The Logistics Handbook

A Practical Guide for Supply Chain Managers in Family Planning and Health Programs

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Supply Chain Managers
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Health Programs

FPLM

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Abstract

The Logistics Handbook includes the major aspects of logistics management with an emphasis on contraceptive supplies. The text should be helpful to managers who work with supplies every day, as well as managers who assess and design logistics systems for entire programs. Policymakers may find the text useful in exploring the inputs needed to create an effective logistics system.

Key terms and concepts are clearly defined and explained. The design and implementation of management information systems and inventory control are discussed in detail. Storage and quality control practices are also discussed, and overviews of forecasting and procurement processes are included.

FPLM

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Acronyms

AIDS	acquired immune deficiency syndrome
AMC	average monthly consumption
ARI	acute respiratory infection
CBD	community-based distributor or distribution
CPR	contraceptive prevalence rate
CSW	commercial sex worker
CYP	couple-years of protection
DAR	daily activity register
DHS	Demographic and Health Surveys
EDL	essential drug list
EOP	emergency order point
FDA	U.S. Food and Drug Administration
FEFO	first-to-expire, first-out
FIFO	first-in, first-out
FP	family planning
FPLM	Family Planning Logistics Management
GSMF	Ghana Social Marketing Foundation
HIS	health information system
HIV	human immunodeficiency virus
HMIS	health management information system
ICC	inventory control card
IEC	information, education, and communications
IPPF	International Planned Parenthood Federation
IUD	intrauterine device
IV	issue voucher
JSI	John Snow, Inc.
LMIS	logistics management information system
MIS	management information system
MOH	Ministry of Health
ORS	oral rehydration salts
PATH	Program for Appropriate Technology in Health
PPD	Population, Health, and Nutrition Projects Database
RHU	rural health unit
RIV	requisition and issue voucher
SDP	service delivery point
SMART	specific, measurable, attainable, realistic, and timely
STD	sexually transmitted disease
STI	sexually transmitted infection
TFR	total fertility rate
UNFPA	United Nations Population Fund
USAID	U.S. Agency for International Development
VEN	vital, essential, and nonessential
WBD	workplace-based distribution
WHO	World Health Organization
WRA	women of reproductive age

Preface

The Logistics Handbook: A Practical Guide for Supply Chain Managers in Family Planning and Health Programs was written for anyone involved in the day-to-day management of contraceptive supplies in developing countries. Many of the suggested techniques also apply to the management of essential drugs, including medications used for human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) control programs, acute respiratory infection (ARI), tuberculosis control, and vaccination programs.

A number of techniques described in this handbook will be helpful to readers who are responsible for improving, revising, or designing all or part of a logistics system—including the design of data collection forms and inventory control systems. Additional techniques are described—how to assess the functioning of an entire logistics system and how to monitor such a system continually.

This book is modeled on the U.S.-based logistics management course provided by the Family Planning Logistics Management (FPLM) project of John Snow, Inc. Although the handbook does not contain everything participants learn in the course, we hope that, by capturing aspects of the key topics presented, the project will be able to reach thousands of people involved in supply management.

Supply managers and others reading the handbook from cover to cover will find a wide range of logistics principles and techniques. By reviewing the objectives that appear at the beginning of each chapter, the reader may select chapters of particular interest. One may learn the basic principles of logistics management by reading only the main body text. To make the material more understandable, selected text boxes have a magnifying glass icon placed in the upper-left corner. The text boxes provide (1) hypothetical examples that illustrate the concept being discussed, (2) additional information that explains how to apply a particular technique, or (3) more in-depth information about the topic being discussed. To place the technique in a real setting, text boxes labeled *Case Study* describe how the technique was used in a sample country. Chapter summaries at the end of each chapter reflect how the chapter's objectives were met and may be used as a quick reference.

1 | Introduction to Logistics

Objectives

In this chapter, you will learn the following:

- ❒ The purpose of a logistics system
- ❒ The components of a logistics system and how they fit together
- ❒ Definitions of key terms in logistics
- ❒ How different concepts in logistics compare.

1.1 The Logistics System

During your lifetime, you will encounter hundreds of logistics systems: in restaurants, stores, warehouses, and so on. This handbook describes logistics systems for health programs; however, if you understand a simple example of a logistics system, you will be able to understand almost any health logistics system.

One example of a simple logistics system is a restaurant. The storage facility in a restaurant is the kitchen; the food is held there until it is delivered to the customer. Waiters provide the transportation; they carry the food from the kitchen to the customer. The service delivery points are the tables, places where customers sit to order and eat the food.

For customers, a restaurant is not a logistics system; it is a place to eat. You, too, probably never thought of a restaurant as a logistics system. Your expectations of a restaurant, however, are directly related to logistics.

What expectations do you have when you go out to a restaurant for a meal?

You may expect that the—

- ❒ Restaurant will be attractive and pleasing.
- ❒ Server will provide excellent customer service.
- ❒ Food you order will be available.
- ❒ Food will be served promptly.
- ❒ Correct order will be delivered to your table.
- ❒ Food will be of acceptable quality.
- ❒ Food will be of acceptable quantity.
- ❒ Cost of the meal will correspond with the value.

Customer expectations like those above define the purpose of a logistics system:

> *A logistics system provides excellent customer service: by fulfilling the* six rights*, ensuring that the right goods, in the right quantities, in the right condition, are delivered to the right place, at the right time, for the right cost.*

The Six "Rights"

The **RIGHT** goods
in the **RIGHT** quantities
in the **RIGHT** condition

delivered . . .

to the **RIGHT** place
at the **RIGHT** time
for the **RIGHT** cost.

Whether the system supplies soft drinks, vehicles, or pens, or manages contraceptives, essential drugs, or other commodities, these six rights always apply.

Two expectations mentioned earlier are not considered part of the logistics system: (a) that the atmosphere in which products are delivered will be pleasing and attractive, and (b) that customers will always receive excellent customer service. These expectations are related to *quality of care* issues, which are not discussed in this handbook. Quality of care issues, which include a number of other expectations and outcomes, however, do greatly influence the logistics system and vice versa.

In many family planning programs, contraceptives are a donated item. If an item is donated, does *at the right cost* still apply?

Yes. Even though the product is donated, the program is responsible for paying the cost of storing and transporting contraceptives.

Why Do Logistics Systems Fail?

Businesses often fail due to logistics problems that affect their ability to fulfill one or more of the six rights. A business that offers an excellent atmosphere and excellent customer service, but cannot meet the customer's need by fulfilling all six rights, will ultimately fail.

Most store owners understand that they must fulfill the six rights. They make every effort to ensure that their customers receive the products they expect when they want them at the price they are willing to pay. Satisfied customers in turn will want to return to the same store.

Think of a store where you shop frequently. Does the store *always* meet the six rights? Does it offer the goods you want at the right price and when you want or need them? If not, why do you shop there?

1.2 The Logistics Cycle: Organizing Logistics System Activities

Logistics management includes a number of activities that support the six rights. Over the years, logisticians have developed a systematic approach to describing the activities of a logistics system. They call it the *logistics cycle* (see figure 1-1).

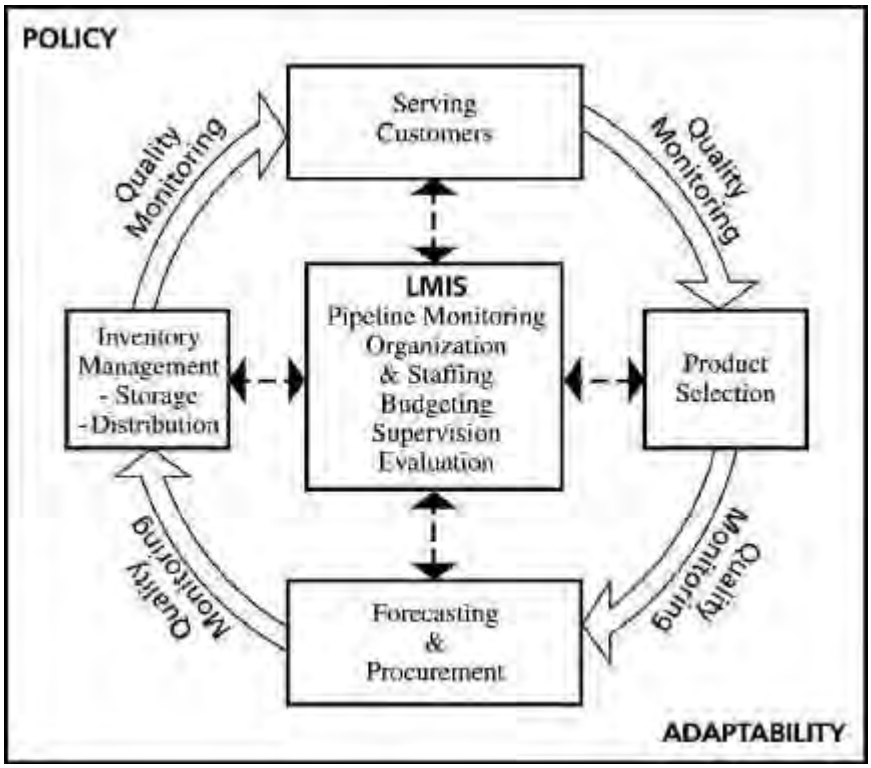


FIGURE 1-1. Logistics Cycle

The first thing you will notice about the cycle is its circular shape, which indicates the interdependence of the various elements in the cycle. Each activity—serving customers, product selection, forecasting and procurement, and inventory management—depends on the others.

For example, product selection is based on serving customers. What would happen if, for medical reasons, we select a product that customers refuse to use? We would need to rethink our decision and order a product more acceptable to the customer. We would have to look for one that tastes better, is a different color, or is packaged differently. This decision would, in turn, affect our procurement and storage, two other activities in the logistics cycle.

In the next few sections, we look at all the elements shown in the logistics cycle:

- ❒ The major activities in the cycle.
- ❒ Logistics management information systems (LMIS) at the heart of logistics.
- ❒ Quality monitoring among the activities.
- ❒ The logistics environment—policies and adaptability.

1.2.1 Major Activities in the Logistics Cycle

Let's briefly review the major activities in the logistics cycle:

- ❒ **SERVING CUSTOMERS.** Each person who works in logistics must remember that he or she selects, procures, stores, or distributes products to meet customer needs. For example, a storekeeper does not store drugs simply for the purpose of storing; he or she stores products for use in preventing or curing illnesses. The logistics system ensures customer service by fulfilling the six rights. Each activity in the logistics cycle, therefore, contributes to providing excellent customer service.

Substitution?

For some items, you may be willing to accept a substitute when your first choice is not available. For example, if you need ballpoint pens, although you may want blue ink pens, you may be willing to accept black ink. What if, however, you urgently need a blue pen? Would you accept a low-quality blue pen or pay a higher price for a blue pen somewhere else?

Although substitution of one product for another may work for ballpoint pens, it does not work often for health commodities. A family planning client may not want to switch to pills if an injectable contraceptive is not available. The difference between a pen and a person's health is obvious. A business selling pens may fulfill most but not all of the six rights and still provide acceptable customer service. A health system has no choice; it must fulfill all six rights.

- ❒ **PRODUCT SELECTION.** In any logistics system, products must be selected. In a health logistics system, product selection may be the responsibility of a national formulary and therapeutics committee, pharmaceutical board, board of physicians, or other government-appointed group. Most countries have developed essential drug lists patterned on the World Health Organization (WHO) Model List.

The committee's ability to select from among products is influenced by other elements of the logistics cycle. Perhaps the most important of these is the budget available to purchase the chosen products. For example, boards often choose generic drugs over name brands that may be more expensive.

Many programs supplement the development of essential drug lists (which focus on those products deemed most cost-effective in treating priority health problems) with programs to promote rational drug use. Rational drug use efforts aim to help prescribers choose the right product for each health problem and the correct quantity to dispense. Good dispensing practices and patient education on using drugs correctly are other elements of rational use programs. Although this handbook does not deal directly with drug product selection or promoting rational drug use, it is important to be aware of these topics. (See the suggested reading list at the end of the book.)

- ❒ **FORECASTING AND PROCUREMENT.** After products are selected, the quantity required of each product must be determined and procured. The forecasting process—estimating the quantities of the various commodities that will be needed for a specified time period—is described in chapter 6. The procurement process, which can be complex, is not presented in this handbook. (See the suggested reading list at the end of the handbook for sources of additional information about forecasting and procurement.)
- ❒ **INVENTORY MANAGEMENT: STORAGE AND DISTRIBUTION.** After an item has been procured and received, it must be stored until the customer needs it. Almost all businesses store a quantity of stock for future customer needs. Determining how much stock should be stored is an important decision. We discuss distribution in chapter 4 and storage in chapter 5.

1.2.2 Logistics Management Information Systems

Information is the motor that drives the logistics cycle. Without information, the logistics system would not be able to run smoothly. Managers gather information about each activity in the system and analyze that information to coordinate future actions. For example, information about inventory levels and consumption must be gathered to ensure that a manager knows how much more of a product to procure.

Logisticians added the word *logistics* to *management information system* (MIS) to create *logistics management information system* (LMIS). They wanted to make it clear that the collection of data for logistics is a separate activity from the collection of data for other information systems, including health management information systems (HMIS). Logisticians emphasize the use of logistics data for making decisions about activities within the logistics cycle. LMISs are discussed in chapter 2.

Other activities help drive the logistics cycle and are also at the heart of logistics:

- ❒ **ORGANIZATION AND STAFFING.** A logistics system can only work if well-trained and efficient staff place orders, move boxes, and provide goods to clients. Health programs must be organized to provide the appropriate resources (for example, supervision authority and technical knowledge) to complete logistics activities. Organization and staffing, therefore, are an important part of the cycle. Logistics staff must make the six rights a top priority for a logistics system to work properly.
- ❒ **BUDGET.** Budgeting affects product selection, the quantity of products procured, the amount of storage space available, and the number of staff working in logistics. Logistics activities must receive sufficient funding in the budget if the whole system is to operate effectively.
- ❒ **SUPERVISION.** Supervision of the logistics system keeps it running smoothly and helps anticipate needed changes. Effective supervision helps avoid problems or resolves them quickly before they grow into crises.
- ❒ **EVALUATION.** Evaluation of the logistics system can help demonstrate the impact of the system on other elements.

Although these elements are not discussed separately in the handbook, nearly every chapter has more information about each.

1.2.3 Quality Monitoring

In the logistics cycle, notice how *quality monitoring* appears between each activity of the logistics cycle. This refers not only to the quality of the product, but also to the quality of the work. Quality monitoring is listed four times in the cycle, and understanding each notation is important.

- ❒ **BETWEEN PRODUCT SELECTION AND FORECASTING.** You should ensure that you carefully monitor the quality of your procurement decisions. For example, you select Noristerat, an injectable contraceptive, as the most medically appropriate product for your system. During forecasting and procurement, you learn a donor cannot supply Noristerat, but will supply the injectable contraceptive Depo-Provera®. When you review the assumptions made about the medical appropriateness of Noristerat, you realize that Depo-Provera is equally appropriate and decide to offer that product instead. Quality monitoring plays an important role in forecasting and procuring the right products based on appropriate product selection.
- ❒ **BETWEEN PROCUREMENT AND STORAGE.** After selecting and forecasting needs, products are procured. A program's request for procurement should include specifications for manufacturers to follow (for example, a specification may note that the date of expiration must be printed on each cycle of oral contraceptives). After procuring items, you must monitor their quality before they enter the distribution system. Often, the manufacturer carries out quality monitoring, but the family planning program or pharmaceutical board may also require independent testing. At this stage, some programs also conduct compliance testing—a quality-monitoring procedure to ensure that procurement specifications (such as potency tests for drugs) are being followed. One simpler quality assurance technique you can implement at this stage is to check labeling and packaging for arriving shipments. Make sure that labels and packaging match your specifications.
- ❒ **BETWEEN INVENTORY AND SERVING CUSTOMERS.** While products are being stored and distributed (but before they are given to customers), it is important to monitor their quality. Because this element of quality monitoring happens within a program's logistics system, we discuss this in further detail in chapter 5, which deals with storage. Remember, you want products in the right condition to be available for customers.

- **BETWEEN SERVING CUSTOMERS AND PRODUCT SELECTION.** Even after products have been distributed to customers, you need to continue to monitor quality. You need to know how customers feel about the quality of the products and whether the customers are satisfied with the service they received. Quality monitoring of both the product and the service is critical to the success of your effort to promote the use of your products—contraceptives, vaccines, or other essential drugs. You want customers to use the products they receive and be satisfied with them and with the service they received. The results of monitoring customer satisfaction can be used to inform decision makers about what products to select in the next procurement cycle. Remember, it is up to you to get the right goods to the customers.

