

# Streamlining Immunization Logistics in the Provinces of Central Java and Yogyakarta, Indonesia

A Collaborative Project of  
the Ministry of Health,  
Republic of Indonesia and  
PATH

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## Acronyms and abbreviations

AD	Auto-disable (syringe)
DTP3	Third dose of diphtheria, tetanus and pertussis vaccine
EEFO	Earliest expiry date, first out
EPI	Expanded Programme on Immunization
EVSM	Effective Vaccine Stores Management
FreezeTag	Freeze indicator product
GAVI Alliance	Global Alliance for Vaccines and Immunization
HB3	Third dose of hepatitis B vaccine
IR	Infra-red
MDVP	WHO Multi-dose vial policy on keeping opened vaccine vials
MIS	Management Information System
MOH	Ministry of health
NID	National Immunization Day
PUSH+	System of health center visits to distribute vaccine, collect sharps waste and provide supervision. Called "PUSH plus."
SOP	Standard operating procedure
SMS	Stock Management System
TTM	Miniature electronic temperature recorder
Uniject™ device	Integrated needle and pouch of vaccine designed to give a single injection
UNICEF	The United Nations Children's Fund
VVM	Vaccine vial monitor
WHO	World Health Organization

## Executive Summary

The Streamlining Immunization Logistics project, implemented between April 2005 and March 2006 in eight districts of Central Java and Yogyakarta, Indonesia, has demonstrated qualitative improvements in the efficiency of sub-national logistic systems supporting the delivery of immunization services. The Streamlining project achieved these improvements using two related strategies. First, it introduced an integrated system of vaccine distribution, collection of sharps waste, and supportive supervision within a scheduled system of health center visits. Second, the project established and achieved strong compliance with a set of standard operating procedures (SOPs).

These strategies empowered district management to provide regular, dependable logistic and supervisory support to health centers. The effect of this support has reduced recurrent costs, lightened the burden on health center staff, and motivated supervisors to achieve and maintain high standards of vaccine management and injection safety practices. Engagement of district management to support high-quality immunization services contributed to heightened interest in achieving high standards at the provincial vaccine stores which are now close to meeting World Health Organization (WHO) and United Nations International Children's Emergency Fund (UNICEF) global Effective Vaccine Stores Management (EVSM) standards.

The Streamlining project is significant to Indonesia because it:

- Offers a blueprint to the other 31 provinces of the country for raising the standard of efficiency and reliability of immunization service support. This is essential for Indonesia to maintain overall high immunization coverage, eliminate pockets of low coverage, introduce new vaccines, and expand supplementary immunization strategies to a wider age group.
- Tackles the issue of sharps waste management for all injections. The project shows the potential for a wider integration of logistic support and supervision for all public health interventions at the level of service delivery. Streamlining establishes an operational platform for all of primary health care by using immunization as the “kick-start.”
- Addresses the need to remove health systems constraints to achieve high performance immunization services. In the global context, the project is concerned with articulating and meeting the norms and standards that are increasingly being applied by the global community through the GAVI Alliance and the Global Fund for external financial and technical support to the development of health services.

The achievements of the project occurred, against the backdrop of two unexpected constraints. First, the reliability of central supplies of vaccines and syringes was very low during the project period, compromising efforts at a sub-national level to raise efficiency. The second constraint was the non-compliance of private health services with SOPs; this caused supply chain difficulties for the public service that supplies private sector health organizations with vaccines and syringes. Both issues need the urgent attention of the Ministry of Health (MOH).

Based on the achievements of the project, this report recommends that the new streamlining system be sustained in existing project areas and expanded to other provinces.

## Background

A reliable and efficient logistics system has always been a success factor for the performance and sustainability of immunization services. But today the reliability and efficiency of the system is critical to the success of two new global immunization goals:

- Introduction of new vaccines globally (six in the next decade) is stimulating efforts to reach higher standards of immunization data quality and vaccine handling and storage.
- Disease control and elimination programs—in particular polio eradication and measles control—require exceptionally high standards to assure the effectiveness of mass immunization campaigns.

Maintaining high standards for the system of immunization logistics is always a challenge in large, geographically-dispersed countries. But Indonesia, in spite of being one of the largest and most dispersed developing country populations, tackled its challenges through innovative changes in policy and pioneered the introduction of several new immunization technologies. For example:

- Faced with the prospect of very low immunization coverage of hepatitis B vaccine to newborns in the home, Indonesia introduced the Uniject™ device and the use of this vaccine outside the cold chain.
- Faced with the discovery of widespread freezing of sensitive vaccines in the cold chain, the rules for vaccine distribution and storage were radically changed.
- To facilitate solutions to these two problems, Indonesia was the first country globally to introduce vaccine vial monitors (VVMs) on all vaccines.
- Faced with poor compliance with sterilization and reuse procedures for syringes, Indonesia introduced auto-disable (AD) syringes to improve injection safety and changed the system of supply to assure synchronized distribution of syringes, safety boxes, diluents, and vaccines.
- To tackle the problem of syringe waste disposal, Indonesia has tested systems of collection and optimal disposal of waste syringes and needles and plans for national replication of these systems.

Until now, the changes described above have taken place separately—each change responding to a particular problem and following a different path of implementation. The decentralization of the health system in 2002 in Indonesia has presented a unique opportunity to make a comprehensive change to the vaccine distribution system by empowering district management and incorporating all the current needs in a single, streamlined logistics system. The goal of this system is to integrate the changes and ensure a single comprehensive approach for the future.

## Objectives

The goal of the Streamlining project is to improve the quality and reliability of immunization logistic systems by:

- Establishing SOPs in vaccine, cold chain, and waste management.
- Demonstrating the PUSH+ system of integrated supplies distribution, waste management, and supportive supervision.

The ultimate aim of the Streamlining project is to replicate the methodology in other Indonesian provinces. Within the context of a PUSH+ system of vaccine distribution (system of health center visits distribute vaccine, collect sharps waste, and provide supervision), the project was targeted to achieve specific objectives in the categories of immunization services; vaccine distribution chain; injection safety and sharps disposal; and supervision and monitoring. The objectives for each category follow.

### Immunization services

1. Achieve higher immunization coverage of the third doses of diphtheria, tetanus, and pertussis vaccine (DTP3); and hepatitis B vaccine (HepB3) in project zones than before the project.
2. Conduct immunization sessions in project zones according to the plan with no disruptions due to logistics.

### Vaccine distribution chain

3. Meet EVSM standards in provincial/district stores and ensure health center stores meet a set of project criteria based on the EVSM principles.
4. No detection of vaccine freeze exposure by freeze indicators or temperature charts associated with discard of vaccine.
5. Records are maintained of vaccine discard due to VVM status and vaccine wastage is monitored.
6. Records of vaccine and syringe stock balance shows no stockouts occurred.
7. Vaccine stock balance records demonstrate that surplus stocks (exceeding utilization plus buffer) do not accumulate.
8. Vaccine stock issue records including VVM status demonstrate EEFO prioritization procedure is followed.

### Safety of injections/sharps disposal

9. Vaccine and syringe stock records show that the “bundling” principle is followed (syringe stock => vaccine stock x utilization).
10. Distribution system (fuel, consumables, maintenance, and driver) for PUSH+ system is equal or lower than previous baseline costs.



11. Safety boxes are used, not overfilled, and collected monthly; and 100 percent of immunization syringe waste is destroyed or sent for recycling.

**Supervision and monitoring**

12. Improvement of timeliness and quality of supervision occurred compared to baseline data.
13. Immunizations and logistics records are accurate, and reports are timely and complete.

