or expert consensus to most effectively protect patients, providers and communities.

### *Use sterile injection equipment*

1. Use a sterile syringe and needle for each injection and to reconstitute each unit of medication. 
2. Ideally, use a new, single use syringe and needle. Inspect packaging for breaches in barrier integrity. Discard a needle or syringe if the package has been punctured, torn or damaged by exposure to moisture.  
3. If single use syringes and needles are unavailable, use equipment designed for steam sterilization. Sterilize equipment according to WHO recommendations and document the quality of the sterilization process using time, steam, temperature (TST) spot indicators. 

### *Prevent contamination of injection equipment and medication*

4. Prepare each injection in a clean designated area, where blood or body fluid contamination is unlikely. 
5. Use single-dose vials rather than multi-dose vials. 
6. If multi-dose vials must be used, always pierce the septum with a sterile needle. Avoid leaving a needle in place in the stopper of the vial. 
7. Select pop-open ampoules rather than ampoules that require use of a metal file to open. 
8. If using an ampoule that requires a metal file to open, protect fingers with a clean barrier (e.g., small gauze pad) when opening the ampoule. 
9. Inspect for and discard medications with visible contamination or breaches of integrity (e.g., cracks, leaks). 
10. Follow product-specific recommendations for use, storage and handling. 
11. Discard a needle that has touched any non-sterile surface. 

### *Prevent needle-stick injuries to the provider*

12. Anticipate and take measures to prevent sudden patient movement during and after injection.
13. Avoid recapping and other hand manipulations of needles. If recapping is necessary, use a single-handed scoop technique.
14. Collect used syringes and needles at the point of use in an enclosed sharps container that is puncture- and leak-proof and that is sealed before completely full.



### *Prevent access to used needles*

15. Seal sharps containers for transport to a secure area in preparation for disposal. After closing and sealing sharps containers, do not open, empty, reuse, or sell them.
16. Manage sharps waste in an efficient, safe and environment-friendly way to protect people from voluntary and accidental exposure to used injection equipment.



### *Other practice issues*

17. Engineered technology. Whenever possible, use devices designed to prevent needle-stick injury that have been shown to be effective for patients and providers. Auto-disable (AD) syringes are increasingly available to prevent reuse of injection equipment in selected settings, including immunization services.
18. Provider's hand hygiene and skin integrity. Perform hand hygiene (i.e., wash or disinfect hands) before preparing injection material and giving injections. The need for hand hygiene between each injection will vary based on the setting and whether there was contact with soil, blood or body fluids. Avoid giving injections if skin integrity is compromised by local infection or other skin condition (e.g., weeping dermatitis). Cover any small cuts.
19. Gloves. Gloves are not needed for injections. Single use gloves may be indicated if excessive bleeding is anticipated.
20. Swabbing of vial tops or ampoules. Swabbing of clean vial tops or ampoules with an antiseptic or disinfectant is unnecessary. If swabbing with an antiseptic is selected for use, use a clean, single use swab and maintain product specific recommended contact time. Do not use cotton balls stored wet in a multi-use container.
21. Skin preparation before injection. Wash skin that is visibly soiled or dirty. Swabbing of the clean skin before giving an injection is unnecessary. If swabbing with an antiseptic is selected for use, use a clean, single use swab and maintain product specific recommended contact time. Do not use cotton balls stored wet in a multi-use container.



## Appendix C: Template agenda for a national injection safety planning workshop

*Template agenda for a national one-day planning workshop on a national policy for the safe and appropriate use of injections*

### *Objectives*

- Review the results of the national injection practices assessment;
- Review the draft outline of a national strategy for the safe and appropriate use of injections;
- Establish a national injection safety committee;
- Obtain consensus on the key elements of the national strategy for the safe and appropriate use of injections;
- Identify next action points towards a national strategy for the safe and appropriate use of injections.

### *Suggested participants for the workshop and the national injection safety committee*

- Relevant departments of the Ministry of Health, including HIV prevention and care, essential medicines, immunization and health system;
- Direction of preventive and direction of curative care;
- National professional association (medical and nursing associations);
- Non governmental associations;
- International organizations;
- Bilateral partners.

### *Agenda items*

#### *Morning : Situation analysis*

1. Opening by Ministry of Health officials (30 min.)
2. Global injection practices issues (15 min. presentation, 15 min. discussion)
3. Assessment results (30 min. presentation, 30 min. discussion)
4. HIV prevention and care activities in the country: Overview (15 min. presentation , 15 min. discussion)
5. National drug policy: Overview (15 min. presentation, 15 min. discussion)
6. Immunization safety in the country: Overview (15 min. presentation, 15 min. discussion)
7. Health system management: Overview (15 min. presentation, 15 min. discussion)

#### *Afternoon: Proposed plans*

8. Outline of a proposed injection safety plan (30 min. presentation, 30 min. discussion)
9. Role of HIV prevention and care in the national plan (15 min. presentation, 15 min. discussion)
10. Role of the national drug policy in the national plan (15 min. presentation, 15 min. discussion)
11. Role of immunization services in the proposed plan (15 min. presentation, 15 min. discussion)
12. Role of the health system in the proposed plan (15 min. presentation, 15 min. discussion)
13. Costing, budgeting and financing (30 min.)
14. Next steps and action points (30 min.)

An additional half-day break out session may be useful to develop points 9-12 and to prepare a draft injection safety plan and recommendations to be approved by participants.