1.2.4 The Logistics Environment: Policies and Adaptability

In addition to logistics cycle elements, two outside forces—policies and adaptability—have a strong influence on the logistics system.

- **POLICIES.** Government regulations and procedures affect all elements of the logistics system. Many governments have established policies on the selection of medical products, how items are procured, when items are distributed, where and how items are stored, and the quantities customers receive (often called *dispensing protocols*). Logistics managers can influence these policies, but may not be able to change them. Logistics managers should keep up-to-date on current policies and carry them out as specified.

- **ADAPTABILITY.** This is the logistics system's ability to successfully obtain the resources (either internal or external) that are necessary to address changes in demand. Logistics managers often depend on a larger system, such as the government, to provide inputs. Where managers do not control the inputs, adaptability becomes more challenging. Money is one of the most important resources in logistics. For example, as demand increases, the logistics system needs more money to pay for fuel for extra deliveries, hire new warehouse workers, and train clinic personnel. The program's ability to meet these needs—its adaptability—will have an impact on the logistics system.

What about Manufacturing?

Manufacturing is not included in this version of the logistics cycle because we wanted to focus on the *management* of health programs. Most pharmaceuticals and contraceptives are not manufactured by the program. Often, products are supplied from international sources apart from the country's logistics system. If, however, you want to include manufacturing in the logistics cycle, it would fall under forecasting and procurement.

Many governments are proposing ways to reform the entire health sector, such as decentralization, cost recovery, and integrating different aspects of health care, such as family planning with sexually transmitted disease (STD) control or primary health care. These reforms require a direct response from the logistics system. A good example is cost recovery. How will recovered funds move up the pipeline to be used to pay for the next shipment? The logistics system must continue to function when reforms, such as cost recovery, are implemented. To be able to function, a logistics system must be adaptable.

1.3 Key Logistics Terms

Many logistics terms mentioned in this handbook have special meanings, so definitions in a dictionary may not be the same as the definitions below. Although many more terms could be defined, the basic terms listed here are used throughout the handbook.

- **SUPPLIES, COMMODITIES, GOODS, PRODUCTS, AND STOCK**

  All the items that flow through a logistics system. The terms are used interchangeably throughout this handbook.

- **USERS, CLIENTS, AND CUSTOMERS**

  The people who receive supplies. The terms are used interchangeably throughout this handbook. *Users* is a term familiar to those who collect information about *new* or *continuing* users. *Clients* is a term often associated with clinic patients. However, we want to emphasize thinking of the people served as *customers*, in the same way that a commercial business thinks of its customers. The concept of customer service can also be applied within a logistics system—the *customer* of the central warehouse is the regional or provincial warehouse.

❒ SERVICE DELIVERY POINTS

Any facility where customers (users) receive supplies. Service delivery points (SDP) are frequently clinics and hospitals, but an SDP may even be a district-level facility. They are called SDPs, because all of these locations serve customers directly.

❒ PIPELINE

The entire chain of storage facilities and transportation links through which supplies move from the manufacturer to the consumer, including port facilities, central warehouse, regional warehouses, district warehouses, all SDPs, and transport vehicles. In a logistics setting, the logistics system is often called a pipeline (see figure 1-2).

This term was coined because a logistics system is in many ways similar to the pipeline that brings water into homes. Like a water pipeline, the logistics system has *tanks*—that is, warehouses—for storing *water*—that is, products—until they are needed.

Transportation links, like pipes, are also part of a pipeline. Unlike a water pipeline, which is usually continuous, a health logistics pipeline requires transportation to move supplies periodically from one warehouse to another. In geographically diverse countries, supplies may move by various means, including small boats, buses, and even bicycles.

❒ LEAD TIME

The time between when new stock is ordered and when it is received and available for use. When logistics managers evaluate how well a logistics system is meeting the six rights, they measure lead time and try to reduce it. Goods should reach customers at *the right time*—in the shortest time possible.

When you calculate lead time, it is especially important to include all the time up to when the stock is *available for use*. Stock that has been received but not recorded and put on the shelf is not ready to be issued and certainly is not available to be used. To satisfy the client's need, stock must be available to be put in the hands of the user right away.

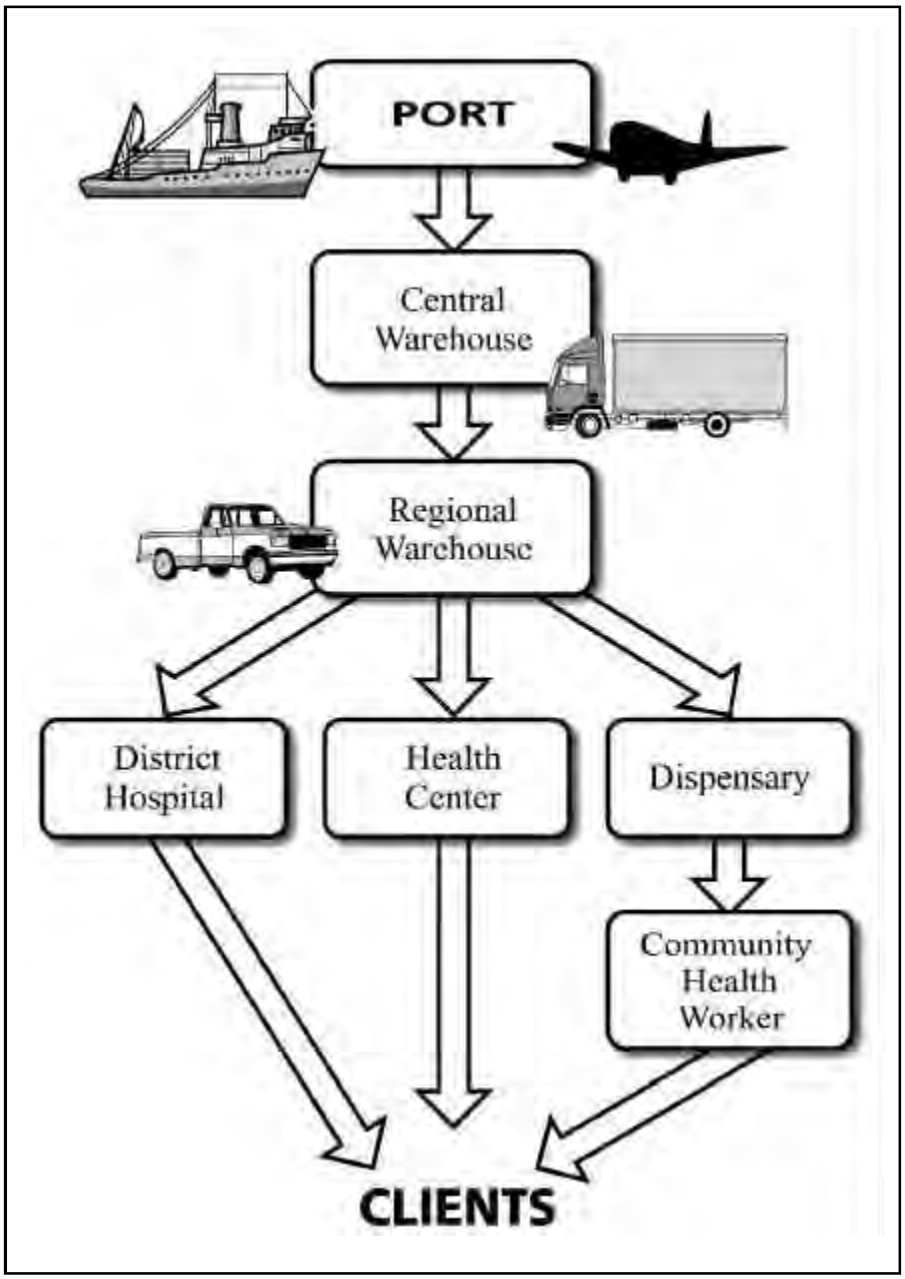


FIGURE 1-2. Basic Supply Pipeline

What Is Lead Time?

A breakdown of lead time includes the following activities:

- The ordering facility (lower-level) manager decides that more stock is needed.
- An ordering form is completed and sent to the upper level.
- The upper level receives the order, and a manager approves the order (usually by signing the form).
- The manager then sends the form to the storekeeper.
- The storekeeper packs the order and gives it to a driver.
- The driver takes the order, and often several others, and transports them to the ordering facility.
- The ordering facility receives the order, conducts a visual inspection, places the order on the shelf, and records the transaction.
- The product is then ready for distribution, and the lead time clock stops.

Lead time can be a few hours or several months, depending on your system. It also varies with the speed of deliveries, availability of transport, and, sometimes, weather. No matter what factors affect your system, remember to take them into consideration when calculating lead time.

1.4 Logistics Comparisons

Several common logistics terms can best be defined by comparing them with an opposing term. These are *push* and *pull* ordering, *dispensed* and *issues* data, and *vertical* and *integrated* distribution. The following sections compare each of these paired terms. Although many more concepts could be defined, these basic comparisons are referred to throughout the handbook.

1.4.1 Push Versus Pull?

Placing orders is a routine activity in logistics. In most logistics systems, an order is placed for new supplies every month or every quarter. In some logistics systems, the quantity to be ordered is determined by the person placing the order. This is called a *pull* or *requisition* system. In other systems, the quantity to be ordered is determined by the person who fulfills the order. This is called a *push* or *allocatio*n system.

- ❒ In a *pull* system, the personnel who receive the supplies determine the quantities to be issued.
- ❒ In a *push* system, the personnel who issue the supplies determine the quantities to be issued.

In the earlier restaurant example, customers give their orders to the server, who then fills the order. No one expects the server to tell the customer what to eat. Restaurants are usually a pull system. In contrast, in the home, the cook decides what to serve, based on the family's taste and the available ingredients—this is a push system.

The advantages and disadvantages of push and pull systems are shown in table 1-1.

Push or Pull for Limited Supplies?

If supplies of products are limited, a pull system is not appropriate, because not enough supplies are available to fill all orders. In this case, a push system is the only choice. In a push system, the higher level tracks the needs of all lower levels and determines the best way to distribute the limited quantity of supplies.

Push and pull approaches may both be used in one system; however, it is usually inefficient to combine the two among facilities at the same level. For example, a pull system may be used from the central level to the regional level and a push system from the regional level to SDPs. But only one system should be used within each level. Imagine the frustration and confusion at the regional warehouse if some clinics are pulling supplies while other clinics need supplies pushed to them. For the pipeline to work, the proper quantities must be ordered and shipped in the shortest time possible. Using two systems at one level only adds to confusion and delays.

It is also important that, when a logistics system is designed, the lower level and the higher level understand who decides what quantities are to be ordered.

If staff at the higher level think it is a push system, and staff at the lower level think it is a pull system, lower-level staff may become confused when the quantity they receive is not the same as the quantity they ordered. If this happens often enough, lower-level staff may assume that they will never receive what they order and stop ordering.

TABLE 1-1. Advantages and Disadvantages of Push and Pull Systems

Category	Push	Pull
Calculations	*Advantage:* The higher level is confident of its own calculations and the quantities it issues. *Disadvantage:* The higher level must calculate all orders.	*Disadvantage:* The lower level must be able to do calculations, and the upper level may still need to verify them.
Information used Note: Neither system works when information is not available to decision makers!	*Disadvantage:* The information that the higher level uses to make calculations may be less current.	*Advantage:* The lower level has the most current information.
Waste	*Disadvantage:* If the higher level does not understand the situation or does not use the available information appropriately, it may not issue the right quantity.	*Advantage:* Can be less wasteful because the lower level knows its customers and their demand best.
Responsiveness	*Disadvantage:* The higher level cannot respond quickly to changes.	*Advantage:* The lower level is more up-to-date.
Training	*Advantage:* Fewer people need to be trained to make calculations.	*Disadvantage:* Lower levels may not be equipped with the skills needed to make the calculations.
Sense of ownership	*Advantage:* Managers feel they have more control over the system.	*Advantage:* Lower level owns its decisions about orders and, therefore, feels it has more control over the system.
Workload	*Disadvantage:* In large systems, the higher level may need to make large numbers of calculations.	*Disadvantage:* The lower level must allocate time to make calculations instead of serving customers.

If the higher level believes it is a pull system and staff at the lower level think it is a push system, the higher level may assume that no supplies are needed because no order was received. The lower level may assume that no supplies were sent because they were unavailable. The design of the system must eliminate such misunderstandings.

1.4.2 Dispensed Versus Issued?

Logistics systems exist to fulfill the six rights for the customer; therefore, all decisions in logistics should be based on information about the customer. Logistics systems need to track information about the quantities of a product actually put in the hands of customers. After a product is received by a customer, it is considered used; even if it is wasted or discarded, the logistics system will still need to be able to resupply the item, regardless of its ultimate use. (Outside the field of logistics, of course, knowing how customers use or discard the supplies they receive is of great interest.)

Information about the quantity of products given to customers is called *dispensed to user data*, often abbreviated as dispensed data or consumption data. Because SDPs are the only places that give supplies to customers, this is the only level at which we can collect dispensed to user data.

> *Dispensed to user data provide information about the quantity of goods actually given to customers.*

The pipeline, however, also includes all intermediate storage facilities. The term for information on the movement of products between any two facilities is called issues data. For example, when the regional level gives supplies to the district level, this is issues data.

> *Issues data provide information about the quantity of goods shipped from one level of the system to another.*

Whenever possible, decisions for planning should be based on dispensed to user data. If the regional warehouse issued 50,000 condoms to the district warehouse last quarter, should it issue the same number this quarter? The answer is *not necessarily*, because condoms may be piling up in the district warehouse. The order will be more accurate if information is available on the number of condoms dispensed to users during that time period. Throughout this handbook, we emphasize the importance of using dispensed to user data for decision making.

In systems in which dispensed to user data are not available, issues data can be substituted. Always use issues data from the lowest level possible. For example, issues data from districts to clinics are preferred to data from the central warehouse to districts, because district issues better reflect customer demand. Because the relationship between issues data and customer demand is not direct, collection of the actual dispensed to user data should be a priority for logistics systems that do not have dispensed to user data available.

1.4.3 Vertical Versus Integrated?

Many countries have several logistics systems for selecting, procuring, and distributing supplies to clients. Often programs, such as family planning, maternal and child health, malaria control, tuberculosis control, or nutrition, all manage and distribute supplies for their own programs. Such programs are called vertical programs, because they historically have been managed by separate management units at the central level.

A vertical system is a logistics system that supplies and manages products for only one program.

Recently, however, many countries have been moving away from having several vertical logistics systems toward having just one system that distributes supplies for all programs. For example, a system that manages contraceptives for the family planning program might also manage oral rehydration salts (ORS), vitamin A, and other products for the maternal and child health program.

An integrated system is a logistics system that supplies and manages products for more than one program.

Vertical and integrated systems each have their own advantages and disadvantages. In reality, it is often the case that within a given country some logistics functions remain vertical, whereas others are integrated. For example, contraceptives, ORS, and vitamin A capsules may be procured by separate programs, but they may also be subsequently stored and transported together. Procurement, in this example, is said to be vertical, whereas storage and transport are integrated. There is ongoing debate about the advantages and disadvantages of vertical and integrated logistics management. This debate is not, however, a major focus of this handbook. (See the suggested reading list at the end of the book for sources of additional information about how integration can affect logistics.)

CASE STUDIES

Vertical Compared with Integrated Distribution in Ghana and Nepal

In Ghana, the family planning program is separate from all other Ministry of Health programs. It has its own managers who are in charge of the LMIS for family planning (FP) products. These same managers work with donors to forecast and procure needed supplies; however, they do not have a separate budget for FP product logistics, nor do they manage personnel dedicated solely to FP logistics. Within their storage facilities, they maintain a separate area for FP products and have an inventory control system based only on the needs of FP customers. But warehouse personnel do not just work in this area of the warehouse. The Ghana FP logistics system is primarily a *vertical* system.

In contrast, the Nepal system is integrated. The LMIS manages more than 300 medical products (everything from scalpel blades to Depo-Provera). A central Ministry of Health procurement unit forecasts and orders supplies and works with donors to ensure continual supply. Storage spaces are organized according to space requirements rather than by program, and all products are distributed at the same time. The FP program has its own managers, separate from other programs, but below the central level. Logistics personnel have responsibility for all 300-plus products. The Nepal FP logistics system is primarily an *integrated* system.

1.5 An Introduction to Key Concepts

In the past, logistics was considered a custodial activity. Storekeepers were the custodians of stored supplies. Consequently, the science (and art) of logistics and the people who make the system work were not considered important factors in family planning, HIV/AIDS control, essential drug, or vaccination programs. Now that program managers realize how important the six rights of logistics are to a program's success, this view has been changing rapidly.