## Methodology

### Study area selection

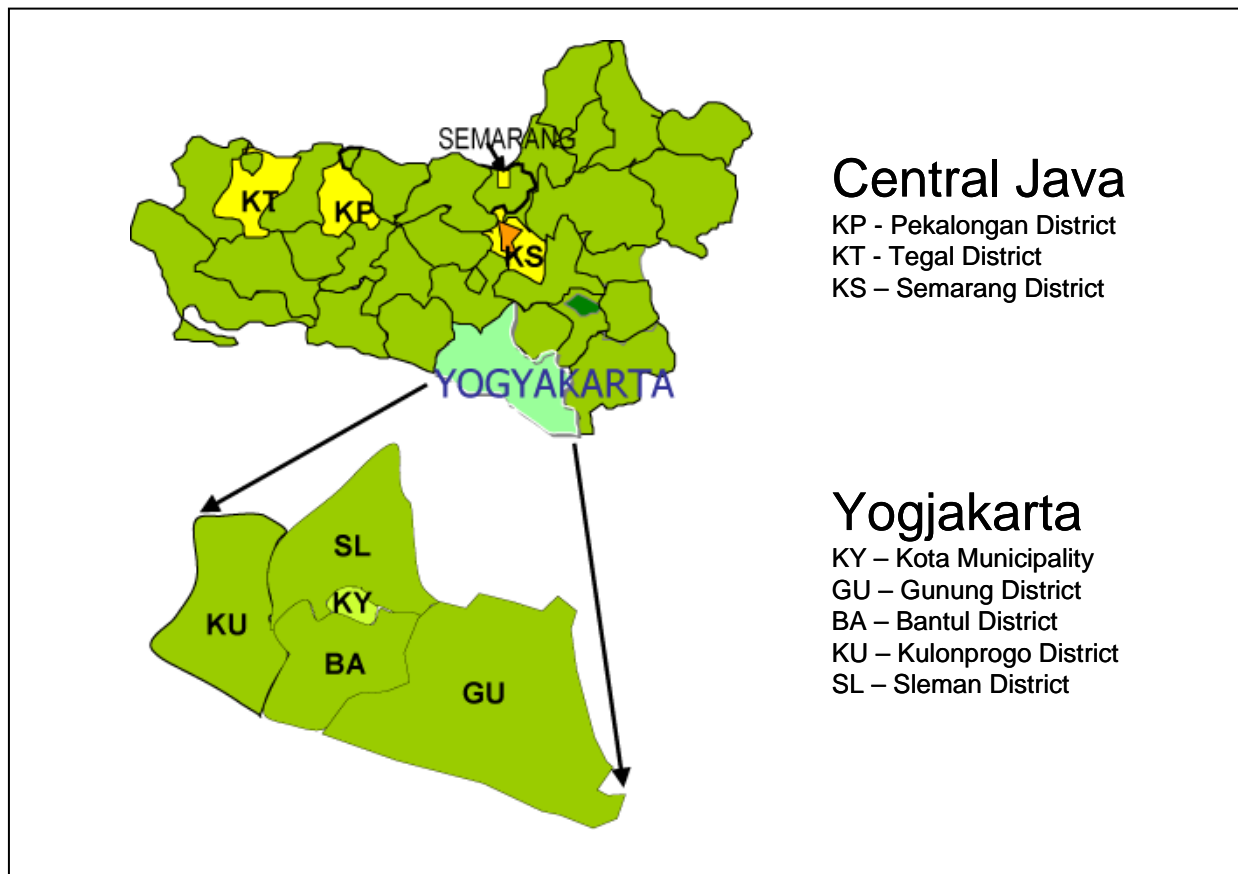
The following two provinces were selected for the Streamlining project:

- Yogyakarta (population 3,333,913 in the 5 project districts)
- Central Java (population 5,925,650 in the 3 project districts)

The main reason for selecting these provinces was that both had previously collaborated with PATH. Yogyakarta participated in several immunization and vaccine related programs: Early Birth, Out of the Cold Chain Delivery of HepB in Uniject (2000), and the Sharps Waste Management Study (2003). Central Java collaborated with PATH on the installation of the multi-log computerized cold room temperature monitoring device, Effective Vaccine Stores Management Initiative (2003), and the introduction of the Stock Management System (2004). Because these initiatives are key elements in the Streamlining project, this was an opportunity to expand these activities into a full, logistics system evaluation at the province scale.

All five districts of Yogyakarta and three districts of Central Java were selected to implement the project (Figure 1).

**Figure 1. Map of the project provinces and districts.**



## ***The streamlined system defined***

The innovative features of a streamlined system of immunization logistics—incorporating SOPs and the PUSH+ system of health center visits—can be summarized by the following initiatives at each level:

- **Province**
  - Vaccine store meets WHO/EVSM standards and SOP.
  - Computer-based Stock Management System (SMS) and multi-log system of temperature recording used.
  - Vaccine freeze indicators and VVMs used.
  - ThermoTrace temperature inspection aid used.
  - Integrated with a supervisory visit:
    - Distribution of vaccines/diluents.
    - Bundled distribution of syringes/needles.
    - Logistic and immunization supervision.
- **District**
  - Vaccine store meets relevant EVSM criteria and SOP.
  - Vaccine freeze indicators and VVMs used.
  - ThermoTrace temperature inspection aid used.
  - Computer-based Stock Management System (SMS).
  - Integrated with a monthly health center visit:
    - Distribution of vaccines/diluents.
    - Bundled distribution of syringes/needles.
    - Logistic and immunization supervision.
    - Collection of used safety boxes for central disposal.
    - Checking/collection of immunization reports.
- **Health center**
  - SOPs for vaccine handling and safe injections.
  - Vaccine freeze indicators.
  - Use of batch cards for stock control.
  - Safety boxes used to collect all syringes at curative and preventive injection sites.

Most of these features were implemented as planned in the project, level-by-level with the following exceptions and modifications:

- **Province level project modifications**
  - Central Java districts collected vaccines from the provincial store.
  - Yogyakarta provincial store multi-log computer-based continuous temperature recording system was not installed.

- **District level project modifications**

- Yogyakarta monthly health center visits by the districts were not used to collect safety boxes. Instead, the former system of centralized and regionalized collection and disposal were used.

### **PUSH+ distribution**

The PUSH+ system requires that each participating district create a distribution plan valid for at least the following six months. The plan is created by mapping the health facilities to be visited and designating round-trip visits, each normally lasting less than a day. The destinations for each trip are listed with the total distance, duration, and number of people traveling, in addition to the driver. A typical district in the project provinces required about 15 working days per month to complete one distribution cycle, with about two health center visits per round-trip.

A mapping example of PUSH+ trips in a district of Yogyakarta is shown in Figure 2.

**Figure 2. Mapping of PUSH+ distribution trips in a district of Yogyakarta.**



Each district requires a dedicated vehicle to carry both personnel and supplies. PATH funded rental charges, fuel, and the driver’s remuneration for the duration of the project in each area.

Before a particular trip, sufficient vaccines and bundled supplies, including syringes, diluent, droppers, and safety boxes are loaded into the vehicle for a specific group of health facilities. On arrival at each health facility the district logistician/supervisor:

- Conducts a physical stock count of vaccines and supplies at the facility.
- Checks and corrects batch cards.
- Completes a Distribution and Supervision Form and issues the stock from the cold box in the vehicle.

- Collects filled safety boxes, placing them in a separate box in the vehicle.
- Conducts a supervisory interview with health facility staff using the Distribution and Supervision Form (Appendix A)—a monthly review of disruptions in scheduled immunization services and the reasons (e.g., vaccine stockouts or postponement of the immunization session).
- Verify completion of immunization report forms and correct the previous month’s reports if additional data are now available.

In Central Java, a similar trip is made each month with the same vehicle to collect vaccine from the provincial store. In Yogyakarta, vaccines are distributed monthly to districts by the province and include a supervisor visit.

### **Distribution vehicle**

In most cases, a double-cab pickup was recommended for distribution trips because of its ability to carry supplies and transport up to four people including the driver. A vehicle was purchased and dedicated for distribution in each of the project districts of Central Java.

In highly innovative fashion, the district of Semarang obtained a matching district government grant against PATH funding for renting a vehicle. The Semarang district used the funds to buy and convert a 1999 light truck into a double-cab to transport supervision staff and supplies for distribution trips (Figure 3).

**Figure 3. Conversion of a used light truck into a double-cab for PUSH+ activities.**



## ***Monitoring tools***

Monitoring tools used in the Streamlining project included three stock control tools and four temperature monitoring tools. These logistics system tools replaced or supplement those currently used.

### **Stock control tools**

Three stock control monitoring tools were instrumental in the project: the batch card, Stock Management System (SMS), and the Distribution and Supervision Form (district and province). Additional information about these tools is located in Appendix A.

#### **The Batch Card**

A batch card is a record created for each new supply lot of vaccine entering the distribution chain. During the project, batch cards were used at health centers as well as district and province-level stores. The card is used to record the store balances and transactions, stock adjustments, and VVM status. The card supplemented or replaced a variety of stock ledger systems in use at the outset of the project.

#### **Stock Management System (SMS)**

SMS is a computer-based (Excel) spreadsheet stock control tool developed for WHO as part of an intermediate store management system. The main goal of using this spreadsheet is to provide store managers with the experience of monitoring supplies before a more sophisticated database is introduced; it also provides minimum data requirements for programmers who code a tailor-made stock keeping software.

The stock management component of the software works with electronic batch cards. All data variables existing on a batch card are entered into the spreadsheet. SMS tracks ten different batches of 21 different commodities. The SMS results (summary) page lists all the commodities and up-to-date stock levels. The system also provides color codes and messages to assist the SMS user.

#### **Distribution and Supervision Form**

The Distribution and Supervision Form (Appendix A) records a single issue of vaccine and bundled syringes by the district management to the health center during the monthly visit. A physical inventory check is made during this visit and stock adjustments are recorded on the same form. A supervision checklist is also incorporated within the Distribution and Supervision Form.

## **Temperature monitoring tools**

Four temperature monitoring tools were instrumental in the project: TTM recorders for equipment performance checks, ThermoTrace temperature inspection aid, freeze-tag indicators, and multi-log system of temperature recording.

### **TTM recorders for equipment performance checks**

Temperature recorders, the size of a vaccine vial, were provided to each provincial and district store for routine performance checks on cold chain equipment by supervisors. These recorders are used repeatedly in cold chain studies conducted with PATH's assistance and have been introduced for routine checks on the cold chain within the project area (Figure 4).

### **ThermoTrace temperature inspection aid**

Pen-sized ThermoTrace infrared thermometers (Figure 4) were provided to all vaccine management supervisors and storekeepers in the study area allowing for instantaneous temperature checks at any location in a vaccine store by pointing and clicking.

### **Freeze-tag indicators**

Freeze-tag indicators (Figure 4) are currently preferred to provide warning that freezing temperatures have occurred in vaccine stores. The indicators give a clear warning when they have been exposed below freezing for more than 60 minutes. Freeze-tag monitors were provided throughout the project areas.