## Appendix D: Cost-effectiveness of safe and appropriate use of injections

The WHO CHOICE project estimated the cost-effectiveness of various health interventions related to injection safety[10]. Interventions to reduce unnecessary injections were assumed to be 30% effective (reduction of the proportion of prescriptions including at least one injection) while the average effectiveness of interventions to decrease unsafe use of injections was assumed to be 95% (reduction of the proportion of injections administered with reused equipment). To estimate the costs of these interventions in 2000, it was assumed that start-up activities included a national planning workshop, the development and production of information, education and communication (IEC) material, a workshop for the training of trainers, the training of procurement officers and district planning workshops. Further activities included the supply of injection equipment, annual national follow-up workshops, interactional group discussions between patients and health care providers and annual monitoring surveys.

Under these assumption, interventions to reduce unnecessary injections would cost on average 0.015 international dollars (I\$) per capita and prevent 2 753 304 DALYs worldwide (average cost effectiveness ratio (CER): I\$ 26 per DALY averted, range by region: 7 – 5124). Interventions to reduce the unsafe use of injections would cost on average I\$ 0.17 per capita and prevent 8 718 795 DALYs worldwide (average CER: I\$ 98 per DALY, range by region: 12-1107). Combined interventions for the safe and appropriate use of injections would cost on average I\$ 0.18 cents per capita and prevent 8 856 461 DALYs worldwide (average CER: I\$ 102 per DALY, range by region: 14 - 2293). If resources were scarce, interventions to reduce injection overuse would thus be preferred to interventions to reduce unsafe use as they are less costly and more cost-effective. However, the implementation of the combined interventions would avert almost three times as many DALYs with a cost-effectiveness of far less than the gross domestic product per capita, which makes these interventions a very sound investment in health.

**Table 10: Cost-effectiveness ratio of interventions to reduce injection overuse, reduce unsafe use of injections and the combination, by region, in 2000**

	Gross Domestic Product I\$/capita	Cost per discounted and age-adjusted DALY averted (I\$)		
		Reduction of injection overuse (30% effective)	Reduction of unsafe use of injections (95% effective)	Combined interventions
AFR D	1 381	16	39	42
AFR E	1 576	7	12	14
AMR B	7 833	3 862	499	1 385
AMR D	3 837	132	97	125
EMR D	2 393	23	282	283
EUR B	7 294	5 124	1 107	2 293
EUR C	6 916	273	213	272
SEAR B	2 545	42	100	108
SEAR D	1 449	8	102	102
WPR B	4 186	66	125	138
<b>Total</b>		<b>26</b>	<b>98</b>	<b>102</b>

## 10 Key resources

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### **Benchmarking**

1. *Best infection control practices for intradermal, subcutaneous and intramuscular injections. WHO/BCT/DCT/01.02 (Appendix B).*

### **Assessment tools**

2. *Injection practices: The rapid assessment and response guide. WHO Department of Blood Safety and Clinical Technology. WHO/BCT 02.11.*
3. *The WHO tool for the assessment of injection safety. WHO/VAB/01.30.*
4. *The WHO tool for the rapid assessment of health care waste management. WHO Department of Protection of the Human Environment, Second draft, February 2001.*

### **Planning tools**

5. *"Aide Mémoire" for national safe and appropriate use of injection policies. WHO Department Blood Safety and Clinical Technology, April 2000.*
6. *"Aide Mémoire" for national safe health care waste management. WHO Department of Protection of the Human Environment, November 2000.*

### **Implementation tools**

7. *Communication toolbox for the safe and appropriate use of injections. WHO Department of Blood Safety and Clinical Technology, 2003 (in final production).*
8. *Procuring single use injection equipment and safety boxes: A practical guide. WHO Department of Blood Safety and Clinical Technology, Draft 6, April 2003.*
9. *Pruess A et al. Safe management of waste from healthcare activities. WHO, 1999.*

### **Evaluation tools**

10. *Guide to supervising injection providers. WHO Department of Blood Safety and Clinical Technology, Draft 2 for field testing, January 2003.*

## References

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- 1 Simonsen L, Kane A, Lloyd J, Zaffran M, Kane M. Unsafe injections in the developing world and transmission of blood-borne pathogens. *Bulletin of the World Health Organization* 1999;77:789-800
- 2 Kane A, Lloyd J, Zaffran M, Simonsen L, Kane M. Transmission of hepatitis B, hepatitis C and human immunodeficiency viruses through unsafe injections in the developing world: model-based regional estimates. *Bulletin of the World Health Organization* 1999,77:801-7
- 3 Hauri A, Armstrong GL, Hutin YJF. Contaminated injections in health care settings. In: Ezzati M, Lopez AD, Rodgers A, Murray CJL. *Comparative quantification of health risks: Global and regional burden of disease attributable to selected major risk factors*. Geneva, World Health Organization, 2003.
- 4 World Health Report 2002. Preventing risk factors, promoting healthy life. Geneva, 2002.
- 5 Mac Aulay C. Guidelines to develop standards. The Quality Assurance Project, URC, for the Center of Human Services, 7200 Wisconsin Ave., Suite 600, Bethesda, MD, 1999.
- 6 Best infection control practices for skin-piercing intradermal, subcutaneous and intramuscular needle injections. WHO/BCT/DCT 01.02.
- 7 WHO-UNICEF-UNFPA-IFRC. Joint statement on the use of auto-disable syringes in immunization services. WHO/VAB/99.25. Document available at <http://www.who.int/vaccines>.
- 8 Dicko M, Oni AQ, Ganivet S, Kone S, Pierre L, Jacquet B. Safety of immunization injections in Africa: not simply a problem of logistics. *Bulletin of the World Health Organization* 2000; 78:163-9.
- 9 WHO. Report on the 12<sup>th</sup> Expert Committee on the Selection and Use of Essential Medicines, 2002. Unedited version. April 2002.
- 10 Dziekan G, Chisholm D, Johns B, Rovira J, Hutin YJF. The cost-effectiveness of policies for the safe and appropriate use of injection in health care settings. *Bulletin of the World Health Organization* 2003; in press.