The growing importance of logistics has led logisticians to broaden their thinking beyond warehouse walls. This handbook promotes five key concepts that help place logistics in the framework of the larger health program. One or more of the following key concepts are discussed at the end of each chapter:

- ❒ **CUSTOMER SERVICE.** Logistics exists to ensure that customers get the products they need and want.
- ❒ **DATA FOR DECISION MAKING.** Identify the logistics decisions you need to make; then collect the data to inform or guide the decisions. Do not collect information you do not plan to use.
- ❒ **SYSTEMS APPROACH.** Remember that logistics is only one component of a successful program, and all of the components need to work together for a program to be successful. Logistics advisors should work with managers who are responsible for other activities and functions (e.g., information, education, and communication campaigns).
- ❒ **POLICY-LEVEL VISIBILITY.** Although the profile of logistics continues to rise, you should continue to advocate for appropriate resources to ensure the flow of products through the pipeline.
- ❒ **CONTINUOUS IMPROVEMENT.** No logistics system is perfect. Do not change the logistics system just for the sake of change, but look at how to improve the system to ensure it can adapt to changes in the programs it supports.

This chapter highlights the key concept of *customer service*. No matter where in the logistics system you work, you serve various kinds of customers. Usually people think of customers as the end users—the clients who enter a health facility to get a product they need.

When you work at a district or regional health facility, do you have customers? Yes—your customers are the people who receive products from you. In this case, they are referred to as *internal* customers, in contrast to *external* customers, the end users.

The district warehouse expects good customer service from the regional warehouse. The district warehouse expects to receive the right quantity of the right good, at the right place (its warehouse), at the right time, in the right condition, and at the right cost. The six rights apply to both internal and external customers. Everyone working in logistics should remember he or she is serving customers, whether internal or external. And everyone should remember that he or she is a customer, too—of the level above him or her.

Look at the logistics cycle on page 5 and note the position of the label, "Serving Customers." Serving customers is placed at the top of the cycle to emphasize the importance of our ultimate goal—getting products to end users. Everyone working in logistics should keep this in mind. The customer is the most important reason for our work.

1.6 Chapter Summary

In this chapter you learned the following:

1. The purpose of a logistics system—

   To supply the right goods, in the right quantities, in the right condition, to the right place, at the right time, and at the right cost.

2. How the components of a logistics system fit together in the logistics cycle.

3. Definitions of key logistics terms—

- ❒ **SUPPLIES, COMMODITIES, GOODS, PRODUCTS, AND STOCK.** All items that flow through the logistics system.
- ❒ **USERS, CLIENTS, AND CUSTOMERS.** The people who receive supplies.
- ❒ **SERVICE DELIVERY POINT.** Any facility where clients receive supplies.
- ❒ **PIPELINE.** The entire chain of storage facilities and transportation links through which supplies move from the manufacturer to the consumer, including port facilities, central warehouse, regional warehouses, district warehouses, all service delivery points, and transport vehicles.
- ❒ **LEAD TIME.** Time between when new stock is ordered and when it is received and available for use.
- ❒ **PULL SYSTEM.** Quantities to be issued determined by the personnel who receive the supplies.
- ❒ **PUSH SYSTEM.** Quantities to be issued determined by the personnel who issue the supplies.
- ❒ **DISPENSED TO USER DATA**. Information about the quantity of goods given to clients.
- ❒ **ISSUES DATA.** Information about the quantity of goods shipped from one level of the system to another.
- ❒ **VERTICAL SYSTEM.** Logistics system used to supply and manage stock for only one program.
- ❒ **INTEGRATED SYSTEM.** Logistics system used to supply and manage stock for more than one program.

2 | Logistics Management Information Systems

Objectives

In this chapter, you will learn the following:

- ❒ The purpose of a logistics management information system
- ❒ The essential data needed for logistics management
- ❒ The purpose of the three types of logistics records and the data they must contain
- ❒ The purpose of reporting
- ❒ The types of reports and the data they must contain
- ❒ The purpose of feedback reports.

2.1 Logistics Management Information Systems

> *The purpose of a logistics management information system is to collect, organize, and report data that will be used to make decisions.*

We collect information to make decisions. The information we gather is used to improve customer service by improving the quality of management decisions. LMISs enable logisticians to collect the information needed to make informed choices. If information is not going to be used to make decisions, it should not be collected.

2.2 Essential Data for Decision Making

If data are to be collected for decision making, you need to know how much data and what data to collect. To decide what data to collect, look at the decisions you will need to make. Think about the questions a logistics manager might ask. What information would he or she need to answer those questions and make informed decisions?

The questions might include the following:

- ❒ How long will current supplies last? Do we need to order more supplies now?
- ❒ Where are our supplies in the pipeline? Do we need to move supplies from higher to lower levels?
- ❒ Where is consumption the highest? Do those facilities need more resources?
- ❒ Are we experiencing losses from the system that require us to take action?
- ❒ Are supplies flowing regularly through the pipeline? Do we need to adjust our pipeline to account for bottlenecks in the system?
- ❒ Are any products about to expire? Should we take them out of the pipeline? Can we distribute them before they expire?

Hundreds of decisions can be made using the appropriate data. To make logistics decisions, a logistics manager needs three essential data items: (a) *stock on hand,* (b) *rate of consumption,* and (c) *losses and adjustments*. Although we may make good use of other data items in logistics, these three data items are *absolutely required* to run a logistics system:

- ❒ **STOCK ON HAND.** The quantities of usable stock available at all levels of the system. (Items that are unusable are not considered part of stock on hand. They are considered losses to the system.)
- ❒ **RATE OF CONSUMPTION.** The average quantity of stock dispensed to users during a particular time period.
- ❒ **LOSSES AND ADJUSTMENTS.** Losses are the quantity of stock removed from the pipeline for any reason other than consumption by clients (due to expiration, theft, damage, and so on). Adjustments are made when quantities are issued to or received from other facilities at the same level of the pipeline. Also, adjustments may be used to explain administrative changes—for example, when you count stock and find a different amount from the quantity listed on the bin cards. For this reason, adjustments may involve either positive or negative changes to stock.

Service Statistics Data

Many information systems collect more than just the essential data items. They may include a number of items we call *service statistics*. Service statistics for family planning may include the total number of clients seen, the number of referrals made, the number of clients counseled but not receiving supplies, the number of new or continuing users, and demographic information (for example, age or parity). Family planning program managers use this information to evaluate the success of their programs in bringing in new clients, planning for resource allocation based on workload, and conducting research. Thus, such data are *essential* for these broader types of management decisions. Our emphasis, however, is on logistics decisions, and, for these, the *essential* data are stock on hand, rate of consumption, and losses and adjustments.

2.3 Three Types of Records

From a logistics point of view, only three things can happen to supplies in a pipeline—they are stored, moved (in transit), or consumed (used). Because we want to be able to monitor supplies at all times in the pipeline, we need three types of records to track the supplies (see figure 2-1).

- ❒ **STOCKKEEPING RECORDS.** These keep information about products in storage.
- ❒ **TRANSACTION RECORDS.** These keep information about products being moved.
- ❒ **CONSUMPTION RECORDS.** These keep information about products being consumed.

Each record type has a distinct form and use.

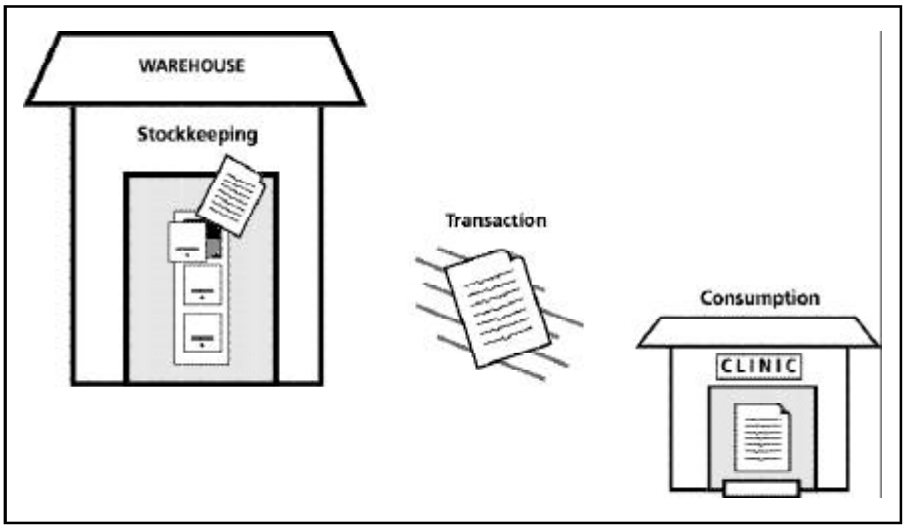


FIGURE 2-1. Three Record Types

2.3.1 Stockkeeping Records

The answers to the most common questions on stockkeeping records are as follows:

- ❒ *What is the primary purpose of stockkeeping records?*

  Stockkeeping records are used to record information about items in storage.

- ❒ *What essential data items do stockkeeping records contain?*

  They must contain the quantity of stock on hand and the quantity of losses and adjustments.

- *What about the third essential data item—consumption data?*

  Products are stored in a storeroom and generally are not distributed (dispensed) directly from the storeroom to the customer. Consumption data, therefore, are not found on stockkeeping records.

- *Who completes the stockkeeping record?*

  It is completed by anyone who receives or issues stock from storage. It is also completed by anyone who takes a physical inventory of the stock. This includes the warehouse manager and other warehouse staff, as well as service delivery point staff. Pharmacies store stock and should also use stockkeeping records. The pharmacist and other pharmacy staff are responsible for completing these stockkeeping records.

- *When are entries to stockkeeping records made?*

  Entries are recorded on the stockkeeping record whenever products are received or issued. Entries are also recorded when stock is counted during a physical inventory. When the stockkeeping record is full, a new record is started using the ending balance from the previous record.

- *How are the data on a stockkeeping record organized?*

  Stockkeeping records are organized by date. They record receipts, issues, losses and adjustments, and the balance on hand. They also record the results of physical inventories (when items are counted to verify the quantity in storage).

- *In what formats are stockkeeping records printed?*

  The most common formats for stockkeeping records are individual stock cards and ledgers. A *stock card* is a generic name for either an inventory control card or bin card.

- *What is a bin card?*

  A bin card is an individual stockkeeping card that keeps information about a single lot of a product by brand (see figure 2-2). For example, one bin card would contain information about a single lot of Lo-Femenal at a storage facility. It should note the stock on hand of Lo-Femenal for that lot only, as well as any losses and adjustments for that lot. Bin cards are usually displayed at the bins (or shelf) where the lot is found.

FIGURE 2-2.
Bin Card

BIN CARD

No.

Article

Date	RIV/IV-No.	Quantity			Signature
		Received	Issued	Balance	
(1)	(2)	(3)	(4)	(5)	(6)

❒ *What is an inventory control card?*

An inventory control card is an individual stockkeeping card that keeps information about all lots of a product. One inventory control card should be kept for each product. The inventory control card is a summary of the bin cards for a product. For example, one inventory control card would contain information about all of the Lo-Femenal at a storage facility. It should note the total stock on hand of Lo-Femenal in the warehouse, as well as the total losses and adjustments without regard to lot number or where the product is located in the warehouse. Inventory control cards generally are kept in the office of the warehouse manager (see figure 2-3). In larger warehouses, which may have many lots of each product stored in different places, it is usually desirable to maintain both inventory control cards and bin cards, to ensure that each lot is managed properly. In smaller storerooms, a bin card may be the only stockkeeping record kept.

FIGURE 2-3. Inventory Control Card

INVENTORY CONTROL CARD			
Commodity Number	Description		
Unit	Maximum Stock	Minimum Stock	Location

Date	Transaction Reference	Quantity Received	Quantity Issued	Losses/ Adjustments	Quantity on Hand	Quantity on Order

❒ *What is a stores ledger?*

A stores ledger is a stockkeeping record that contains the same information as the inventory control card described above. Unlike inventory control cards, a stores ledger is bound like a book. It is used instead of the individual card format. Government rules in some countries require the use of stores ledgers. (Managers may believe that binding the pages increases accountability, because missing pages are obvious.) The ledger format is less desirable than individual cards, because it is easy to run out of space for an individual product. It is also hard to add new products—you can alphabetize a set of individual inventory control cards, but you cannot alphabetize pages within a bound book.

❒ *What information other than essential data can be included on an inventory control card or stores ledger?*

Because information is recorded by date, inventory control cards or

stores ledgers include information about when shipments are received and when issues are made, along with the shipment quantity. They also include the results of a physical inventory. For tracking the movement of stock, inventory control cards or stores ledgers may also include a reference number for the shipment or shipping document. It is useful to include the *quantity on order*, which tells the warehouse manager how much has been ordered and when the order was placed. The quantity on order is especially useful for calculating the lead time.

In facilities with more than one storekeeper, a column for the initials of the person receiving, issuing, or counting stock is helpful for tracking these activities. It is frequently desirable to include identifying information (formulations, brand names, and identification codes) and stock location information. The standard reorder quantity amount (stated in months of supply) is also useful. (See chapter 3 for more information about months of supply and chapter 4 for more information about reordering.)

❒ *How do stockkeeping records move?*

Stockkeeping records do not usually move; they stay where products are stored (e.g., the warehouse, pharmacy, or stockroom).

2.3.2 Transaction Records

❒ *What is the primary purpose of a transaction record?*

Transaction records are used to record information about the movement of stock from one storage facility to another.

❒ *What essential data items are included on a transaction record?*

Although transaction records are essential in recording the movement of stock, they do not have to include any of the essential data items mentioned earlier. It is frequently desirable to include the current stock on hand and, depending on the system design, losses and adjustments, and consumption data, as well. The issuing facility may use the additional data to evaluate the reasonableness of the quantities requested or to ration the quantities to deliver if supplies are limited.

❒ *Who completes the transaction records?*

Warehouse personnel at both issuing and receiving facilities complete transaction records. In pharmacies or service delivery points, pharmacy personnel or nurses complete transaction records.

- *When are transaction records filled in?*

  Transaction records are initiated any time a facility requests or issues supplies. They are completed when the receiving facility confirms receipt of the items shipped.

- *How are the data on a transaction record organized*?

  Transaction records are organized by date, which helps identify the transaction. Transaction records can then serve as *ticklers*, reminders that a request was made and not yet received or that an item was issued, but confirmation of receipt is still pending. We recommend that transaction records include a reference number that identifies each transaction. Data on the transaction record are organized by the product requested or issued. One transaction record is usually used to request or issue any number of products. On some transaction records, the product names are preprinted; on others, the name of the product is written by hand.

- *In what formats are transaction records printed?*

  The most common formats are packing slips, receiving records, issue vouchers, and requisition and issue vouchers. The format of the transaction record depends on whether the system is pull or push. In all cases, a preprinted voucher number on each transaction record helps track individual shipments.

- *What is a packing slip?*

  Facilities issuing supplies send packing slips with the supplies (see figure 2-4). They list the name of the facility where supplies are being sent and the names and quantities of each item shipped. A packing slip is usually paired with a receiving record. Some logistics systems are required by government regulations to use packing slips. If possible, issue vouchers or requisition and issue vouchers should be used instead of packing slips. (Descriptions of issue vouchers and requisition and issue vouchers are found in the following text.)

FIGURE 2-4. Packing Slip

PACKING SLIP

Date: ..... Ship to: .....

	ARTICLE	QUANTITY SHIPPED Shipped	REMARKS
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

Shipped by: ..... Date: .....

❒ *What is a receiving report?*

A receiving report lists the names and quantities of items received (see figure 2-5). It is usually paired with a packing slip. The facility receiving the supplies completes the receiving report.

Some logistics systems are required by government regulations to use receiving reports, but such forms only duplicate data recorded on the inventory control card. If possible, issue vouchers or requisition and issue vouchers should be used instead of receiving reports.

FIGURE 2-5. Receiving Report

RECEIVING REPORT

Date: _____ Ship to: .....

	ARTICLE	QUANTITY RECEIVED	REMARKS
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

Received by: ..... Date: .....

❒ *What is an issue voucher?*

An issue voucher (IV) lists the items and quantity issued to a facility (see figure 2-6). It also includes a separate column for the quantities received in case any items are lost or damaged en route. IVs are used in a push system; the higher level determines the quantity to be sent and issues the supplies to the lower level. A correctly designed IV is used instead of a packing slip and receiving report, thus reducing the number of forms to be completed (and the chance of errors). An IV should be completed in triplicate (three copies). The issuing facility completes the date and quantities issued, signs the record, and sends the top two (1 and 2) copies to the receiving facility (see figure 2-7), along with the supplies. The bottom copy (3) is often called the *tickler* because the issuing facility keeps the bottom copy reminder (or as a tickle) that it is waiting for verification of a shipment. The receiving facility verifies the quantity received, signs the form, and sends the

top copy (1) back and keeps the middle copy (2) for its files. The top copy (1) arrives at the issuing facility, which then disposes of the tickler (3) and keeps the top copy for its files. Each of the facilities ends up with a completed copy of the IV for its permanent file. Because the transaction has only one IV number at both facilities, there is no confusion when either facility manager needs to talk to the other about a problem with the shipment.