### **Multi-log system of computerized temperature recording**

Sensors located in multiple vaccine refrigerators, freezers, or cold rooms feed temperature data to a central computer peripheral (Figure 4 and Appendix A) where data are continuously stored, analyzed, and available to the storekeeper. The system was installed in the provincial store in Semarang, Central Java before the project began, and continued to be evaluated during the project.

## ***Project timetable***

The Streamlining project was scheduled to begin in January 2005, but due to the Tsunami disaster, project implementation was delayed until March 2005. MOH staff was needed to provide disaster relief and this prevented work on the project.

Project preparation and training took place in March 2005 and the first distribution visits were made in April 2005. Three progress reviews took place (June and December 2005, and April 2006) and project supervisor visits occurred every two months. The project was completed in May and closed in June 2006. The timetable of program activities appears in Figure 5 and a description of these activities follows.

Figure 4. Temperature monitoring tools introduced by the Streamlining project.

### Freeze-Tag



Freeze-Tag changes irreversibly from a check to a cross when it has been exposed below 0°C for more than 60 minutes. It cannot be re-used.  
To monitor refrigerators for freezing temperatures.

### Thermo-trace



Thermo-trace makes instant Temperature readings  $\pm 1^{\circ}\text{C}$  at a distance by pointing the laser beam and clicking to see the temperature.  
For supervision checks on cold chain temperatures.

### Remonsys Multilog



Multilog records the temperature of multiple sensors located in cold rooms or refrigerators, stores them in a stock control (SMS) PC and provides reports and plots of temperature over time.  
Audible and telephone alarm system.

### Gemini TinyTalk TK0014 data logger



Tiny TTM records temperatures Continuously up to 6 months. Recording accuracy is  $\pm 0.2^{\circ}\text{C}$ . A computer is required to program and download temperature information so that it can be analyzed and printed.



## Streamlining Project Activities

The specific Streamlining project activities included preparation and training, conducting a baseline assessment, supervisory visits, preliminary and mid-term review, final data collection and analysis, final review visit and meeting, and a national presentation. Specific of each activity follow.

**Figure 5. Streamlining project activities.**

Activities:	2005												2006	
	March	April	May	June	July	August	Sept	October	November	December	January	February	March	April
Training & preparation	■													
Baseline survey														
Supervision visits:														
Central Java		■		■			■			■			■	■
Yogyakarta		■		■			■			■			■	■
Preliminary Review				■										
Mid-term review										■				
Final data collection and analysis													■	
Final review visit and meeting														■
National presentation													■	

### Preparation and training

A total of 467 staff were trained on the Streamlining project during March 2005, including central MOH, province, district, and health center immunization staff in Central Java and Yogyakarta provinces. The training for central MOH, province, and districts was well-accepted and pre- and post-testing indicated it was also well-understood by participants, however, one training for health center staff produced an especially large number of participants (50 or more). Province and district managers facilitated the training, and PATH staff and consultants served as information resources and provided problem solving support.

Information about using new monitoring tools was prepared, printed, and introduced during training. Both provinces and the MOH agreed to use the newly introduced batch cards instead of existing systems, resulting in more complete data.

### Baseline assessment

The PUSH+ distribution system was launched on April 1, 2005. Using the first distribution/supervision trip, a baseline assessment of the current status of health centers was

conducted by provincial managers using a 118 item questionnaire. The final data collection and analysis used a shortened questionnaire (65 matching questions; see Appendix B) and the remaining baseline questions were discarded. A shorter questionnaire was used during final data collection because the project originally was looking for a wider dataset than needed for the project.

### **Supervision visits**

Supervisory visits were made to the project sites by a team including:

- PATH, Jakarta supervisory staff (usually two persons).
- National MOH immunization staff.
- Provincial supervisors.

Visits were made every two months to each province, each district, and to one or two sample health centers per district. Supervisory visits followed a standard checklist of tasks to ensure:

- Availability and compliance with SOPs.
- Accuracy of Distribution and Supervision Forms and batch cards.
- Compliance with sharps waste management procedures.
- Discussion of implementation problems as they occur.
- Inspection of improvements to vaccine and dry store accommodation.
- Motivate study participants.

Discussions were held with the immunization staff and supervisors so senior staff would provide support for the protocol and to their staff in implementing the SOPs. A supervisory report was prepared by PATH and MOH participants.

### **Preliminary and mid-term reviews**

Reviews of the project were conducted according to the following timeframe:

- Preliminary review: May 30 through June 8, 2005.
- Mid-term review: December 3 through 20, 2005.

These reviews were conducted by a PATH team in collaboration with MOH national, provincial, and district personnel. The objectives of the reviews were to:

- Review the progress of project activities in each district.
- Assess the level of compliance with SOPs.
- Assess the need for mid-course adjustments to the design of the system.

Meetings were also held during these reviews at Kaliurang, Yogyakarta (in June) and at Semarang, Central Java (December 6 and 7, 2005) for senior staff of the national immunization team, provincial staff, and district managers in Yogyakarta and Central Java.

### **Final data collection and analysis**

Final data collection and analysis was conducted in March 2006 following a slightly modified and shortened version of the baseline survey questionnaire with 65 questions; 53 of the questions were used as indicators to validate the 13 project objectives (Appendix B). Unlike the baseline survey which visited all health centers in each project district of both provinces, the final data collection was made from six randomly selected health centers in each district.

The baseline and final data were analyzed for the same health centers. The analyzed project data appears in Tables 2 through 10, and are discussed in the results section of this report.

### **Final review visit and meeting**

The final review visit took place April 16 through 28, 2006 following the same procedure from previous reviews. The review team included:

- Representative of the national immunization unit in Jakarta.
- Representative of the provincial immunization management.
- District health managers.
- Anton Widjaya, PATH, Jakarta.
- Other staff from PATH, Jakarta.
- Dr Ahmet Afsar, PATH consultant.
- Mr John Lloyd, PATH, France (Project Director).

During the final review, all districts in both provinces and one health center in each district were visited. A meeting of all district managers participating in the project took place in Yogyakarta April 26 and 27 to review the results and challenges, and discuss plans to sustain the system in the future.

### **National presentation**

Presentations on the Streamlining project were made by Dr. Anton Widjaya, PATH Jakarta, and Dr. Lily Herawati, MKes Expanded Programme on Immunization (EPI) manager, Central Java, to the Fifth Polio National Immunization Day (NID) meeting on April 12, 2006, in Salatiga, Central Java. Over 100 participants from all 33 Indonesian provinces and the main donor organizations attended. During the second day of the meeting, field visits occurred to the Central Java provincial cold rooms, two of the three Streamlining site districts, and four health centers in each district. The replication of Streamlining project in other provinces of Indonesia was discussed.

## Results

The project resulted in six main achievements:

1. Streamlining positively impacted service delivery and immunization coverage.
2. Injections are safer and a more environmentally acceptable management system is in place for used syringes and needles.
3. Stock-control, storage, and handling of vaccines occur in compliance with SOPs.
4. More frequent, consistent and high-quality supervision allows for incorporating training for the health center staff.
5. More accurate, timely, and complete Management Information System (MIS) recording and reporting by health centers occurs.
6. PUSH+ policies have an overall positive effect on district and health center operational costs.

The indicators representing results for health centers in Tables 2 to 10 are expressed as percentages of the number of health centers sampled in Central Java (78), Yogyakarta (118), and the number of health centers (48) sampled from the total participating in the project (196). The percentages are all oriented to give higher values for higher performance, even when high performance entails the absence of a condition (e.g., “*No used needles or syringes found on the ground around the facility*”).

Following detailed descriptions of each project result, a final section of this report discusses the issues and challenges to address in order for streamlining to be sustained.

### ***Streamlining positively impacted service delivery and immunization coverage.***

#### **Project objectives:**

- *Immunization coverage (DTP3 and HepB3) in project zones higher than before the project began.*
- *Immunization sessions in project zones conducted according to plan with no disruptions due to logistics.*

Three factors make it difficult to assess the impact of streamlining on immunization coverage (HepB3 and DTP3) and service delivery. First, both provinces already reported high immunization coverage before the project (2004) and continued to report high coverage through the end of 2005. Second, immunization coverage may have been compromised by disruption of vaccine supply at the provincial store in Central Java, causing stockouts in the districts. Second, immunization coverage may have been compromised by disruption of vaccine supply at the provincial store in Central Java, causing stockouts in the districts. The final factor was the inability to monitor the completeness and timeliness of planned immunization sessions in the project areas.

**Table 1. Coverage of HepB3 and DTP3 during 2004 and 2005 in project provinces.**

Province	2004			2005		
	Target <1 year	DTP3	HB3	Target <1 year	DTP3	HB3
3 project districts in Central Java	61.541	54.979 (89%)	53.195 (86%)	61.577	51.857 (84%)	50.589 (82%)
Non-project districts in Central Java	551.131	517.695 (93.9%)	451.858 (82%)	544.095	448.591 (82.4%)	380.022 (69.8%)
Yogyakarta	51.064	48.399 (95%)	46.392 (91%)	50.307	48.716 (97%)	51.116 (101%)

Source: PHO Central Java and D.I. Yogyakarta, March 2006

Despite challenges, project immunization coverage (Table 1) brings light to two observations. In Yogyakarta, there is a reported increase in immunization coverage (2 percent for DTP3 and 10 percent for HepB3) between 2004 and 2005. The province has eliminated AD syringes stockouts and reduced vaccine stockouts from 13.3 percent before the project to 3.3 percent during the project. However, an immunization coverage cluster sample survey<sup>1</sup> conducted in 2004 found that coverage rates for DTP3 and HepB3 were respectively 99.8 and 99.8 percent, and it seems unlikely that increases in reported coverage are significant.

In addition, non-project districts of Central Java reported immunization coverage declined (-11.5 percent for DTP3 and -12.2% for HepB3) from 2004 to 2005. In contrast, coverage in the three project districts declined by only 5 percent for DTP3 and 4 percent for HepB3 during the same period. Disruption in the projects areas seems to have benefited from the additional reserve stocks of vaccine at the district and health center level and from good compliance with vaccine management SOPs.

***Injections are safer and a more environmentally acceptable management system is in place for used syringes and needles.***

**Project objective:** *Vaccine and syringe stock records show that the “bundling” principle is followed.*

**Implementation of “bundling” policy**

The practice of distributing matching quantities of AD syringes and vaccines together or in a coordinated administrative manner is known as “bundling.” This practice was hard to implement in Central Java province because the MOH division responsible for supplying dry storage and AD syringe distribution is located far from the provincial vaccine stores. At the start of the project, distribution was poorly coordinated, irregular, and insufficient. To correct this situation and following the preliminary review in June 2005, stocks of syringes were supplied to the provincial vaccine stores and bundled deliveries of AD syringes were made by the PUSH+

<sup>1</sup> *The identification of Immunization Coverage in Yogyakarta Province, Indonesia*, Clinical Epidemiology and Biostatistics Unit, Dr. Sardjito General Hospital/Medical School, Gadjah Mada University, Yogyakarta, Indonesia.

teams. Precisely measuring the administrative costs of bundling syringes is difficult because AD syringes are obtained from local outlets in addition to centrally provided supplies.

However, syringe stockouts can serve as an indicator of sufficient syringe supply, which is the aim of “bundling.” Table 2 shows the status at the baseline and the final assessments regarding stockouts. These figures demonstrate that stockouts primarily due to central supply failures persisted; however, there is no evidence this disrupted service delivery.

**Table 2. Stockouts of AD syringes at health center stores.**

Indicator	Central Java		Yogyakarta		Project	
	Baseline %	Final %	Baseline %	Final %	Baseline %	Final %
No syringe stockouts observed	61	94	87	100	77	97

## Sharps waste management

**Project objective:** *Safety boxes are used, not overfilled and collected monthly, and 100 percent of immunization syringe waste is destroyed or sent for recycling.*

At the start of the project, the management of sharps waste was universally weak in the health centers. Field observations by supervisors noted widespread recapping of syringes, absence of waste segregation, local burning of sharps waste, collection of sharps in inappropriate containers, and continued use of sterilizable syringes in contravention with national policy.

Table 3 shows that recapping needles continues in 49 percent of health centers in Yogyakarta, but is a completely eliminated practice in Central Java. No recapped syringes were found in Yogyakarta during the final review.

**Table 3. Sharps waste management indicators at baseline and final assessment.**

Indicator	Central Java		Yogyakarta		Project	
	Baseline %	Final %	Baseline %	Final %	Baseline %	Final %
SOP on giving safe injections available in health center	41	100	55	100	50	100
No sharps containers were over-filled before being discarded	59	94	46	87	51	90
Filled safety boxes are stored in a locked area	67	100	75	100	72	100
All syringes are discarded without recapping	56	100	49	53	52	71
No used needles or syringes found on the ground around the facility	36	100	39	100	38	100
Syringes destroyed by incineration (>800C)	–	100	80	100	50	100

Used syringes are no longer seen on the ground near the health centers because safety boxes are widely used for both immunization and other syringes. Two types of safety boxes are being used:

the WHO standard five liter box supplied by UNICEF, and a locally manufactured box provided by the MOH for curative syringes. The standard of the local box does not meet WHO puncture proof standards at present, but this will reportedly change in the next procurement.

Regionalized or centralized collection systems and incineration are now used for all sharps waste generated at health centers in the project areas. In districts of Yogyakarta that participated in waste management studies before the project began, sharps waste was either taken to health centers equipped with small scale incinerators, or it was collected and taken to district hospital incinerators by the Division for Environmental Health. In all other areas of Yogyakarta and Central Java, filled safety boxes were collected by the PUSH+ teams monthly and taken to district-based hospitals or small scale incinerator sites.

### ***Stock-control, storage, and handling of vaccines occur in compliance with SOPs.***

**Project objective:** *Provincial/district stores will meet the standard of the EVSM and health center stores will meet a set of project criteria based on the principles of the EVSM.*

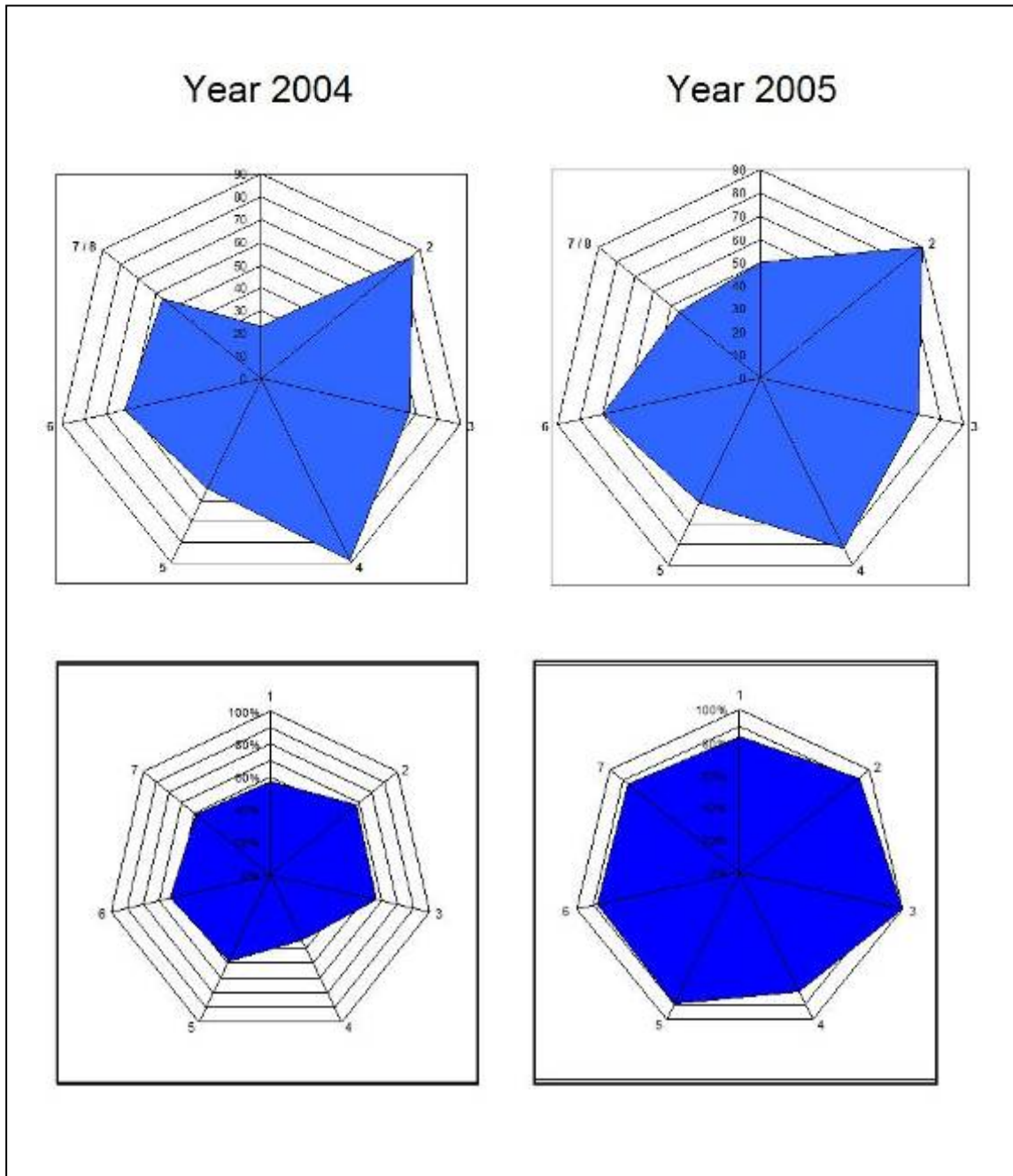
### **Achievement of EVSM standards**

WHO's EVSM standard is designed for primary stores at the national level and in large countries at the provincial levels. The standard is evaluated by using a protocol, questionnaire, and weighted score system against ten major criteria over a period of twelve months:

1. Pre-shipment and arrival procedures ensure all shipments are in satisfactory condition when received in the primary stores.
2. All vaccines are stored within WHO recommended temperature ranges.
3. The capacity of cold storage is sufficient to meet the demand.
4. The buildings, equipment, and transportation available to the program enable the cold store to function effectively.
5. All buildings, equipment, and transportation are properly maintained.
6. Stock management is effective.
7. Deliveries of vaccine to the next level are timely, sufficient, and correct.
8. Minimal damage to the vaccine occurs during distribution.
9. The facility follows standard operating procedures.
10. Human and financial resources are sufficient.