ISSUE VOUCHER

Issue Voucher No.: _____

Date: ..... Ship to: _____

	ARTICLE	QUANTITY ISSUED		REMARKS
		Shipped	Received	
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

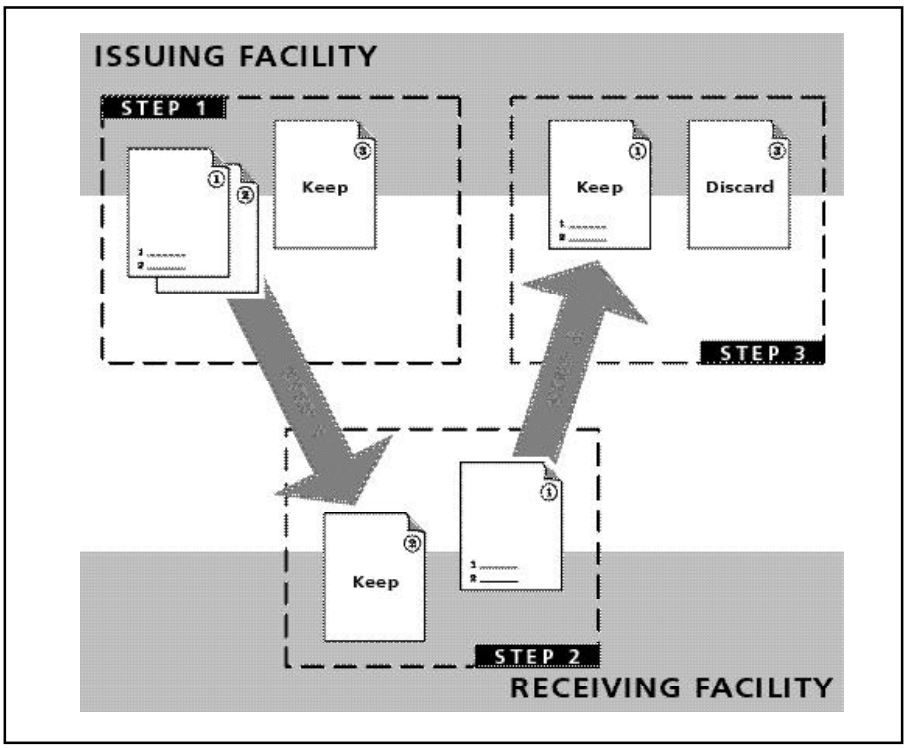
Approved by: _____ Date: _____

Shipped by: ..... Date: .....

Received by: _____ Date: _____

FIGURE 2-6. Issue Voucher

FIGURE 2-7. Issue Voucher Flow



❒ *What is a requisition and issue voucher?*

A requisition and issue voucher (RIV) is similar to an IV, except that the RIV is used in a pull system (see figure 2-8). An RIV lists the items and quantities requested by a facility. It also includes a column for the quantity actually issued. This is important in situations in which it is impossible to supply the full amount requested. Like an IV, the RIV includes a column for the quantity received to account for any losses or damage in route.

RIVs should be completed in quadruplicate (four copies) (see figure 2-9). The requesting facility completes the date and quantities requested for each item, signs the record, and sends the top three copies (1, 2, and 3) to the issuing facility, keeping the bottom copy (4) as a tickler to remind it that it has placed an order and is awaiting its arrival. The issuing facility fills the order, signs the form, and sends the top two copies (1 and 2) to the receiving facility, along with the supplies, keeping the bottom copy (3) as a tickler. The receiving facility signs the form, verifies the quantity received, and sends back the top copy (1). The receiving facility keeps the second copy (2) for its files and disposes of the tickler copy (4). The top copy (1) arrives at the issuing facility, which then disposes of the tickler (3) and keeps the top copy for its files. Each of the facilities ends up with a completed copy of the RIV for

its permanent file. Because the transaction has only one RIV number at both facilities, there is no confusion when either facility manager needs to talk to the other about a problem with the shipment.

REQUISITION AND ISSUE VOUCHER

Requisition and Issue Voucher No. _____
Ship to: _____

Date: _____

REQUISITIONED			ISSUED		
Article	Quantity on Hand	Quantity Requested	Shipped	Received	REMARKS

REQUISITION:
Requested by: _____ Date: _____

Approved by: _____ Date: _____

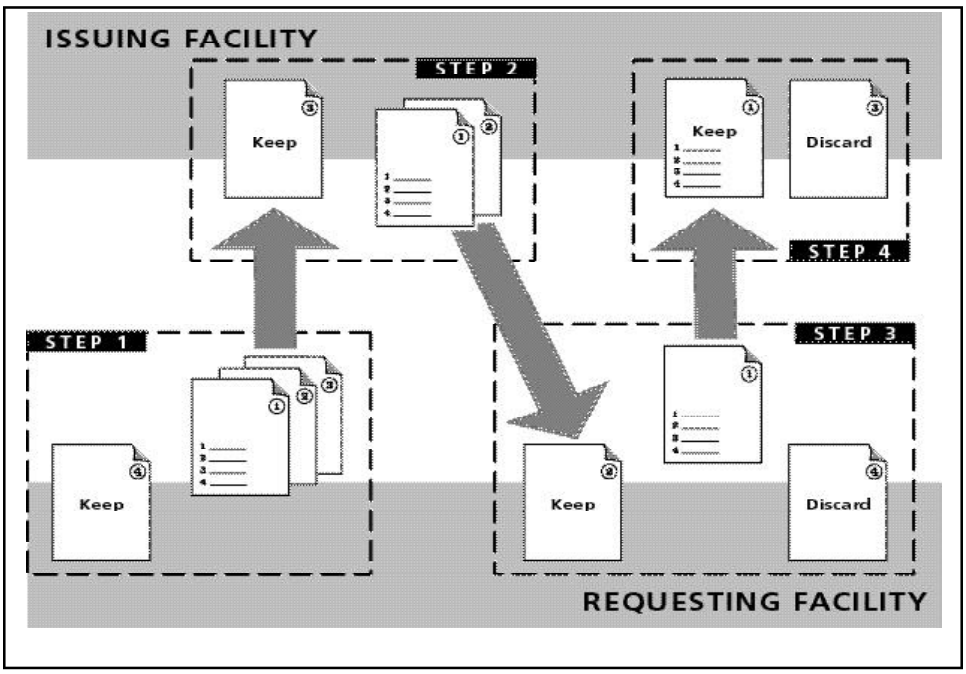
ISSUE:
Approved by: _____ Date: _____

Shipped by: _____ Date: _____

RECEIPT:
Received by: _____ Date: _____

FIGURE 2-8. Requisition and Issue Voucher

FIGURE 2-9. Requisition and Issue Voucher Flow



❒ *What information other than the essential data items can be included on a transaction record?*

All transaction records should include dates, signatures, and a space for comments. The date enables you to calculate lead times. The signatures indicate authorization of a transaction (by, perhaps, an accounting department or program manager). Try to limit the number of required signatures on a transaction record to reduce the administrative burden and time spent collecting signatures. A space for comments should be available for recording reasons why the quantities shipped are different from the quantities received.

❒ *How do transaction records move?*

Transaction records move with the product from the issuing facility to the receiving facility. In a pull system, the transaction record may be brought in person by the facility requesting supplies, such as during a monthly meeting. Otherwise, transaction records move by regular mail or are hand-delivered from the requesting facility to the higher-level facility.

2.3.3 Consumption Records

- *What is the primary purpose of a consumption record?*

  To record the quantity of each item dispensed to a customer.

- *Which of the essential data items do consumption records contain?*

  As the name of the record implies, consumption records contain dispensed to user data.

- *What about the other essential data items—stock on hand and losses and adjustments?*

  Consumption records do not record stock on hand or losses and adjustments.

- *Who completes consumption records?*

  Service personnel at service delivery points complete consumption records.

- *When are consumption records filled out?*

  Consumption records are filled out whenever supplies are dispensed to customers. They are totaled at the end of the reporting period, usually monthly.

- *How are the data on a consumption record organized?*

  Consumption records are usually organized by the date of visit. They record the quantity of a specific product dispensed to users.

- *How are consumption records organized?*

  Consumption records are usually bound in a book or are printed on oversized paper. This allows room for non-logistics information, such as client service data, to be recorded. One record (perhaps consisting of several pages) is usually used per month; however, in a bound book, a new page is started each month.

- *In what formats are consumption records printed?*

  The most common formats are daily activity registers (DAR) and tick sheets.

- *What is a daily activity register?*

  Daily activity registers (DAR) record the quantity of each product received by a customer (by name or client number) and by date (see figure 2-10). They work best when the generic names of drugs and the brands of each contraceptive are preprinted on the form. Handwritten brand information is sometimes used, but this makes it difficult to tally the data for reporting. On the bottom of the DAR, totals are taken for each product for reporting.

- *What is a tick sheet?*

  A tick sheet records the quantity of each brand of product dispensed to users (see figure 2-11). A *tick* or mark (often an X) is made for each unit dispensed. In some cases, each box represents a client, and the number of each item dispensed is written in the box. A tick sheet does not record this information by day or by client. In some cases, a tick sheet may be made from an ordinary spiral-bound notebook. Tick sheets work well at small service delivery points, service delivery points that do not collect general patient data, or community-based distributors.

- *What information other than the essential data items can be included on a consumption record?*

  Consumption records often include service statistics, such as whether the patient is a new or continuing user. But, because the personnel who complete these records serve customers, the collection of data other than essential data should be kept to a minimum. Serving the customer should always be the first priority.

- *How do consumption records move?*

  Consumption records generally do not move. They usually remain at the service delivery facility.

FIGURE 2-10. Daily Activity Register

DAILY ACTIVITY REGISTER (FAMILY PLANNING)

S.D.P./Clinic Name: _____ S.D.P./Clinic Number: _____ Month: Year: _____

Date	Name of Client	Client Number	Client Type		Contraceptives Dispensed at This Visit																Referrals		Gloves	Comments/ Remarks
			New	Revisit	Oral Contraceptives								Injectables		Nur-plant	IUD			Con-doms	Foam-ing Tablets	Steril-zation	Natural FP		
					Micro-gynon	Neo-gynon	Eu-gynon	Micro-ish	Nu-dette	Lo-gynon	Tri-nordial		Depo-Provera	Nori-ster		Copper T	Nova T	Multi-load						

FIGURE 2-11. Tick Sheet

WORKPLACE-BASED DISTRIBUTION (WBD) PROGRAMME
MONTHLY STATISTICS REPORT

Name: _____ WBD Counselor or Supervisor Aggregate (circle one)

Month and Year: _____ Zone Covered: _____

BRAND	QUANTITY OF PRODUCTS DISTRIBUTED	TOT.
Panther		
Kamal		
Secure		
ORS		

ACTIVITY LOG

Activity	Number	TOT.
New Acceptors		
Continuing Users		
Referrals		
Home Visits		

Express all quantities in pieces (for Kamal, Panther), cycles (for Secure), and sachets (for ORS). Do not use packets, boxes, or cartons as counting units for any product.

Signature: _____ Date completed: _____

2.3.4 Relationships among Data Found in Records

In a well-functioning LMIS, the relationships among data found in records are clear. For example, at the service delivery level, the consumption figures recorded on the DAR should be close to the issue quantities recorded on the inventory control card (ICC). Also, the transaction numbers on an RIV or IV should match the numbers recorded on the ICC. Periodically, logistics managers should verify the quality of the data.

Maintaining accurate records is crucial to good supply management. At any level of the system, managers should be able to report the stock on hand for any item quickly and easily. In a small warehouse, this may mean walking to the storage area and reading the numbers off an easily located bin card. In a large warehouse, this may mean being able to find the ICC file quickly. The entire transaction should be clear—who placed the order and when, when the order was filled and shipped, and when the order was received. If questions arise, you should be able to trace a transaction by using the reference number from the stockkeeping records to locate the transaction records.

2.4 Summary Reporting and Reporting Systems

Stockkeeping, *transaction*, and *consumption records* record data. To make the collected data useful, it must be made available to managers in a form suitable for decision making. In this section, we discuss the movement of information on reports.

2.4.1 The Six Rights for LMIS Data

If customers expect to find the right goods, in the right quantity, at the right place, at the right time, in the right condition, and for the right cost (see section 1.1 on the six rights), is it reasonable for logistics managers to expect the same to be true of information they need?

We think the answer is definitely yes! The six rights also apply to data. We need the right data (the essential data items), at the right time (in time to take action), at the right place (the information must be where the decisions are made), and in the right quantity (having all essential data from all facilities). The data must be of the right quality (we have to believe that the data are correct) and at the right cost (we should not spend more to collect information than we spend on supplies!).

How do data get to decision makers? As you learned already, stockkeeping records and consumption records are kept at storage and service delivery facilities, yet they contain all the essential data needed to make decisions. And, although transaction records move from one facility to another, they do not necessarily contain essential data. Data must be given to decision makers for them to make informed decisions. Therefore, reports are used to move the essential data to decision makers.

Record Compared with Report

Up to this point, we have referred only to *records*. In this text, records are forms on which data are collected. *Reports* are forms on which all essential data items for a specific facility and for a specific time are moved from one level in a logistics system to another, usually in summarized or aggregated form.

2.4.2 Summary Reports

- *What is the primary purpose of a summary report?*

  To report all essential data items for a specific facility and for a specific time period (usually monthly or quarterly).

- *What essential data items do summary reports contain?*

  They must contain all three essential data items—stock on hand, consumption, and losses and adjustments.

- *Who completes the summary report?*

  The manager responsible for collecting the three essential data items usually completes the summary report.

- *When are summary reports completed?*

  Summary reports are completed at the end of the reporting period (usually monthly or quarterly). Lower-level facilities are usually given a reporting deadline, and each successive level is given another deadline for reporting to the next level. For example, clinics may be given until the tenth day of the following month to report to districts, districts may have until the 20th day to report to the region, and the region may have until the last day of the month to report to the central level.

CASE STUDY

Malawi Summary Reporting

In the Malawi system, community-based distributors (CBD) report to SDPs by the fifth day of the month. SDP reports are due at the district level by the tenth day of the month. District reports are due at the regional level by the 15th day of the month, and regional reports are due at the central level by the 20th day of the month. By defining reporting deadlines, the Malawi Ministry of Health (MOH) hopes to minimize the time it takes to receive essential

The system design for reporting deadlines must take the following into account:

- How soon data are needed for decision making.
- How quickly reports can be received at the next level.
- The quantity of data to be gathered at each level.

❒ *How are the data on a summary report organized?*

Summary reports are usually organized by date—monthly or quarterly, depending on the reporting cycle. They report the beginning stock on hand, receipts, the quantity issued or dispensed, losses and adjustments, and the end stock on hand for a certain time period.

❒ *How are summary reports organized?*

Usually one summary report is made for each facility reporting for the period.

❒ *In what format are summary reports printed?*

The most common formats include simple reports, aggregate reports, and report and request reports.

❒ *What is a simple report?*

A simple report is a summary report that lists the name of the facility, the reporting period, the beginning stock on hand, receipts, quantities issued or dispensed, losses and adjustments, and the ending stock on hand. Well-designed reports are self-balancing, which means that by adding and subtracting the data on the report, as appropriate, the reader can determine whether the report is mathematically correct.

Why Use Self-Balancing Reports?

Consider the following report of a district warehouse reporting to a regional warehouse:

Opening Balance + Receipts – Issues/Dispensed ± Loss/Adj. = Closing Balance

100 + 35 – 65 – 0 = 70

The supervisor at the regional level can clearly see that the calculations are correct. Self-balancing reports are helpful because supervisors can verify the calculations. Unfortunately, self-balancing reports may not reflect actual quantities on hand if districts complete the report without comparing the closing balance with the actual quantity on hand. Opening balances should equal the closing balance of the previous report. A physical inventory conducted at the beginning or end of the month, however, may reveal a discrepancy in the beginning or ending stock on hand. How should such a discrepancy be handled? The discrepancy should be reported as a *loss/adjustment* for the reporting period. It is critical that the reported *closing balance* equal the actual stock on hand, so the quantity to be ordered will be determined directly by the actual stock on hand and not by a calculated number.