To meet WHO standards, the store must achieve a score of 80 percent for each of the ten criteria. Results are depicted in a “radar” chart in which each radial bar represents one indicator. The results of two self-assessments in Central Java and two in Yogyakarta are presented in Figure 6.

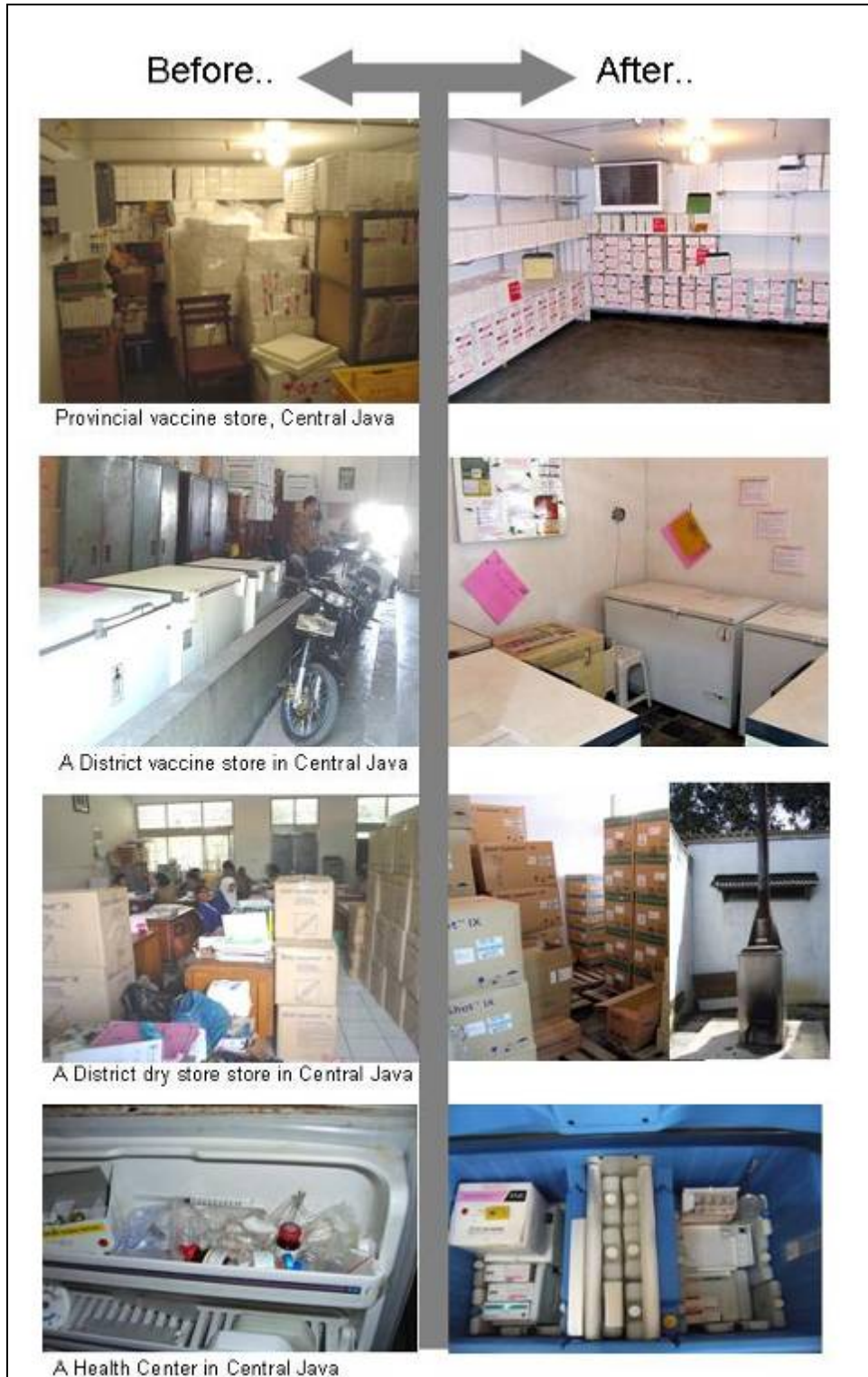
Figure 6. EVSM scores\* for provincial vaccine stores in Central Java and Yogyakarta in 2004 and 2005.



\* Scores against numbered axes corresponding to the ten major criteria previously listed.



Figure 7. Photographs of provincial and district stores before and after the project.



**Table 4. Selected EVSM quality indicators applied to health centers.**

Indicator	Central Java		Yogyakarta		Project	
	Baseline %	Final %	Baseline %	Final %	Baseline %	Final %
<b>The store</b>						
The vaccine store is clean and pest-free	86	100	83	97	84	98
The vaccine store is cool and properly ventilated	85	89	87	97	87	94
The vaccine store is locked and secure	73	100	71	93	72	96
Staff equipped to access the store in all service hours	77	100	66	83	70	90
<b>The refrigerator/vaccine carrier</b>						
The vaccine refrigerator is correctly placed	91	100	86	100	88	100
The vaccine refrigerator looks well maintained	86	100	76	77	80	85
All refrigerators are fully operational at time of inspection	91	100	78	100	83	100
There are sufficient vaccine carriers	90	100	86	100	88	100
Health workers know how to pack vaccine carriers/boxes	73	100	71	90	72	94
<b>Vaccine handling</b>						
SOP on vaccine handling available in health center	42	100	57	100	51	100
SOP on use of opened multi-dose vials available in health center	37	100	49	100	45	100
SOP on storing vaccine when power fails available in health center	36	94	48	100	44	98
All vaccine refrigerators maintain +2°C to +8°C	92	100	81	97	85	98
Vaccines correctly stored in the refrigerator	77	100	81	100	80	100
<b>Stock control</b>						
Vaccine is prioritized for distribution according to EEFO rule	83	100	79	100	81	100
Vaccine managers allow VVM exposure to override EEFO rule	77	100	66	97	70	98
<b>Temperature monitoring</b>						
No VVMs or freeze indicators have triggered	73	100	71	100	72	100
Health workers know how to read VVM and freeze indicators	83	100	77	97	79	98
All refrigerators have a working thermometer	100	100	81	100	88	100
<b>Average overall compliance</b>	<b>44</b>	<b>100</b>	<b>46</b>	<b>97</b>	<b>45</b>	<b>98</b>

Both provinces and most of the project districts began the project with unsatisfactory vaccine stores. The stores were typically untidy and lacked space, or there were non-existent dry stores or inadequate ventilation; implementing multiple storage practices is considered unacceptable by EVSM norms. Figure 6 displays the results of EVSM self-assessments in 2004 and 2005 at the provincial stores of Yogyakarta and Central Java, and shows excellent compliance by Yogyakarta. EVSM assessments were not carried out in district stores, and the baseline and final surveys excluded them. However, supervisory reports by PATH documented significant improvements in most district stores including:

- Stock records corresponded with actual stock
- Temperature recording complied with SOPs.
- Sufficient space was provided to ensure ventilation for equipment.
- Packing areas met standards.
- Vaccine stocks were handled according to SOP.
- Knowledge about proper procedures was high for health workers and storekeepers.
- Syringe/needle waste was handled safely

In some instances, district government funds were used to provide new and more spacious accommodations (Figure 7).

Table 4 shows health center compliance with 19 indicators of EVSM principles. Compliance with SOPs was high in both provinces and in most health centers visited by the end of the project. Copies of the SOPs for vaccine management were posted on the walls of all health centers visited. Knowledge and procedures in the event of a cold chain failure increased from 24 percent to 97 percent in the health centers of both provinces.

## Freeze protection for vaccines

**Project objective:** *No vaccine freezing incidents are detected either by freeze indicators or by temperature charts associated with discard of vaccine.*

**Table 5. Status of freeze prevention compliance with SOP.**

Indicator	Central Java		Yogyakarta		Project	
	Baseline %	Final %	Baseline %	Final %	Baseline %	Final %
No VVMs or freeze indicators have triggered	73	100	71	100	72	100
Health workers know how to read VVM and freeze indicators	83	100	77	97	80	98
No incidents of vaccine freeze exposure (<2C) in previous month	N/A	100	N/A	97	N/A	94
SOP on preventing freezing of vaccines available in health center	65	100	47	100	54	100
SOP on freeze shake-test available in health center	56	100	40	100	46	100

The availability of SOPs, use of freeze tag monitors in every refrigerator, and strong compliance with freeze prevention procedures eliminated vaccine freezing at health centers in both provinces during the project period.

## Use of vaccine vial monitors

**Project objective:** *Discard of vaccine due to VVM status is recorded and vaccine wastage is monitored.*

**Table 6. Status and use of vaccine vial monitors during the project.**

Indicator	Central Java		Yogyakarta		Project	
	Baseline %	Final %	Baseline %	Final %	Baseline %	Final %
No VVMs or freeze indicators have triggered	73	100	71	100	77	100
Health workers know how to read VVM and freeze indicators	83	100	77	97	80	98
Stock movements recorded correctly on batch cards	N/A	94	N/A	83	N/A	87
No vaccines discarded in the previous month	N/A	94	N/A	77	N/A	83

Since 2003, vaccine vial monitors have been used with all vaccines in Indonesia, but before the project, only 83 and 77 percent of health centers (Central Java and Yogyakarta respectively) used them properly. Now all health centers are informed about the use of VVMs and their status is routinely recorded in transaction records on batch cards in every store. Six and 23 percent of health centers (Yogyakarta and Central Java respectively) discarded vaccine due to VVM status in the month before the final assessment; however, only half of these centers (56 percent) used the batch card stock adjustment column to record the waste. Until a higher discard rate is reported, calculating wastage rates reliably will not be possible.

## No stockouts or surplus stocks

**Project objective:** *Vaccine and syringe stock balance records show that no stockouts occurred and surplus stocks (exceeding utilization plus buffer) do not accumulate.*

**Table 7. Stock-outs of vaccine and syringes in health centers.**

Indicator	Central Java		Yogyakarta		Project	
	Baseline %	Final %	Baseline %	Final %	Baseline %	Final %
<b>Stock-outs</b>						
No vaccine stockouts observed	94	50	87	97	90	79
No diluent stockouts observed	100	89	100	100	100	96
No syringe stockouts observed	61	94	87	100	77	98
<b>Surplus stocks</b>						
No over-stocking (>2months) of vaccines	67	61	80	43	75	50
No over-stocking (>2months) of diluent	83	100	73	67	77	79
No over-stocking (>2months) of syringes	61	39	70	27	67	31

During the project, vaccine and AD syringe stockouts rose sharply in Central Java. These health center stockouts were echoed by stockouts at district level (Figure 8) and persistent and repeated stockouts at province level. The disruption in vaccine supply was due to production failures at PT.BioFarma and MOH financing difficulties; AD syringe stockouts were due to clearance and distribution delays on arrival in country. BioFarma, an Indonesian para-statal, is the national vaccine producer and sole vaccine supplier to the MOH.

**Figure 8. Stock-outs of vaccines in districts of Central Java in 2005**

Districts	BCG	DPT	Hep B	Ads 0.05	Ads 5 ml	Measles Diluent
Semarang	September				October December	August
Pekalongan						
Tegal	July September October	September October November	August September	May August September		

Yogyakarta appears to have been affected less from stockouts than Central Java. Central supply of vaccines in Yogyakarta was maintained and no stockouts occurred at the provincial level. However, there were a few stockouts in health centers possibly caused by sharp fluctuations in consumption due to erratic collection of vaccines by private health facilities.

Surplus stocks of vaccines and syringes were recorded during the project. Modest surplus stocks will likely continue to be recorded due to the fluctuating monthly demand. Demand fluctuation does not appear to be seasonal because the pattern in 2004 was not repeated in 2005. Fluctuations are most likely due to erratic demands on health center vaccine supplies from private facilities also causing stockouts.

Based on this information, two major constraints on the efficiency of the distribution system have to be addressed urgently: (1) failures in central supply to provide vaccines to the provincial stores, and (2) the lack of compliance by private health facilities with MOH SOPs related to collection and distribution of vaccines.

### Stocks rotated correctly

**Project objective:** *Vaccine stock issue records, including VVM status, demonstrate that the Earliest Expiry, First Out (EEFO) prioritization procedure is followed.*

**Table 8. Stock rotation according to the EEFO principle.**

Indicator	Central Java		Yogyakarta		Project	
	Baseline %	Final %	Baseline %	Final %	Baseline %	Final %
Vaccine is prioritized for distribution according to EEFO rule	83	100	79	100	81	100
Vaccine managers allow VVM exposure to override EEFO rule	77	100	66	97	70	98

Vaccine stock rotation improved significantly during the project in both provinces following the EEFO principle, and allowing VVM readings to override the EEFO principle when vaccines have been exposed, requiring their use first.

### ***More frequent, consistent and high-quality supervision allows for incorporating training for the health center staff.***

**Project objective:** *Timeliness and quality of supervision improved compared to baseline data.*

Before the project, supervision to health centers was provided through inconsistent visits by the district supervisor two to three times per year. The focus of these visits was integrated supervision and not intensively focused on immunization issues.

Health center staff had the option to consult with supervisors during district office visits to collect vaccines and supplies although this rarely occurred because the supervisor was often absent.

During the project, supervision was included in the PUSH+ monthly visits to the health centers and provided more intensive onsite guidance and problem-solving consultation related to actual situations. The supervised visit followed a standardized format and utilized the Distribution and Supervision Form. The following tasks were monitored and included during the visit:

- Physical stock count of vaccines and syringes and safety boxes.
- Stock adjustment on batch cards as necessary.
- Vaccine needs forecast using Distribution and Supervision Form, and stock issue.
- Inspection of vaccine storage conditions.
- Inspection of injection safety indicators.
- Checking and assistance with monthly immunization reports.
- Discussion of problems on action points with the health center superintendent. The report also included positive feedback to the staff noting well-performed tasks.

The advantages of this approach as perceived by health center staff and reported to members of the review teams were:

- Problem-solving is performed without waiting until a supervisor's visit (which are rarely scheduled).
- Logistics are distributed based on the onsite need and local stock conditions.
- Discussion included not just one, but all related health center staff.
- Scheduled supervision improved the communication and mutual understanding regarding program management interpretation of standard operating procedures.
- Scheduled supervision increased the motivation of the staff to follow SOPs because their work was immediately verified and appreciated (the supervision checklist also listed well performed tasks).

***More accurate, timely, and complete Management Information System (MIS) recording and reporting by health centers occurs.***

**Immunization and logistics recording and reporting**

**Project objective:** *Records of immunizations and logistics are accurate and reports are timely and complete.*

Table 9 shows a dramatic improvement in the timeliness of immunization reports received by districts in both provinces; these results are attributable to the PUSH+ monthly supervision visits. Every health center now has a copy of the immunization report from the previous month available for discussion with the supervisor. Completeness is harder to assess because health centers include private facility reports within their totals, and these facilities routinely fail to report on time, or at all. However, the reports were complete.

**Table 9. Timeliness of immunization reporting.**

Indicator	Central Java		Yogyakarta		Project	
	Baseline %	Final %	Baseline %	Final %	Baseline %	Final %
Monthly immunization reports dated and signed	69	100	89	77	82	86
Monthly immunization reports received on time	43	92	66	73	57	80
Previous month's immunization report available in health center	N/A	100	N/A	100	N/A	100
Previous month's immunization report completed correctly	N/A	100	N/A	60	N/A	75
Health center reports completed correctly	N/A	100	N/A	70	N/A	81

Maintenance of logistic records and reports was not assessed in the baseline survey due to the lack of a standard recording and reporting system. Multiple forms existed in a variety of formats for requisition, stock control, and temperature recording; no procedure exists for keeping, storing, or using the information. Compliance with the new Streamlining project forms has shown improvement (Table 10).

**Table 10. Timeliness and correct use of logistics records and reports**

Indicator	Central Java		Yogyakarta		Project	
	Baseline %	Final %	Baseline %	Final %	Baseline %	Final %
<b>Distribution and Supervision Form</b>						
Previous month's immunization report completed correctly	NA	100	NA	60	NA	75
Previous month's immunization report sent on-time	NA	100	NA	73	NA	83
Previous month's Distribution and Supervision Form available in health center	NA	100	NA	93	NA	96
Previous month's Distribution and Supervision Form completed correctly	NA	100	NA	60	NA	75
<b>Batch card</b>						
Batch cards are in use	NA	100	NA	97	NA	98
Batch cards exist for all vaccines, diluents and syringes	NA	89	NA	80	NA	83
Batch cards are up to date	NA	94	NA	80	NA	85
Stock movements recorded correctly on batch cards	NA	94	NA	83	NA	87
<b>Temperature monitoring</b>						
Manual temperature record exists for past six months	59	94	81	90	73	92

Health center staff interviews suggest that maintaining separate stock cards for each batch of vaccine in the health center is burdensome and unnecessary because batch records exist at the



district store for vaccines issued to health centers. Project and central MOH management therefore agreed that stock cards should replace batch cards for each vaccine product, so all batches could be recorded on a single card.

***PUSH+ policies have an overall positive effect on district and health center operational costs.***

**Project objective:** *The distribution system (fuel, consumables, maintenance, and driver) for PUSH+ is equal or lower than previous baseline costs.*

Recurrent cost data were collected from Tegal District Health Services and Penusupan health center. This data included information about the vaccine collection trip to district, report submission trip costs, health center medical waste management costs, supervisory visit cost, transportation for pharmaceuticals, gasoline cost for pharmaceuticals, vaccine distribution trip costs, vehicle maintenance costs, and per diem expenses for the district teams. Total health center costs were estimated by multiplying the costs of Penusupan health center by the number of health centers in the district.

Table 11 compares district and estimated health center costs in 2004 (before the project started) to the budgeted costs of the PUSH+ system in 2006. The table shows that the PUSH+ system of distribution transfers these costs from health centers (paying 82 percent of the costs), to the districts. Although the annual costs of supervision are higher (+63%) with the PUSH+ system, the frequency of supervision per year rises from 2 to 12 visits and the cost per transported commodity volume drops from 1056Rp to 763Rp<sup>2</sup>. Overall costs per fully-immunized child rises 4 percent with the PUSH+ system.

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<sup>2</sup> At the project start, prices are quoted in Indonesian Rupiah (about 8,700 Rupiah to US\$1 end of April 2006).