❒ *What is an aggregate summary report?*

One of the most important decisions logistics managers face in collecting data on summary reports is determining when and at what level data can be aggregated.

Consider a pipeline of three regions, each with two districts, and each district with four clinics. The clinics forward their reports monthly to the district. The district can report to the region in one of three ways:

- Include information for the district storeroom only on the report, and then include a copy of each clinic's report separately.
- Include information for the district storeroom only on the report, and then add all of the clinic data together on a second report.
- Add data for the district and clinics together, but, under the column *issued/dispensed*, report only the aggregate dispensed to user data from the clinic (ignoring the issues data from the district to the clinic).

With any of these three methods, the regional level will receive all of the essential data items for the district. Each method has advantages and disadvantages, however. These are described in the following section in order of preference, the first method being the most preferable (see table 2-1).

TABLE 2-1. Advantages and Disadvantages of the Three Methods of Aggregating Data

Method	Advantages	Disadvantages
■ One report for the district ■ One copy of each clinic report	■ Each report can be self-balancing. ■ The region can analyze each facility separately.	■ The district still needs to add all of the clinic consumption together to make decisions, and the region has to make this calculation, as well. ■ It involves large numbers of forms and copies.
■ One report for the district ■ One aggregate clinic report	■ Each report can be self-balancing. ■ The region can analyze each level separately.	■ The region cannot pinpoint problems at individual clinics.
■ One aggregate report for both	■ The region only gets one report.	■ The form is not self-balancing. ■ The district may make an error in selecting the data item to report. ■ The region cannot pinpoint problems within the district.

Worksheets for Aggregation

At intermediate facilities with large numbers of lower-level facilities reporting to them, tracking consumption data for decision making is easier when data-tracking worksheets are introduced. The worksheet is organized to collect consumption data by facility for each month. For example, where clinics report monthly to districts, but districts report only quarterly to regions, worksheets can be used to aggregate data for a three-month period. Worksheets also provide a quick overview of the rates of consumption (increasing, decreasing, or stable) at each facility over time. Worksheets are usually kept at the facility making the aggregation, and no duplicates are made (see figure 2-12).

❒ *What is a report and request report?*

A report and request report in a pull system is a summary report that presents the data to the next higher level and requests new supplies. The advantage of this report is that the higher level can verify the need, and the lower level sends up only one form. A report and request report is combined with an IV that represents the other steps in the transaction (see figure 2-13).

Unfortunately, it is more difficult (but not much more) to calculate lead time when two forms are used to record a transaction. We often recommend the use of a report and request format when designing a logistics system, because reporting is clearly linked to placing the next order. This linkage encourages timely submission of reports.

FIGURE 2-12. Consumption Worksheet

Product:		Year:	

Facility	QUANTITIES DISPENSED TO USERS																	
	January			February			March			April			May			June		
	Clinic	CBD	Total	Clinic	CBD	Total	Clinic	CBD	Total	Clinic	CBD	Total	Clinic	CBD	Total	Clinic	CBD	Total
1																		
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		
TOTAL																		

FIGURE 2-13. Quarterly Report and Request for Contraceptives

QUARTERLY REPORT & REQUEST FOR CONTRACEPTIVES

Province:_____ District:_____ Location:_____

Facility type: Depot: ○ District Store: ○ SDP/Clinic: ○ Other: ○

Report for Quarter Beginning: _____ Ending _____

Contraceptive	Beginning Balance	Received This Quarter	Dispensed/ Issued	Losses/ Adjust-ments	Ending Balance	Quantity Needed
Microgynon						
Neogynon						
Microlut						
Nordette						
Trinordial						
Depo-Provera						
Noristerat						
Norplant						
Copper T						
Multiload						
Condoms						
Foaming Tablets						
Gloves						

Submitted: _____ Explanation of losses: _____

Date:_____ _____

_____

❒ *What information other than the essential data items can be included in a summary report?*

Information in a summary report can also include service statistics data. Summary reports should also include a place for comments, particularly explanations for any losses and adjustments. The person completing the report should sign the report and date it. At higher levels in the system, the summary report could also indicate the completeness of the report. For example, the report may indicate that 100 reports were expected, but only 92 were received. Knowing this, a manager at the next higher level can determine how well facilities are reporting and make mathematical adjustments for missing data.

❒ *How do summary reports move?*

They move up the pipeline from the service delivery points to the central level. Depending on where reports are aggregated, reports from SDPs may move all the way to the central level or may be kept at the level at which they were aggregated. Where appropriate, it is possible to skip reporting to intermediate levels and report directly to higher levels. This has the effect of shortening the *lead time* for reporting.

Errors in Aggregation

When aggregating data, you can easily report the wrong information, unless the procedures for aggregation are clear. It is important that staff at all levels understand which "stock on hand" should be reported (that of the reporting facility only, that of the reporting facility and all lower-level facilities, or the aggregation of the lower levels only). If the wrong data are reported (such as *issues* instead of *dispensed to user*), the decisions made using that data will also be incorrect.

2.4.3 Feedback Reports

As we have discussed, program and logistics managers collect data to make decisions. When they receive data they know are incorrect, they need to communicate with the facility that sent the data. Managers can also use data they receive to congratulate facilities for moving toward program goals. To do this, managers can use feedback reports (see figure 2-14).

Feedback reports inform lower levels about their performance and, in some cases, provide information about reporting from other facilities. Feedback reports also inform managers at higher levels about how the system is functioning.

Feedback reports may help solve many problems. For example, when summary reports are self-balancing, it is easy to pinpoint errors in the individual reports. Feedback reports can include information about these errors and how to correct them. In addition, feedback reports let the person sending the report know his or her work has been received (and when it was received). Also, feedback reports may be used to motivate lower levels to turn in complete, error-free reports on time by reporting which sites are producing quality reports and which are not.

FIGURE 2-14. Feedback Report

MOH & HC Family Planning Program

Supply Status Report
Report Period: 2nd Quarter, 1998
All Facility Types
Condom – 52mm

Contraceptives

	Type	Receipts	Issued/ Dispensed	Closing Balance	Current MOS	Average Monthly Consumption
Karak Health Directorate	**Health Directorate**	**10**	**10,312**	**5,164**	**12**	**5,293**
Dispensing To:						
Adar	Health Center	0	184	98	1.6	61
Al-Adnaniyah	Health Center	126	203	31	0.5	68
Al-Gwayyer	Health Center	0	80	108	5.4	20
Al-Iraq	Health Center	240	360	80	0.6	127
Al-Jad'a	Health Center	0	128	20	0.5	43
Al-Jadidah	Health Center	449	364	98	0.8	121
Al-Karak Al-Riyadi	Health Center	1,874	3,708	1,408	1.1	1,258
Al-Karak Al-Tadribi	Health Center	2,228	1,848	708	1.1	618
Al-Marj	Health Center	0	152		0.0	71
Al-Qasr	Health Center	0	140	196	4.2	47
Al-Qatraneh	Health Center	207	120	120	3.0	40
Al-Rabbeh	Health Center	336	220	160	2.2	73
Al-Shahabiyah	Health Center	6	80	14	0.5	27
Al-Sumakiyeh	Health Center	0	40	190	14.6	13
Al-Taybeh (KARAK)	Health Center	196	200	168	2.8	67
Al Thanya	Health Center	114	100	114	3.5	33
Al Yarqot	Health Center	240	200	40	0.6	67
Amr'a	Health Center	0	60	112	5.6	20
Ay	Health Center	1,000	860	300	1.0	287
Batir	Health Center	144	20	129	18.4	7
Faqoa	Health Center	0	100	41	1.2	33
Ghor Al-Mazi'ah	Health Center	68	220	28	0.4	73
Ghor Al-Safi	Health Center	1,012	1,132	222	0.6	377
Kathrabbah	Health Center	160	140	128	2.7	47
Majra	Health Center	0	40	148	11.4	13
Manshiyeh Abu-Hammoo	Health Center	1,308	984	384	1.2	321
Moa'b	Health Center	258	398	156	1.2	133
Mohye	Health Center	100	60	100	5.0	20
Mu'ta	Health Center	1,126	990	180	0.6	330
Rakin	Health Center	17	380	108	0.9	127

SAMPLE DATA

Higher-level managers can use feedback reports to gauge how well the system is functioning. For example, a feedback report might list the locations that are stocked out or overstocked, percentages of those reporting at each level, or quantities of losses and adjustments by level. Feedback reports can also focus on a single facility or product. Having this information enables a manager to make informed logistics decisions.

Preparing feedback reports is easiest when the LMIS is automated. Computers quickly calculate mathematical errors and highlight missed deadlines; list the percentage of expected reports received; and search for data averages, highs, and lows. Feedback reports are essential for manual systems, too, but the time and effort needed to process and prepare reports by hand may be great. All logistics systems should be designed with feedback mechanisms.

What If Data Are Missing?

One of the most difficult problems logistics managers face is deciding what to do when facilities do not report. Should you send the report in late? Should you send in your report with only available data? Should you substitute other data for the missing information? Any of these responses may be appropriate. Each program may have a different procedure for handling missing data. Most important, all managers must know what procedure to follow, and they should follow the same procedure consistently. Well-designed summary reports include the number of expected reports and the number of reports received, enabling higher-level managers to calculate the percentage reporting. All managers should, of course, encourage the reporting facilities to report all data on time. The supervisor should contact any facility that does not comply as soon as possible and offer assistance.

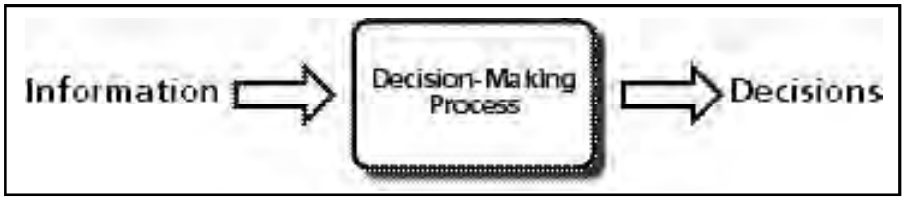
2.5 Key Concept: Data for Decision Making

Now that we have discussed LMISs, it is appropriate to discuss the key concept of using *data for decision making*.

At the most fundamental level, the decision-making process can be viewed as a *black box*, into which information flows and out of which decisions emerge. Although figure 2-15 is a simplistic view of what logistics managers actually do, it illustrates some important points that are frequently overlooked in LMIS development.

- ❒ If you are interested in decisions of any type, you must understand the decision-making process.
- ❒ To improve decisions, you could improve the information flowing into *the box* or improve the process within the box. These are two different types of activities; in most cases, to have any effect on decisions, the two must be done at the same time.
- ❒ It is not possible to define *better information* without understanding both the decisions being made and the decision-making process. This is the most important principle of LMIS development: to design a relevant, useful system, you must first consider what decisions are being made and, second, how they are made. Only with this understanding can you say what information is needed and how to collect it. Information systems fail most frequently because the information they collect is not useful in decision making.

FIGURE 2-15. Decision-Making Process



2.6 Chapter Summary

In this chapter you learned the following:

1. The purpose of a logistics management information system is to collect data on which to base decisions.
2. The essential data needed for logistics management are—

- ❒ **STOCK ON HAND.** Quantities of usable stock available at all levels of the system. Do not count any items that are unusable. These should be considered losses to the system.
- ❒ **RATE OF CONSUMPTION.** The average quantity of a particular item dispensed to users during a particular time period.
- ❒ **LOSSES AND ADJUSTMENTS.** Losses are the quantity of stock removed from the pipeline for any reason other than consumption by clients (e.g., losses, expiration, theft, damage, etc.). Adjustments include quantities issued to or received from other facilities at the same level. Adjustments may also be administrative changes, such as a physical count that discovers a different amount from the quantity listed on the bin cards. Remember: Adjustments may be either positive or negative changes to stock.

3. The three types of logistics records and the data they must contain are—

- ❒ **STOCKKEEPING RECORDS.** Used to record information about items in storage. At a minimum, stockkeeping records must contain the quantity of stock on hand and the quantity of losses and adjustments.
- ❒ **TRANSACTION RECORDS.** Used to record information about the movement of stock from one storage facility to another. Transaction records need not include any essential data items.
- ❒ **CONSUMPTION RECORDS.** Used to record the quantity of each item dispensed to clients.

4. Reporting processes the essential data into a format useful for decision making.

5. Summary reports must contain all essential data items—stock on hand, consumption, and losses and adjustments. Report types include simple reports, aggregate reports, and report and request reports.
6. Feedback reports are used to inform lower levels about their performance and, in some cases, to provide additional information about reporting from other facilities. Feedback reports also inform managers at higher levels about how well the system is functioning.

3 | Assessing Stock Status

Objectives

In this chapter, you will learn the following:

- ❒ The purpose of assessing stock status
- ❒ The data needed to assess stock status
- ❒ The general formula for assessing stock status
- ❒ How to analyze consumption data for trends
- ❒ How to determine the months of stock available at any level, if given inventory and dispensed to user data.

3.1 Purpose of Assessing Stock Status

You probably already understand the principles of assessing stock status. A simple example from daily life will demonstrate that you probably assess stock status regularly.

How often have you prepared rice and looked at the rice container to see how much rice remains? When you conclude that you have enough rice, too little rice, or more rice than you need, you have assessed the stock status.

Suppose you were asked to assess the stock status of a supply of aspirin in a clinic. Assume you found 100 aspirin tablets. With this information, can you tell if the clinic has too much aspirin? Too little? Just enough?

What you really want to know is not, "How much aspirin does the nurse have?" but, "How long will the nurse's supply of aspirin last?" When you answer this question, you are describing why you assess stock status.

> *The purpose of assessing stock status is to determine how long supplies will last.*

If you know that the clinic dispenses about 25 aspirin tablets a month, it is possible to determine that the aspirin supply will last about four months from the following simple formula:

How much we have of a certain product ÷
How much we use during a given period = How long that product will last

or, in this case,

100 tablets on hand ÷ 25 tablets used per month = 4-month supply of tablets.

You have just assessed stock status.

Assessing stock status is a management function. Stock status assessments are usually not written in reports, nor are the number of months of stock on hand recorded on a stock card. Stock is assessed to make a decision about how long stock will last. To assess stock status, you need to know how much of each item is on hand, but you also need to determine how long the supply of each item will last. Depending on your inventory control system, your assessment will cause you to place an order or, in some cases, place an emergency order. If your assessment tells you that no order is needed, you can return to your other duties confident that your supplies will last until your next order.

3.2 How to Assess Stock Status

Our formula for assessing stock status can be expressed in terms more familiar to logisticians. The *amount we have* is the same as *stock on hand*. The *amount we use* is the same as *rate of consumption*. Because stock assessment is measured in terms of *months of supply* (a convenient measure because data are often collected on a monthly basis at the SDP level), the *average monthly consumption* (AMC) is a more accurate way of describing the rate of consumption. By substituting more familiar terms, the equation becomes—

Stock on hand ÷ Average monthly consumption = Months of stock on hand

Stock on hand and average monthly consumption, therefore, are the data items we need to assess stock status.

Why Is Assessing Stock Status Imperative?

When you assess stock status, time is an essential factor. In the aspirin example above, it would have been an entirely different situation if the nurse had dispensed 100 aspirin tablets *per week* and would not have been resupplied for another *month.* You may think that 100 aspirin tablets seems like a lot for a clinic or hospital. On the other hand, if you work with or in a large warehouse, 100 aspirin tablets seems like very few, making the supply extremely understocked. It is important, therefore, to ask how long supplies will last.

In logistics management, your job is to turn data and numbers into information that can be used to determine if you have enough stock to last until the next order is received and available for dispensing or issuing.

3.2.1 Stock on Hand

To calculate the months of stock on hand, you need to know the quantity of stock on hand. You can find stock on hand data in your stockkeeping records (inventory control card, bin card, or stores ledger). The most accurate source is a physical inventory.

Physical inventories are discussed in chapter 5.

> *A physical inventory is the process of counting by hand the total number of units of each commodity in your store or health facility at any given time.*

3.2.2 Average Monthly Consumption

In addition to knowing the stock on hand, you also need to know the average monthly consumption. The AMC can be determined from consumption data. It can only be found in one place—consumption records (daily activity registers or tick sheets). Because usage rates fluctuate—sometimes greatly—from month to month, you should use an average of several months' consumption, rather than data from one month only. To calculate the average monthly consumption, you should derive a simple average by finding the sum of a set of monthly consumption numbers and dividing the total by the number of months used.

Decimal Dilemma

When you calculate the AMC, there will probably be a decimal in your answer. Because you cannot distribute a portion of a cycle, you should round off the number using normal math rules. For 0.4 or less, round down to the nearest whole unit, and for 0.5 or more, round up to the nearest whole unit. Because you are rounding for individual units (not boxes or cartons), a difference of one unit will not affect your calculations for supplies significantly.