**Table 11. Estimated costs of distribution, waste management, and supervision in Tegal District, Central Java.**

Costs	Previous system estimated costs 2004		PUSH+ system budgeted costs 2006			
	HC	District	HC	District		
Vaccine collection trip to district	6,156,000	0	0	0		
Report submission trip cost	7,776,000	0	0	0		
Medical waste management cost	2,592,000	0	0	0		
Supervisory visit cost	0	1,890,000	0	0		
Transportation for pharmaceuticals	0	540,000	0	0		
Gasoline for pharmaceuticals	0	1,105,000	0	0		
Vaccine distribution trip to health center	0	0	0	8,640,000		
Annual maintenance cost per vehicle (15 days/ month)	0	0	0	1,500,000		
Per diems for district team	0	0	0	8,490,000		
<b>Estimated annual costs</b>	<b>16,524,000</b>	<b>3,535,000</b>	<b>0</b>	<b>18,630,000</b>		
<b>Cost share</b>	<b>18%</b>	<b>82%</b>	<b>0%</b>	<b>100%</b>		
Effects	Previous System			PUSH+ System		
Number of health centers serviced	27			27		
Volume of transportation	18,985 lt			24,402 lt		
Number of supervision per health center	2 times per year			12 times per year		
Number of fully immunized children	25,987Rp			23,280Rp		
Cost/Effect	Previous system			PUSH+ distribution		
	HC	District	Total	HC	District	Total
Cost per transported volume of commodity	870	186	1,056	0	763	763
Cost per supervisory visit	0	35,000	35,000	0	57,000	57,500
Cost per child fully immunized	636	136	772	0	803	803

## **Streamlining Project Challenges**

### **Dedicated transport and district budget needed**

The PUSH+ system of health center visits by district staff requires at least one vehicle equipped (double-cab) and dedicated to distribute supplies, collect sharps waste, and transport personnel. This implies two budgetary implications:

- Shift of investment in transport from the health center to the district.
- More time spent in the field by district staff requiring a higher per diem budget.

Of the eight project districts, seven have confirmed that this additional budget will be sustained after the project ends.

### **Perception by district management that PUSH+ is a burden on staff time**

The PUSH+ system of health center visits by district staff requires that supervisors spend more time on field visits (about 15 working days per month) and less time in the district office than has been the practice. This additional time spent in the field is perceived by district managers to be a burden on supervisory staff who are already fully occupied with other district office responsibilities. District managers proposed three alternative solutions:

- Recruit or re-allocate staff to cover these responsibilities, allowing existing supervisory staff more time in the field.
- Absorb the additional work among existing supervisory staff and provide overtime payments for their efforts.
- Reduce the frequency of scheduled visits to health centers from monthly to bi-monthly, thereby reducing the supervisory time allocated to field visits and reducing the budget for transport and per diem.

### **Compliance with vaccine management SOPs by hospitals and private clinics**

Currently the health centers, rather than district stores, issue vaccines and, in some cases AD syringes, to private clinics and private hospitals in the vicinity. This approach has advantages but causes a problem for the streamlining objective. Private facilities do not follow the MOH SOP for collection of vaccine and syringes which requires a planned schedule. A recent study suggests that they also fail to meet MOH SOPs for vaccine handling<sup>3</sup>. Instead of following a set schedule, private facilities collect vaccine when needed. This practice results in the following conditions:

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<sup>3</sup> MOH PATH *Monitoring on immunization practice and vaccine management in the private sector in Jakarta*, February 2006.

- Demand fluctuates widely and unpredictably, causing stockouts in some health centers.
- Immunization reports are provided to the health center irregularly, causing health center reports to be incomplete.

One solution to alleviate these problems is to require private facilities to meet the SOPs of MOH vaccine stores, including the collection of supplies on a fixed schedule, and coordination with district vaccine supply dates. This solution would facilitate the collection of immunization reports and offer an opportunity for district supervisors to check on the practices of private facilities.

### Regular and reliable central supply of vaccines and syringes needed

Repeated failures in the supply of vaccines by PT.BioFarma to Central Java have been a major constraint to successfully implementing the Streamlining project in that province, and will continue impairing the timely delivery of immunization supplies unless the problems are resolved. Figure 9 shows that stockouts of one or more vaccines occurred in the province store in six months during 2005, and they continued in 2006. The stockouts at province level produced a ripple effect of stockouts at district stores and in health centers of Central Java, in spite of the generous provision of reserve stocks at these levels.

**Figure 9. Analysis of stockouts by vaccine in Semarang Provincial store (2005)\***

Vaccine	Ave Monthly need	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Polio	882	691	347	109	364	203	0	438	58	1	0	0	142
Meas1	126	249	145	27	303	289	174	161	171	475	219	0	14
HB	60	88.6	14.5	80.5	95.5	70.5	136.8	73.2	0	93.6	28.8	11.5	124.4
TT	945	133	20	65	176	102	0	253	22	121	268	12	31
DPT	591	302	47	50	135	228	38	93	18	0	5	0	0
BCG	254	236	308	82	328	12	0	10	0	20	120	476	234
DPT - HB	591												260

*Note: Data taken at the beginning of each month  
 Red = stockout  
 Yellow = < 1-mo need  
 Green = > 1-mo need but not conform to 3-mo stock  
 Blue = > 1+2-mo supply  
 DPT-HB starts in Jan '06.  
 Source: Central Java PHO May 2006  
 \* Stock quantities in doses x 1000*

The cause of stockouts is reportedly related to inadequate production at PT.BioFarma as well as with financing in early 2005; other provinces were also affected. Central supply of AD syringes to the provinces has also been irregular and has caused stockouts at all levels in both Central Java and Yogyakarta—although the reasons for failures are different. The consequences for

service delivery are less severe because both AD and disposable syringes are locally available in the districts.

Unfortunately for the Streamlining project, these central supply failures have persisted throughout the period of the project, in spite of warnings provided to the MOH by the interim review teams in June and December 2005. Recently, verbal assurances from the MOH note that supplies will return to their previously regular and sufficient state by June 2006 and that additional reserve stocks will be held at the Semarang provincial store in Central Java.

## Discussion and Conclusions

The Streamlining Immunization Logistics project focuses on sub-national needs for infrastructure strengthening. However, the persistent failure of the central supply pipeline during the period of the project is a stark reminder that unless the pipeline is maintained reliably, all efforts focused at subsidiary levels of the system are compromised, and the immunization program is at risk.

Fortunately, due to relatively reliable supplies provided to Yogyakarta and to generous reserve stocks secured at the start of the project for district and health center stores, there was a sufficient supply of vaccine and syringes in the health system to demonstrate the strengths of streamlined logistics support to immunization services.

The PUSH+ system of health center visits by district logistic and supervisory staff has proven successful in motivating and informing health center staff, assuring sufficient supplies and improving safety. The operational costs of PUSH+ are significantly less than before and the system has been universally welcomed by health center staff. The interval between PUSH+ visits might be adjusted to two months (instead of one) to be more affordable and sustainable in large districts with long travel times between district and health centers. Fifteen days of visits per month and at least two health centers per day seems to be a practical target for system design.

PUSH+ places the responsibility for waste management in the MOH up to delivery at the site of destruction where it is then transferred to the department of Environmental Health. The collection of safety boxes during PUSH+ visits has relieved the burden of disposal and transport of waste from the health centers, and has resulted in a safer management of healthcare waste. Disposal by incineration in regionalized or centralized collection systems assures the safe destruction of syringes and prevents their re-use. It is evident that these waste management systems need to be applied to infectious sharps waste for all purposes, not only immunization.

The Streamlining project emphasizes compliance with Standard Operating Procedures (SOPs) that match national policy and are aligned with international norms and best practices. This focus on indicators of performance in vaccine handling and safe waste management has greatly improved both the appearance of vaccine stores, and the practices and motivation of staff working within them. The project has also invigorated an interest in Management Information Systems that, for the first time in study areas, is being used to drive the distribution of vaccine bundled with syringes and the process of supervision.

As suggested by the integrated approach to sharps waste management, the benefits of the streamlining approach and in particular the supervision benefits of the PUSH+ component should be applied in an integrated fashion to the delivery of all public health interventions. Overall operational costs are likely to be reduced, and the benefits of this approach will be more accurate and timely supplies distribution and waste collection, as well as frequent, more supportive supervision. Although more is required of district support with this approach (budgetary and personnel), the investment in a common support system—sharing logistic SOPs, supplies

distribution, waste collection, and certain supervision functions—is appropriate for the future development of primary health services.

A key component lacking from the Streamlining project, yet critical to logistics, is equipment inventory, and the process of forecasting equipment replacement needs. The PUSH+ system of health center visits by district supervisors offers an opportunity to collect data to establish and maintain an equipment inventory within an extended version of the SMS stock control software. Based on this data, district supervisors can forecast future needs for equipment planning and procurement purposes.

## **Recommended Next Steps**

Based on the Streamlining project outcomes, two broad recommendations are suggested:

1. Sustain Streamlined Immunization Logistics in the project areas.
2. Replicate the Streamlined Immunization Logistics System in other Indonesia provinces.

### ***Sustaining streamlining in project areas***

The following specific recommendations will ensure sustainability of the new system in project areas:

- To assure bundling of syringes and needles, either the storage location of vaccines and syringes need to be under the same management, or a high level of cooperation is needed to synchronize deliveries.
- Further improvements are needed at the Semarang provincial store in Central Java to meet the EVSM standards, and the evaluation should be repeated at this location.
- District supervision of health centers should focus on recording the amount of discarded vaccine so that wastage rates are monitored.
- Interruptions in the supply of vaccines by PT.BioFarma to Central Java should be eliminated.
- Require private facilities to meet the SOPs of MOH vaccine stores, including the collection of supplies on a fixed schedule, and coordinate dates of vaccine re-supply by the district.
- Stock cards should be used (instead of batch cards) in health centers for each vaccine product to ensure all batches are recorded on a single card. The necessary card format is prepared and will soon be introduced.
- Some larger districts may need to increase supply intervals from one to two months if distances and availability of staff and transport require. The necessary form changes are being printed and distributed

### ***Replicating the Streamlining Project in other provinces***

To implement Streamlined Immunization Logistics in other provinces, the following seven key milestones need to be reached:

- Convince provinces—through national advocacy—to adopt the system.
- Implement EVSM evaluation in provincial stores and provide necessary upgrades.
- Introduce new SOPs by:
  - Preparing and printing new forms and SOP posters.
  - Training district management at province level.
- Procure and supply new devices and equipment.



- Establish an equipment inventory and needs forecasting system.
- Allocate district staff and transportation according to needs of the distribution plans.
- Provide adequate vaccines and supplies to the province.
- Launch the distribution system.



## ***Stock Management System (SMS)***

SMS is a computer-based (Excel) spreadsheet stock control tool developed for WHO as a part of intermediate SMS. The main goal of this spreadsheet is to provide experience to store managers before using a more sophisticated database. This method also provides minimum data requirements for programmers who code a tailor-made stock keeping software.

While it is not prepared on database software, SMS is able to keep records of a medium-sized vaccine store. Training needs for an intermediate spreadsheet user is low; a 45 minute demonstration was sufficient in project districts. A user manual printed in Indonesian is also available. Necessary changes can be done locally without a database programmer. Codes are open and a password is not needed to use the SMS.

The stock management component of the software works with electronic batch cards. All data variables existing on a batch card can be entered into these spreadsheets. It can keep track of ten different batches of twenty-one separate commodities. In the results page (summary page) users can find a list of all commodities, and up-to-date stock levels. The system also provides color codes and messages to guide and inform the user.

Although the SMS spreadsheet model was initially developed for helping a manual logistics management system, an electronic data transfer structure was tested during the introduction phase. Using third party software, technicians transferred stock data between computers with direct cable connections. However the system did not work properly with dial-up networking due to hardware related problems and poor landline connections.

## ***Distribution and Supervision form***

The Distribution and Supervision form combines a supervision checklist along with space to capture an assessment of existing vaccine stocks and needs for re-supply. During monthly health center visits, district teams use this form to determine supply of vaccines, diluents, syringes, and needles as well as to supervise standards of injection safety, provide training, review immunization recording and reporting, and collect safety boxes of used syringes and needles.





## Appendix B: Data collection instrument used in the final review

### Immunization Services Assessment

Name of the province/district/health center:

\_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

Assessment Date: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

#### In District Health Services:

Take 2006 monthly immunization and vaccine logistics reports received by this district facility and check;

1. How many reports is the district supposed to receive from this health center in 2006? \_\_\_\_\_
2. How many of these reports were dated and signed? \_\_\_\_\_
3. How many of these reports were received on time? \_\_\_\_\_
4. How many of these reports were late? \_\_\_\_\_
5. How many of these reports were not received at all? \_\_\_\_\_
6. Is there any written feedback or reminder for these reports? \_\_\_\_\_

#### In Director's Room

7. Calculate DTP3 Coverage March 2005
8. Calculate DTP3 Coverage March 2006
9. Calculate HEPB3 coverage March 2005
10. Calculate HEPB3 coverage March 2006
11. Ask if immunization sessions in this health center or its posyandus conducted according to plan with no disruptions due to logistics in the previous month? [Y/N]
12. Check first Distribution and Supervision Form (April 2005). Was there any stocked out vaccine? [Y/N]
13. Check first Distribution and Supervision Form (April 2005). Was there any stocked out diluent? [Y/N]
14. Check first Distribution and Supervision Form (April 2005). Was there any stocked out syringe? [Y/N]
15. Check first Distribution and Supervision Form (April 2005). Was there any over stocked (more than 2 months of stock) vaccine? [Y/N]
16. Check first Distribution and Supervision Form (April 2005). Was there any over stocked (more than 2 months of stock) diluent? [Y/N]
17. Check first Distribution and Supervision Form (April 2005). Was there any over stocked (more than 2 months of stock) syringe? [Y/N]
18. Check if a copy of last month's immunization report is available in this health center [Y/N]

19. Is the health unit report completely filled in, signed and dated? [Y/N] (If copy of this report is not available in the HC check the original report in district health services)
20. Is the health unit report sent on-time/late/ or it is not sent? (If copy of this report is not available in the HC or not dated, check the original report in district health services)
21. Check if a copy of last distribution report is available in this health center
22. Is the distribution report completely filled in? [Y/N] (If copy of this report is not available in the HC check the original report in district health services)
23. Check if batch cards are in use? [Y/N]
24. Are there batch cards for all vaccines, diluents and syringes? [Y/N]
25. Check if batch cards are up to date? [Y/N]
26. Check last month's transactions from the batch cards. Are these transactions recorded correctly? [Y/N]
27. Ask if this health center discarded any vaccines in the previous month. [Y/N]
28. If answer to Q230 is yes, check batch cards, other possible reports and records to see if discarded vaccine doses are recorded. Is there any record? [Y/N]
29. Are there records of vaccines discarded due to incorrect storage temperatures? [Y/N]
30. Interview staff. Do they know what to do in the event of an emergency? [Y/N]
31. How does the centre destroy syringes? (Check those that apply)
  - Incinerator on site (>800 C)
  - Burned in a hole
  - Buried
  - Dumped in a latrine
  - Burned in an enclosed container or space
  - Transported off-site to un-controlled location
  - Transported to an incinerator off site
  - Other:
32. Policies, guidelines, and other materials issued by national, sub-national offices are available in the health center [Y/N]:
  - Vaccine handling
  - Giving safe injections
  - Use of opened multi-dose vials
  - Storing vaccines in the event of a power outage
  - Freeze prevention poster
  - Shake test procedure poster
  - Others
33. Can copies of the HC reports be found in the HC? [Y/N]
34. Are the health unit reports completely filled in? [Y/N]

### **In Vaccine Store**

35. Make a physical inventory and fill in the related parts in the attached Physical Inventory Form (Appendix I)
36. Is there any stocked out vaccine? [Y/N]

37. Is there any stocked out diluent? [Y/N]
38. Is there any stocked out syringe? [Y/N]
39. Is there any over stocked (more than 2 months of stock) vaccine? [Y/N]
40. Is there any over stocked (more than 2 months of stock) diluent? [Y/N]
41. Is there any over stocked (more than 2 months of stock) syringe? [Y/N]
42. The vaccine store is clean and pest-free [Y/N]
43. The room is cool and properly ventilated [Y/N]
44. There is a security system to avoid unwanted persons to enter the warehouse [Y/N]
45. An authorized person with a key is available during all service hours to allow the personnel to obtain supplies when needed [Y/N]
46. The vaccine refrigerator is correctly placed [Y/N].
  - not directly exposed to sunlight,
  - condenser has a distance of 10- 15 cm from the wall,
  - placed horizontally/flat,
  - protected against direct wind flow
47. The vaccine refrigerator looks well maintained? [Y/N]
  - clean,
  - not smelly,
  - door is not leaking,
  - thickness of the ice in freezer is less than 0.5 cm
48. Vaccine Vial Monitors (VVM) and freeze indicators are not alarmed [Y/N]
49. Do health workers know how to read VVM and freeze indicators? [Y/N]
50. Are all refrigerators fully operational at time of inspection? [Y/N]
51. Do all cold chain units have a working thermometer or other temperature monitoring device stored with the vaccine? [Y/N]
52. Do all vaccine refrigerators maintain a temperature of +2°C to +8°C? [Y/N]
53. For the past six months, is there a complete set and periodic analysis of twice-daily manual temperature records for each and every vaccine refrigerator and freezer? [Y/N]
54. Are vaccines correctly stored? [Y/N]
  - no freeze-sensitive vaccines stored close to ice lining in ILRs or
  - no freeze-sensitive vaccines stored close to the evaporator plate of service point refrigerators,
  - BCG/measles diluents stored beside its vaccine?
55. Where applicable, are there adequate reserve supplies of kerosene and/or gas? [Y/N]
56. Are there sufficient vaccine carriers? [Y/N]
57. Do staff know how to pack transport boxes? [Y/N]
58. Is vaccine distribution generally made according to the 'earliest expiry – first out' (EEFO) principle? [Y/N]
59. Can the vaccine managers make exceptions to this rule (e.g. because of VVM status)? [Y/N]



60. Check batch cards, thermometers, freeze indicators and previous month's temperature monitoring charts in all vaccine refrigerators in this health center. Is there any incidents of freeze exposure ( $<2^{\circ}\text{C}$ )? [Y/N]

#### **In Vaccination Room**

61. Do storekeepers/health workers know how to read VVMs? [Y/N]  
(Use dummy VVMs and/or sticker samples to check knowledge).
62. Are sharps containers discarded before they are full? (Not overflowing) [Y/N]
63. Are full sharps boxes closed and stored in a locked area inaccessible to the public? [Y/N]
64. Is the syringe discarded without recapping? [Y/N]

#### **Outside**

65. Are there any used needles / syringes around the facility? [Y/N]