When determining the AMC, you should analyze data for the most recent six months. For example, imagine that during the last six months the number of cycles of Lo-Femenal dispensed each month in a clinic was as follows:

January	1,184
February	1,210
March	1,060
April	1,250
May	1,361
June	1,252
Total	7,317

The average monthly consumption, then, is—

7,317 (total number of cycles) ÷ 6 (six months of data) = 1,219.5 or 1,220 (cycles per month AMC)

3.2.3 Putting the Formula to Use

Using the data from above, if the stock on hand for pills is 3,000, and we have calculated the AMC for pills to be 1,220 cycles/month, we have the data to assess stock status. Our formula is—

Stock on hand ÷ AMC = Months of supply

and the calculation is—

3,000 cycles ÷ 1,220 cycles/month = 2.46 or 2.5 months of stock on hand

The answer you obtained means that, based on past usage, you should have enough pills on hand for the next 2.5 months. If you think back to why we assess supply status, you will remember why this calculation is important. If you received a report that stated that 3,000 pills were in a warehouse, you might assume that this quantity is more than enough for several months. The reality is that, given the current rate of consumption, the stock will last only for 2.5 months. If new stock is not received before 2.5 months have passed, the facility is at risk of a stockout and, ultimately, customers will not be served.

Decimal Dilemma

When you calculate months of supply, you will usually have a decimal. If one month is 1.0, 0.25 months is equal to approximately one week. Depending on the lead time, a one-week difference could be crucial to obtaining supplies and avoiding a potential stockout. Therefore, we do not want to round to the nearest whole month. Teaching staff to round to 0.25, 0.50, or 0.75 may be too confusing, so when assessing stock status, round to the nearest tenth of a month, or one decimal place. For example, 3.36 months becomes 3.4 months.

3.3 Analyzing Data for Trends

Now that you have seen the calculations for assessing stock status, your next step is a more detailed analysis of the numbers used in the formula. As you analyze six months of usage data, you may notice that a product's usage is increasing or decreasing steadily (see figure 3-1). What does this mean for your stock assessment?

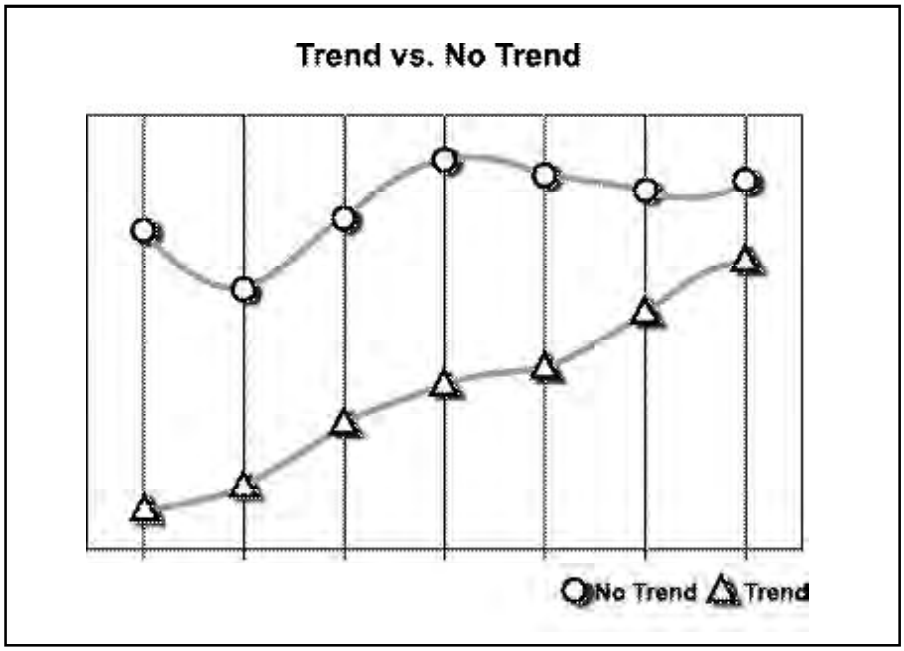


FIGURE 3-1. Trend Analysis

As usage steadily increases or decreases, the months of supply you calculate (based on six months of data) will begin to last for more or less time than you calculated. To respond to this situation, you could use sophisticated mathematical equations in data analysis—linear trends, exponential smoothing, and computer aids—to help project usage. Unfortunately, not all storekeepers have the tools or the time to spend calculating linear trends. The simplest alternative is to calculate the average monthly consumption (AMC) using the average of the last three months of data. These data are sufficient to make calculations and take into account a rising or falling trend.

Use a three-month average only when—

- *You notice a consistent trend, either rising or falling.*
- *The trend continues for the most recent six months or more.*

To use three months of data, you must analyze six months of data before deciding how much data to use. A dip in consumption in only one month of the six is enough to suggest that the trend is not consistent and, therefore, all six months of data should be used in your calculations. Where a consistently increasing or decreasing trend occurs, however, using the last three months of data is better, because it reflects more accurately how your consumption is changing.

Perhaps the best way to understand using trends is to look at a hypothetical example. Suppose you have the following data from clinic reports (see table 3-1):

TABLE 3-1. Hypothetical Clinic Report

Month	Lo-Femenal Consumption (cycles)	Condom Consumption (pieces)
January	1,884	935
February	1,410	997
March	1,760	1,032
April	1,150	1,293
May	1,283	1,567
June	1,352	1,772

If you look carefully, you will see that pill consumption shows no particular trend. You can conclude that, in future months, pill consumption will also vary. When you look at condom consumption, however, you can see a definite growth trend. You can conclude that, in the future, usage is likely to continue to increase. For pills, therefore, calculate the AMC using all six months of data, and only the most recent three months of data (April–June) for condoms.

Why is this recommended? Table 3-2 shows what happens when both six-month and three-month AMCs are used.

If you assume that 3,000 pills and 6,000 condoms are on hand, you would calculate the following, using six-month averages—

3,000 ÷ 1,473= 2.0 months of pills on hand
6,000 ÷ 1,266 = 4.7 months of condoms on hand

and, using three-month averages—

3,000 ÷ 1,262 = 2.4 months of pills on hand
6,000 ÷ 1,544 = 3.9 months of condoms on hand

Look at the different results for pills. The difference is 0.4 months of stock. If you had used only three months of data, you might believe that you have more than sufficient stock. If you use six months of data, you get a lower, more conservative estimate. To ensure that sufficient stock is available, you should use six months of data when no trend is present.

TABLE 3-2. Six-Month and Three-Month AMCs

	Pill Usage (cycles)		Condom Usage (pieces)	
Month	Six months	Three months	Six months	Three months
January	1,884		935	
February	1,410		997	
March	1,760		1,032	
April	1,150	1,150	1,293	1,293
May	1,283	1,283	1,567	1,567
June	1,352	1,352	1,771	1,772
Total	8,839	3,785	7,595	4,632
AMC (6)	8,839/6 = 1,473.2 or 1,473		7,595/6 =1,266	
AMC (3)	3,785/3 = 1,261.7 or 1,262		4,632/3 =1,544	

When we look at condoms, however, there is nearly a one-month difference between the three-month and six-month assessments. If you use a six-month average, the rapidly increasing demand means you will run out of condoms almost a month earlier than expected. The effects can be devastating, especially if you will not be resupplied for two or three months. By using the last three months of data for condoms (because a clear trend exists), you can address the trend better. Table 3-3 summarizes how to calculate stock status.

3.4 When to Assess Stock Status

You should regularly assess the stock status of each item in your storeroom. As a supplies manager, how often you do this is your decision. We recommend that you consider assessing the stock status monthly for all items you store. Even if you only report or order quarterly, you should assess stock status more often to ensure that you are not at risk of a stockout.

If the number of items you store is large, you may not be able to assess the stock status for each item monthly. In such cases, consider a VEN analysis (vital, essential, nonessential), which categorizes products by medical need, and/or an ABC analysis, which categorizes products by cost. These techniques are described in chapter 5, which discusses storage.

TABLE 3-3. Calculating Months of Supply

Calculating Months of Supply			
Steps	Actions		Notes
1	Organize monthly dispensed to user data for the product in chronological sequence.		Gather only the most recent 6 months of data from consumption records or reports of consumption. If less than 6 months of data are available, use all the data available.
2	Review the most recent 6 months of data to determine if there is an increasing or decreasing trend.		Dispensed to user data must be increasing or decreasing consistently over the most recent 6-month period to be considered a trend.
	IF	THEN	
	There is no trend	Determine the **average monthly consumption** by 1. adding the 6 months of data, and 2. dividing the sum by 6.	
	There is an increasing or decreasing trend	Determine the **average monthly consumption** by 1. adding the most recent 3 months of data, and 2. dividing the sum by 3.	
3	Divide the stock on hand for the product by the average monthly consumption calculated in step 2 above.		The stock on hand may be found on inventory records, or reports of inventory, or determined by physical count.
4	Round the figure to one place after the decimal point using standard rounding rules.		Round numbers .05 and above to the next highest number one place after the decimal. Drop numbers .04 and below.

Frequent assessments of stock status are the best way to ensure that you are aware of the potential for stockouts. Simply looking up at a shelf and making a decision not based on consumption data could lead to stockouts and, consequently, the inability of service providers to provide good customer service.

Should You Adjust Data for Stockouts?

In gathering your stock on hand or consumption data, you may find that a stockout has occurred. In some cases, you may discover that facilities have been rationing supplies to avoid a stockout or have been hoarding supplies (gathering large quantities) to avoid future problems. It is tempting, in such cases, to try to adjust the consumption data for "what would have been" if stock had been available and dispensed normally.

We do not recommend that you attempt to adjust these data. If you know that a stockout, hoarding and rationing, or incorrect data reporting occurred in a particular month, disregard the data for that month and include data from earlier months when these events did not occur, until you have six months of data without such problems. You have a better chance of assessing stock correctly if you go back through the records than if you try to guess what might have happened in the incorrect months.

Keep notes on how you made your calculations. It is important to be able to repeat your stock status assessment and get the same answers if you are called on to demonstrate your decision-making process.

3.5 Stock Status Assessment at a Higher Level in the System

As a logistics or health program manager, you probably work in the capital city or a regional center, with various district, provincial, and clinic storerooms and warehouses spread out across the country. Despite the distances to these outlying facilities, it is important that you are able to assess the supply status at any level of your system.

3.5.1 Why You Might Want to Assess Stock Status at Any Level of the System

Assessing supply status at any level or even all levels can give you more than just a glimpse of stock status in your own warehouse. You could also know whether—

- ❒ The levels you supervise are overstocked.
- ❒ The levels you supervise are understocked, and additional shipments are needed.
- ❒ Any products will expire in storage before they reach the user.
- ❒ Some facilities have too much stock and others not enough.
- ❒ Supplies are reaching customers instead of sitting in warehouses.

Knowing the supply status at various levels of your pipeline can prevent such problems.

You should assess stock status at different levels as often as you receive reports on dispensed to user data. Typically, all reports do not come in at once. A district level may report monthly, whereas the central level may only have new data quarterly.

Substituting Issues Data for Consumption Data

You can substitute issues data for dispensed to user data when you assess stock status at higher levels, but that can be problematic. In a pull system, issues data should closely match dispensed to user data if the facilities are stocked properly (not too much or too little—see chapter 4 for more discussion on inventory control). Otherwise, issues data might reflect such practices as hoarding or rationing. Issues data in a push system may be less accurate, because the data frequently are compiled without the most current information; stock could have been issued without sufficient knowledge of actual consumption.

3.5.2 Gathering Consumption Data

When you assess stock status from higher levels, you should base average monthly consumption on actual dispensed to user data from the dispensing level (consumption data). These data can only come from SDPs. When complete dispensed to user data are not available, use one of the following techniques:

- ❒ Take dispensed to user data from previous reports.
- ❒ Adjust incomplete data to estimate complete reporting.
- ❒ Substitute issues data from the lowest possible level for dispensed data.

The last two techniques are discussed in the box on the next page.

Adjusting Consumption Data for Incomplete Reporting

At higher levels, getting complete (i.e., 100 percent) reports of consumption from SDPs may be challenging. Although many systems do collect all reports, it is unusual to have all SDPs reporting on time. When this is the case and you want to assess stock status, you can use the consumption data that are available and adjust them to account for the missing data.

To adjust the data, use the following formula—

Sum of all consumption reported ÷ percent of reports received = estimated total consumption

For example, if you receive eight of ten reports, you have 80 percent of the expected reports. If the sum of the consumption from those reports equals 100, the estimated total consumption would be—

100 ÷ 0.80 = 125

As in any stock status assessment, divide the estimated total consumption by the number of months of data used (following the guidelines discussed in section 3.3). This will give you an estimated AMC to use in the general formula for assessing stock status.

If you use this technique to estimate consumption, remember the following:

- Document how you made your adjustment.
- If reporting is very low, say below 70 percent, substitute issues data for consumption data (as described in the box on page 68).
- Not all clinics are equal. This basic technique assumes that consumption rates for the missing clinic are about the same as for the clinics that have reported. If clinics that have not reported are not like those that have reported (i.e., they are known to dispense much larger or smaller quantities to users), substitute issues data for consumption data (as described in the box on page 68).

3.5.3 Gathering Stock on Hand Data

When assessing stock on hand at the level above the SDP—for example, at the district level—you can use stock on hand data from one or more of the following three sources:

- District warehouse stock on hand.
- Aggregate (sum) of the stock on hand at all SDPs reporting to the district.
- Aggregate of the stock on hand for the district warehouse plus the SDPs reporting to the district.

The source you use depends on the question you want to answer.

If you use the stock on hand for the district warehouse only, you will assess only the supply status of the district warehouse. This tells you nothing about the SDP level, but does indicate how long the district warehouse stock will last.

If you use the SDP data only, you will know how long stocks will last at the service delivery level as a whole, but you will know nothing about the district warehouse, or about individual SDP stock levels.

If you aggregate the stock on hand of both SDPs and the district warehouse, you will assess the stock status of the entire district, but you will not be able to distinguish between stock in the district warehouse and stock in SDPs.

Whenever possible, you should try to use all three methods so you can review all three of the results—the district as a whole, the SDP level as a whole and separately, and the district warehouse itself. Some countries undertake special studies to assess stock status for every facility in the system at approximately the same time. Such a study produces a “snapshot” of stock status that can inform decision makers of changes that may need to be planned for the upcoming year.

Regardless of how often you assess stock status or what data sources you use, be sure to document how you calculated the months of supply. This may be important when you review your decisions.

Using Stock on Hand Data to Assess Stock at Higher Levels

The following example demonstrates four methods for assessing stock status at higher levels. Imagine you are the warehouse manager for a district with two clinics reporting to you. At the end of the month, you conduct a physical inventory of your warehouse and receive reports from both clinics. You find—

Facility	Stock on Hand	AMC	Months of Supply
Clinic 1	*100*	*200*	*0.5*
Clinic 2	*600*	*300*	*2.0*
District	*3 000*	*700 (issued)*	*4.3 (based on issues)*

Method 1: District Warehouse Only

Because the district has dispensed to user data, it can assess its stock status best by using the AMC data from both clinics. The calculation would be—

Facility	Stock on Hand	AMC	Months of Supply
District	3,000	500	6.0

If the regional supervisor assesses stock status using only these data, the potential stockout at the clinic level would be missed. The region would feel safe knowing that the district warehouse had enough stock to supply its clinics for another six months.

Method 2: Aggregate of Clinics Only

If the district reports only the aggregated clinic stock on hand to the region, the calculation would be—

Facility	Stock on Hand	AMC	Months of Supply
All Clinics	700	500	1.4

If the regional supervisor assesses stock status using only these data, the potential stockout at the clinic would be missed. The region, however, would feel somewhat concerned, knowing that, overall, the clinic level has sufficient stock to meet its needs, but will need to be restocked soon.

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Method 3: Aggregate of the District and Clinic

If the district reports all data aggregated, the calculation would be—

Facility	Stock on Hand	AMC	Months of Supply
All	4,200	500	8.4

If the regional supervisor assesses stock status using only these data, the potential stockout at the clinic would be missed. The region would know that sufficient supplies existed in the entire district, but could not tell how they were distributed between the district and clinic levels.

Method 4: Disaggregated Data

In an ideal setting, the regional supervisor would receive all of the data for all facilities. This information could be used to pinpoint problems at all facilities at all levels. It may, however, be difficult to process the numerous monthly reports needed for so many facilities. Managers must understand what each method tells them and the strengths and weaknesses of each, and choose the method most appropriate to their program.

3.5.4 Understanding Your Assessment of Stock Status at Higher Levels

Figure 3-2 illustrates the reason for assessing stock status at higher levels. Stock on hand nationwide (the months of supply at all levels) appears relatively steady and high. However, if you assess the supply status of the central warehouse only, you might believe the stocks are depleting rapidly and more stock is urgently needed. The graph shows that this is not true; rather, stock is gradually being redistributed to lower levels in the pipeline. Understanding stock status at all levels, therefore, is important to managing a logistics pipeline.

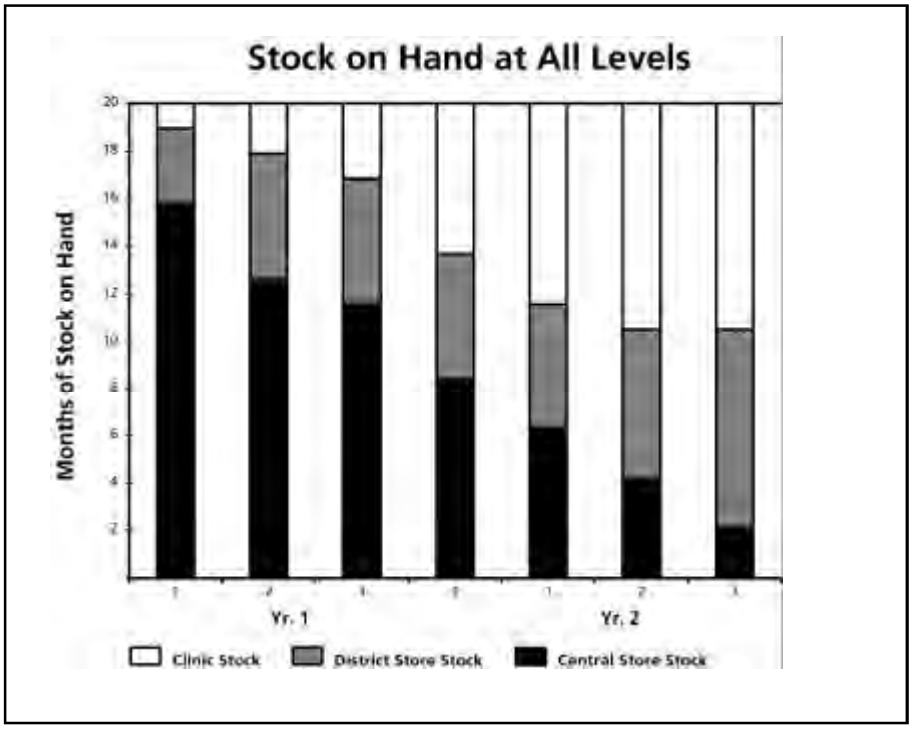


FIGURE 3-2. Assessment Graph

3.6 Key Concepts: Data for Decision Making and the Systems Approach

Assessing stock status is one example of the key concept of using data for decision making; an assessment is made, and appropriate action is taken. At higher levels, assessing stock status tells managers how stocks are moving through the system. Bottlenecks in the system are more readily identified, and action can be taken. Managers can also review stock status to see how well storekeepers are complying with keeping their appropriate levels of inventory.

Stock status assessment is also a good example of looking at data using a systems approach—that is, looking at how all elements of the logistics cycle work *together*. The quantity and quality of your data tell you how your LMIS is functioning. The stock balance at each level tells you where stock is in the pipeline and can identify potential expiration problems. The stock level tells you whether facilities are keeping the appropriate quantities on hand. Problems with stock levels may also indicate transportation problems, management problems due to hoarding or rationing practices, and a variety of other logistics difficulties. Thus, stock status assessment can tell you how your system is functioning.

3.7 Chapter Summary

In this chapter you learned the following:

1. You assess stock status to determine how long supplies will last.
2. Specific data—that is, stock on hand and rate of consumption—are needed to assess stock status.
3. The general formula for assessing stock status is as follows:

   Stock on hand ÷ Average monthly consumption = Months of supply on hand

4. To analyze consumption data for trends, use six months of data when calculating the average monthly consumption.
5. When you have at least six months of data, and a consistently increasing or decreasing trend emerges, use the last three months of data when calculating the AMC.
6. To determine the months of stock available at any level, given inventory and dispensed to user data, do the following:

- ❒ Apply the general formula using the stock on hand for the level you want to assess.
- ❒ For the AMC, use actual consumption data when possible, and use the lowest level of issues data available when consumption data are not available.

4 | Maximum-Minimum Inventory Control Systems

Objectives

In this chapter, you will learn the following:

- ❒ The purpose of an inventory control system
- ❒ Key terms in inventory control
- ❒ Details of three types of maximum-minimum inventory control systems and rules for storekeepers for each system
- ❒ How to determine order/issue quantities
- ❒ How to set maximum and minimum stock levels
- ❒ The advantages of using maximum-minimum inventory control
- ❒ How to select among the three system types.

4.1 Purpose of an Inventory Control System

Your home probably contains a number of inventory control systems. Consider the milk in your kitchen, for example, and think about the following questions:

- ❒ How much fresh milk do you keep in your house?
- ❒ How often do you buy milk?
- ❒ What is the lowest quantity of milk you want to have before you buy more?
- ❒ How much milk do you want to have at any one time?
- ❒ Do you consume milk on a regular, steady basis, or does your use fluctuate?
- ❒ How many people in your house consume milk? Does this change?
- ❒ Are there any financial or other constraints to your purchases of milk, such as limited available supply or limited transport?

Although you can use any other household item in this example, milk is a good one to compare with health products. Like milk, health products are staple goods—you do not want to run out of them, and each may have many uses. For example, milk may be used at breakfast time with coffee and throughout the day in cooking and baking. Likewise, antibiotics are used in a variety of treatments. Using milk as an example also demonstrates that simply having a great quantity of an item does not ensure that you will always have supplies; both milk and antibiotics spoil (or expire) after a time. Expiration is a major concern of inventory control.

Although you may not have a formal inventory control system for milk, when it comes to fuel in a vehicle, you do need a more formal system—in this case, a fuel gauge. The worst thing that can happen to a vehicle, and that you can prevent, is running out of fuel. Similarly, the worst thing that can happen in a clinic is to have a *stockout* (running out of stock). The best way to ensure that you do not run out of stock in a clinic is to establish an inventory control system.

An inventory control system informs the storekeeper when to order or issue, how much to order or issue, and how to maintain an appropriate stock level of all products to avoid shortages and oversupply.

A vehicle's fuel gauge helps you maintain your stock level. The maximum stock you can have is when the gauge reads *full,* and the minimum stock is when the gauge reads *empty*. While driving, you monitor your fuel consumption from time to time and decide when to purchase (order) more gas. By assessing the supply status of the tank, you can calculate when to order and how much, depending on your destination (and perhaps your budget). Some fuel gauges show a *red zone* that indicates that the gas tank is low. Drivers often use the red zone as an indicator of when to buy more fuel. In other cases, drivers replenish the tank on a specific day of the week, regardless of the level, adding enough fuel to reach *full*. In deciding on an approach, drivers are choosing a form of inventory control.

4.2 Key Inventory Control Terms

As we discuss inventory control systems, the following key terms are important:

- ❒ **MAXIMUM-MINIMUM INVENTORY CONTROL SYSTEM.** A maximum-minimum inventory control system is a system that ensures quantities in stock fall within an established range. Throughout this handbook, we use the term *max-min system* as an abbreviation for maximum-minimum inventory control system. Most successful inventory control systems are max-min systems of one type or another.
- ❒ **MAXIMUM STOCK LEVEL/MAXIMUM QUANTITY.** The maximum is the level of stock above which inventory levels should not rise under normal conditions. The maximum level is set as a number of months of stock (for example, the maximum level may be set at four months of stock). The maximum level can be converted to the maximum quantity (for example, the maximum quantity is 120,000 units), but the maximum level is a more useful term because it indicates how long supplies will last. The maximum stock level is fixed, whereas the quantity varies as consumption changes. In this handbook, *max* is the abbreviation for maximum level.
- ❒ **MINIMUM STOCK LEVEL/MINIMUM QUANTITY.** The minimum stock level is the level of stock at which actions to replenish inventory should occur under normal conditions. As with the maximum, the minimum can be expressed as a level (for example, the *minimum level* is one month of stock) or as a quantity (for example, the *minimum quantity* is 30,000 units). The minimum stock level is fixed, whereas the quantity varies as consumption changes. For this handbook, *min* is the abbreviation for minimum stock level. Depending on the design of the max-min system, reaching the min may be a trigger for placing an order (often

called the reorder level or reorder point). In some systems, reaching the min may be an indicator to monitor stocks carefully until the next order is placed or the emergency order point, defined below, is reached.

- ❒ **REVIEW PERIOD/REVIEW PERIOD STOCK.** The review period is the routine interval of time between assessments of stock levels to determine if an order should be placed. This term is also called an *order interval* or *resupply interval*, but review period is preferred, because, in some max-min systems, a review does not always result in an order being placed. Review period stock is the quantity of stock dispensed during the review period.
- ❒ **SAFETY STOCK LEVEL.** The safety stock level is the buffer, cushion, or reserve stock kept on hand to protect against stockouts caused by delayed deliveries, markedly increased demand, or other unexpected events. The safety stock level is expressed in number of months of supply. It may also be expressed as a quantity.
- ❒ **LEAD-TIME STOCK LEVEL.** The lead-time stock level is the level of stock used between the time new stock is ordered and when it is received and available for use. The lead-time stock level is expressed in number of months of supply. It may also be expressed as a quantity.
- ❒ **EMERGENCY ORDER POINT.** The emergency order point (EOP) is the level of stock that triggers an emergency order, regardless of the timing within the review period. The EOP is always lower than the min.

4.3 Three Types of Maximum-Minimum Inventory Control

Three forms or variations of max-min inventory control are applicable to health system logistics: forced ordering, continuous review, and standard max-min.

This section includes information needed to design an inventory control system (theoretical concepts) and how to use that system (operational concepts). We use the verb *set* to mean designing a max-min system, and *calculate* to mean routine implementation of the system. System designers *set* levels in a max-min system, and storekeepers *calculate* the quantities to be ordered.

4.3.1 Forced-Ordering Max-Min Systems

A very common max-min variation for health logistics systems that manage a relatively small number of products is the forced-ordering max-min system. To understand why it is used so commonly, we need to discuss the implementation and design of forced ordering. After gaining an understanding of how the system operates on a day-to-day basis, we move to how the system is designed.

Implementation

Good inventory control procedures are characterized by specific, unambiguous decision rules that storekeepers can follow in making orders.

RULES FOR ORDERING

In a forced-ordering system, the storekeeper decides when to order and how much to order based on the following decision rule:

In a forced-ordering max-min system, the storekeeper does not use the min at all, because he or she always takes action at the end of the review period. The review period, then, is the trigger for ordering.

> *At the end of each review period, review all stock levels and order enough stock to bring the levels up to the max.*

The storekeeper must be careful not run out of stock entirely, however; so, in addition to applying the decision rule for ordering, he or she is given an EOP (discussed later). The decision rules for a forced-ordering max-min should, also include the following:

Storekeepers know they have reached the EOP when they assess stock frequently. This is why, in systems that place orders quarterly, stock status should be assessed monthly. The results of a stock status assessment alert the storekeeper to the need to place an emergency order for any item that has reached the EOP.

> *Place an emergency order if the stock level for any item falls below the EOP before the end of the review period.*

HOW TO CALCULATE THE ORDER QUANTITY

To calculate the quantity to order, storekeepers must be able to convert stock levels (number of months of stock) into the actual quantities needed. A storekeeper cannot, for example, send an order to the central warehouse that asks for two months of stock of an item. The central warehouse would not know what *two months of stock* means.

Forced-Ordering System

Imagine a clinic in which the storekeeper is given a max of three months and an EOP of one month. The review period is monthly. If the average monthly consumption is 100 condoms/month, the max quantity would be 300 condoms, and the EOP would be 100 condoms. If the stock on hand at the end of the review period is 200 condoms, the order quantity is 100 condoms.

The storekeeper should use the following formula to calculate the quantity to order for each product:

Maximum stock quantity - Stock on hand - Quantity on order = Order quantity

—where—

Maximum stock quantity = Average monthly consumption x Maximum number of months of stock to be kept

It might be helpful to review two elements already defined in previous sections that appear in the above formula:

- ❒ **AVERAGE MONTHLY CONSUMPTION.** The average of the quantities used in either the most recent three or six months, as appropriate (see chapter 3 for a discussion of how to decide between three or six months of data).
- ❒ **QUANTITY ON ORDER.** This is the quantity of stock previously ordered but not yet received. In a well-functioning logistics system, this number is zero, because you should receive your previous order well before the end of the review period.

Table 4-1, a job aid, includes all the steps you need to determine reorder quantities using a forced-ordering max-min system.

TABLE 4-1. Determining Reorder Quantities

Determining Reorder Quantities Using Forced-Ordering Maximum-Minimum Inventory Control Procedures

STEPS	ACTIONS	NOTES	EXAMPLES
1	**Calculate average monthly quantity of a product consumed**	Total Quantity of Product Consumed in a Specific Number of Months ÷ Specific Number of Months = Average Monthly Consumption	Over the last 6 months the following quantities of Lo-Femenal were dispensed: September 316 cycles October 374 cycles November 349 cycles December 358 cycles January 390 cycles February 367 cycles 2,154 cycles consumed in last 6 months 2,154 cycles ÷ 6 months = 359 is average number of cycles consumed per month
2	**Calculate maximum quantity**	Average Monthly Quantity Consumed (for a specific product) x Maximum Months of Stock (for a specific product) = Maximum Quantity (for a specific product)	If the maximum stock level for Lo-Femenal is set at 6 months: 359 x 6 = 2,154 Maximum Stock Level for Lo-Femenal
3	**Calculate reorder quantity**	Maximum Quantity (for a specific product) − Quantity on hand − Quantity already on order = Quantity to reorder	If there are 718 cycles in stock, and nothing on order, 2,154 − 718 − 0 = 1,436 Quantity of Lo-Femenal to Order

Designing a Forced-Ordering System

To design a forced-ordering max-min system, you should set the max and min levels high enough to avoid stockouts, yet low enough so as not to increase the risk of expiration or damage. The balance will go below the min, but, ideally, it should never go below the emergency point. To achieve this performance, you must set a minimum level high enough to ensure that the facility never runs out of stock completely.

The goal is to avoid stockouts of essential products. Moreover, the system should ensure that emergency orders are rarely placed, because such orders are time-consuming and possibly expensive. However, you must still set the max low enough to ensure that space in the storeroom is adequate, and that the stock does not expire before it can be used.

HOW TO SET THE MIN

To begin your design, set the minimum level, which should approximately equal the stock level you want the facility to have at the end of a *normal* review period. Set the min high enough to account for the normal time needed to replenish stock and all other uncertainties in a system's operation. Take into account the following:

- ❒ Lead time is variable.
- ❒ You may see more customers than you expect, so you may need additional stock.
- ❒ Deliveries may be late.
- ❒ You may not receive everything you ordered.

Emergency Orders

An emergency order should be just that—an order placed only when a realistic possibility of stocking out exists. Emergency situations are not normal; rather, they are the exception. When a max-min system experiences frequent emergency orders, the system design and stock levels should be reviewed and probably reset.

A small number of emergency orders may occur, particularly in places where disease patterns vary widely, or when the onset of an epidemic cannot be predicted. A lack of communication between program managers and storekeepers can also result in emergency ordering. For example, a condom promotion campaign that is scheduled without notifying the storekeeper that additional supplies may be needed could result in an emergency order.

When an emergency order is placed, storekeepers usually should order a quantity adequate to reach the maximum level, not just enough to last until the next review period. This may not be possible in some situations. For example, if the emergency order is delivered by motorcycle, the quantity cannot be as large as for a regular delivery by truck.

Setting Review Periods in Forced-Ordering Max-Min Systems

This handbook has defined a review period as the normal interval of time between assessments of stock levels to determine if an order should be placed.

In many programs, the system designer cannot set the review period. It may be based on existing government review periods, or it may coincide with the reporting period, usually monthly or quarterly. Gathering data for a routine report is usually an excellent opportunity to assess the status of supplies and place an order.

Reporting periods may sometimes be more frequent than review periods. For example, a clinic may send reports in monthly, but only place orders quarterly. This is the case when it is difficult to resupply clinics more often, for example, due to transportation and road condition difficulties.

In designing a max-min system, it is often easiest to use reporting periods as the review periods. By linking reporting and ordering, logistics managers are more likely to receive the information needed for central-level decision making.

The formula for setting the min in a forced-ordering system is—

Min stock level = Lead-time stock level + Safety stock level

We discuss both the lead-time stock level and safety stock level in the following section.

SETTING THE LEAD-TIME STOCK LEVEL. Lead time is the time between when stock is ordered and when it is delivered and available for use. The lead-time stock level, therefore, is the number of months of stock used after an order is placed and before you receive the new order. The min clearly has to include the lead-time stock level, because you will need stock to distribute after you place an order and are waiting for it to come in. If it takes a month from the time you place an order until you receive and unpack your new stock, the min must be at least one month.

Because lead times are variable, accurately setting the lead-time stock level can be difficult. As a designer, you could set the lead-time stock level to equal the average of the lead time levels for the past two or three review periods for the average facility. Determining the average can be tricky. If you use the lead time for urban clinics last month, for example, to set the lead-time stock level for district-to-clinic deliveries, the level may not be appropriate for rural facilities. Instead, you should use an average for all facilities at the same level.

Consider, however, a system for which transport is not routinely available, or where weather conditions (e.g., a rainy season) make selected roads impassable (see figure 4-1). In such situations, the designer must use the longest lead time observed between the two least-reliable facilities, or at least some facilities will stockout. This will ensure that, under almost every conceivable situation, a stockout will not occur. But increasing the lead-time stock level increases the min and, ultimately, the length of the pipeline.

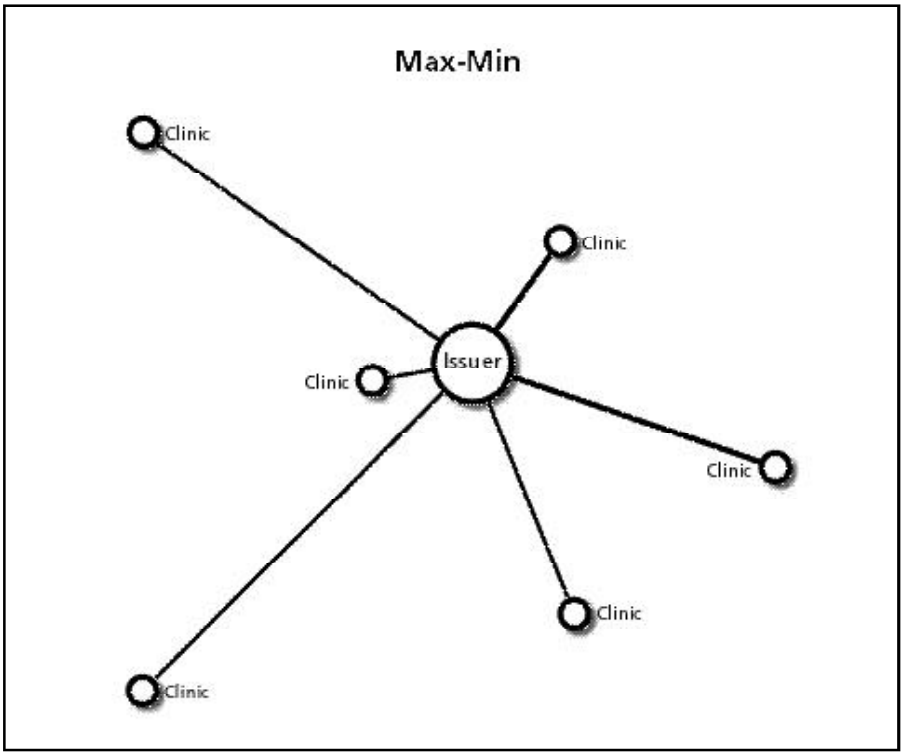
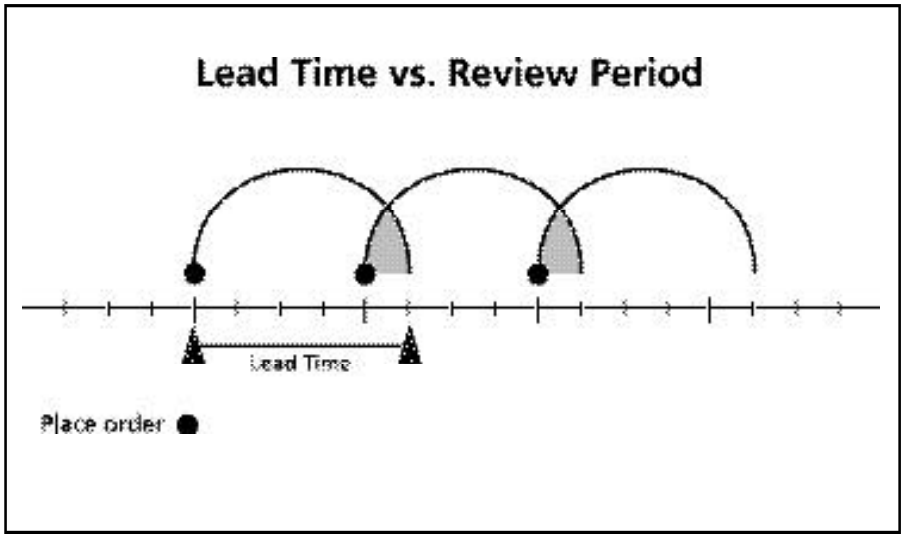


FIGURE 4-1. Clinic Locations May Vary Greatly in Distance from Issuer

Should Lead Time Ever Be Longer than the Review Period?

We recommend that the lead time always be shorter than the review period. Consider a system in which clinics order monthly, but supplies are not available for use until five weeks later. The result is that you place your next order before the first order arrives. Though the *order quantity* formula accounts f or an order that has not been received, it is difficult to count on outstanding orders arriving on time and in the full quantity expected. This situation adds unnecessary guesswork to the system (see figure 4-2).

FIGURE 4-2. Lead Time Longer than Review Period



SETTING THE SAFETY STOCK LEVEL. Safety stock accounts for the other uncertainties mentioned earlier. Other terms for safety stock include *security stock* or *buffer stock*. The safety stock level is one of the most important decisions the system designer must make. How should it be set?

Safety stock is the buffer, cushion, or reserve stock kept on hand to protect against stockouts caused by delayed deliveries or markedly increased demand.

As a general guideline, the safety stock should equal at least half of the review period stock.

Decimal Dilemma

When setting lead time or safety stock, your answer may include half or some other portion of a month. For example, when review periods are quarterly (every three months), the safety stock level is set to at least one and one-half months of stock. If the lead time is one month, therefore, the min will be two and one-half months. It is difficult to work with partial months, however, and difficult to teach storekeepers decision rules based on partial months.

The best solution is to add lead time and safety stock and then *round up to the next full month.* For example, if the average lead time is three weeks, and the safety stock level is four weeks, the min is one and three-fourths months. For ease of use, round this number up to two months. The additional stock is not likely to be enough to affect the overall system.

How much larger than half the review period stock should the safety stock be? Only the designer and personnel in the system assessing confidence in the system can determine this. Personnel must believe that the safety stock is sufficient to prevent a stockout, or they may begin to order more stock than they actually need. When demand is stable, and the logistics system functions well, the safety stock can be lower because there is less uncertainty. When demand is unstable, or the logistics system does not function well, the safety stock level should be set higher. In a new system, the designer should set the safety stock higher, monitor the system's performance, and lower the safety stock, if possible, as data on actual fluctuations in demand and supply become available. Remember, however, that setting a higher safety stock increases the quantities kept in stock, which, in small warehouses, may result in expired or damaged products.

DETERMINING THE MIN. After you decide on a lead-time stock level and a safety stock level, you set the min by adding these two elements together.

Remember, in a forced-ordering system, storekeepers do not need to know the min, nor are they concerned about what it is. All they need to do is bring the stock level up to the maximum at the end of the review period. Why, then, establish a min in a forced-ordering system? First, you, as the designer, determine the max based on the min, as described below. Also, the min is the stock level you would like the facility to have on hand at the end of a normal review period—that is, a review period when nothing special has gone wrong. It must be high enough to prevent stockouts when things do go wrong.

HOW TO SET THE MAX

Setting the max is relatively easy in a forced-ordering system. The formula for setting the max is—

Max stock level ³ Min stock level + Review period stock level

You set your min previously, and your review period is fixed (probably monthly or quarterly). Simply add the two to find the max. The *greater than or equal to* symbol (≥) indicates that it may make sense to set the maximum level higher than the sum of the min and review period stock level, when it is logically and economically sensible to deliver a larger quantity. For example, it may make economic sense to deliver an entire pallet of condoms rather than loose cartons.

Forced-Ordering System

To set the max and min for a hypothetical clinic in a forced-ordering system, begin by setting the min. If the lead time is known to be approximately one month, the min has to be at least one month. In addition, each year, the delivery truck is called on occasionally to take care of other duties, and the warehouse skips that month's delivery. The designer of the system needs to include a safety stock of about one month to account for skipped months. The min, therefore, would be 1 + 1 = 2 months (the sum of the lead time and safety stock).

If the clinic is instructed to order monthly, the max would be at least the min plus the review period—that is, greater than or equal to 3.

The min for the clinic would be 2, and the max would be greater than or equal to 3.

SETTING THE EMERGENCY ORDER POINT

As a system designer, you should set max and min levels high enough to avoid stockouts, yet low enough not to increase the risk of expiration or damage (if the warehouse is too full, the risk of damage increases). On rare occasions, however, a facility may find itself very low on stock before it is time to place a routine order. When stocks reach the EOP, the storekeeper should place an emergency order.

The EOP should not be set to equal the min, because the min includes the buffer stock. The EOP could be as high as the lead-time stock level if urgent orders take as long to process as a routine order. In most cases, however, it should be possible to issue stock faster than normal in urgent or emergency situations. This is called the *emergency lead time*. The EOP is defined as—

Emergency order point ³ Longest emergency lead time stock

The designer should set the EOP equal to or greater than the longest emergency lead time to avoid a mistake in timing the delivery of an emergency order.

ADVANTAGES AND DISADVANTAGES OF THE SYSTEM

A forced-ordering system has both advantages and disadvantages:

- ❒ The storekeeper's decision rule is simple: order every item at the end of the period.

CASE STUDY

Forced Ordering in Malawi

In Malawi, the logistics pipeline consists of a central warehouse, three regional warehouses, 24 district warehouses, and approximately 400 SDPs. Every month, district family planning coordinators determine how much of all seven contraceptive commodities should be allocated (pushed) to each SDP they supervise to bring them up to a three-month max. Quarterly, these same coordinators request (pull) all seven contraceptives up to a six-month max from the regional warehouses. As this example demonstrates, forced-ordering systems can be push or pull. Because districts pull all seven types of contraceptives from the regions and push them to the clinics, at the end of each review period regardless of how many units are in stock, it is a forced-ordering system.

- ❒ Because orders are placed at regular intervals (i.e., the end of each review period), transportation can be scheduled for specific times, making it easier to ensure the availability of transport resources.
- ❒ Because all items are ordered at the end of every review period, storekeepers do not need to assess stock status constantly, unless they believe there is potential for a stockout to occur.

One disadvantage of a forced-ordering system is that orders for some items may be for small quantities, because all items are ordered, regardless of the stock on hand.

A Variation: Forced-Ordering Delivery Truck System

One variation of a forced-ordering max-min system is the delivery truck system, sometimes called a *topping up* or *bread truck system*. The rules for the storekeeper and the considerations for the designer are the same as for a regular forced-ordering system.

The difference between a regular forced-ordering system and a delivery truck system is the way the deliveries are made. In a delivery truck system, a truck is loaded with supplies at the end of the review period. The truck and a delivery team travel to a single facility, assess the stock, and leave (top up) an amount of each product that is sufficient to bring stock levels up to the max at that location.

In more efficient delivery truck systems, the truck is loaded to capacity, and the delivery team *tops up* several facilities before returning to the higher level for additional supplies.

Delivery truck systems can be either pull or push systems. In the former, the truck arrives, and the storekeeper completes the report/transaction record and orders from the truck. In the latter, the supervisor on the truck calculates the quantity to be issued and issues it from the truck. The supervisor may or may not also complete the facility's report. In some cases, the supervisor and storekeeper complete the order form together. The difference for the designer is determining who is trained to complete the order form: many storekeepers or fewer supervisors/delivery team members.

ADVANTAGES AND DISADVANTAGES OF THIS SYSTEM

The delivery truck system has several advantages over regular forced ordering:

- ❒ The lead time is zero because the order is filled on the spot, lowering the lead-time stock to zero. This lowers the min and, consequently, the maximum stock levels.

- ❒ Damaged or expired products can be put back on the truck for disposal (if this is the procedure for handling these products), taking advantage of space on the truck.
- ❒ The truck can be sent out with a full load of supplies, eliminating multiple small orders.
- ❒ The LMIS report can be completed and collected at the time of delivery. This is especially advantageous when reporting is delayed because of poor mail service, or when reporting is spotty because facilities lack postage funds.
- ❒ If a supervisor goes along on the truck for deliveries, he or she can provide on-the-job training and supervision at the various stops. This is helpful when transport for supervision alone is difficult, and higher-level managers want to ensure routine supervision.

Forced-Ordering Delivery Truck System

The Philippines uses the delivery-truck variation of forced-ordering max-min systems. The Philippine system consists of a central level, provincial level, and SDPs (rural health units [RHU], hospitals, and NGOs). One hundred forty-seven delivery teams were created at the provincial level to make deliveries to 3,879 SDPs. The inventory control system was designed in part due to changes in the Philippine government, which transferred authority for managing supplies to the provinces. Provinces were trained to make deliveries to SDPs. *Delivery teams* of about three people each make quarterly deliveries to SDPs. Delivery team leaders complete the SDPs' monthly reports and determine the quantity to be issued. At this level, the Philippine system is a push delivery truck system.

The Philippine delivery truck system has proved quite effective in reducing stockouts. A 1991 survey of RHUs showed an 8 percent stockout rate for pills and a 52 percent stockout rate for condoms. By 1993 this had been reduced to 0 percent for pills and 1 percent for condoms. The reduction in stockouts can be credited not just to the delivery truck system, but also to training in systemwide inventory control procedures. This example demonstrates that introduction of inventory control systems can significantly affect the well-being of a family planning program. (Although data from the two surveys are not entirely compatible, the evident reduction in stockouts is still significant.)

The delivery truck system can also have certain disadvantages:

- ❒ If the truck breaks down, the whole system breaks down, so alternate transport for emergency orders must be available.
- ❒ A sufficient number of staff must be available in the office to complete logistics management and other duties while supervisors are away making deliveries.

4.3.2 Continuous Review Max-Min System

Of the three types of inventory control, continuous review max-min inventory control is probably the least appropriate for most health programs. But when it is appropriate, it can be very effective. To understand why, we discuss both the implementation and design of continuous review. Comparing continuous review with forced-ordering max-min systems shows how small variations in design can change the way an entire system functions.

Implementation

RULES FOR ORDERING

In a continuous review system, the storekeeper is told when to order and how much to order based on the following decision rule:

> *Review the stock level of each item every time an issue is made. If the stock level is at the min or has fallen below the min, order enough stock to bring the level up to the max.*

In a continuous review system—

- ❒ The review period is not fixed; a decision about whether to order is made each time a product is issued.
- ❒ The storekeeper must know both the maximum and minimum stock levels.
- ❒ The storekeeper does not need an emergency order point, because an order can be placed any time stock is needed.
- ❒ The storekeeper must assess stock status each time an issue is made. In a system with many items, this means that the storekeeper's workload increases: in a forced-ordering system, the storekeeper needs to assess stock status only when levels appear low enough to warrant an emergency order.
- ❒ The storekeeper must be able to order (pull) stock from the higher level, because the storekeeper is the only one who can assess stock

status every time an issue is made. A continuous review system must be a pull system.

HOW TO CALCULATE THE ORDER QUANTITY

The formula used to calculate the order quantity is—

Maximum stock quantity - Stock on hand - Quantity on order = Order quantity

—where—

Maximum stock quantity = AMC x Maximum number of months of stock to be kept

This is exactly the same formula used in a forced-ordering max-min system (see table 4-1, the job aid for calculating order quantity).

Designing a Continuous Review System

The goal in designing a continuous review max-min system is the same as for any inventory control system—to set the max and min levels high enough to avoid stockouts, yet low enough so as not to increase the risk of expiration or damage.

Continuous Review System

Imagine a clinic in which the storekeeper is given a max level of three months and a min level of two months. Average monthly consumption is 100. After issuing a quantity of condoms, the storekeeper notes that 200 are left, so he or she orders 100 condoms.

The formulas for setting the max and min in a continuous review system are the same as for a forced-ordering system. They are—

Min stock level = Lead-time stock level + Safety stock level

—and—

Max stock level ³ Minimum stock level + Review period stock level

You will note that a review period is included in the second formula, even though a continuous review system has no fixed review period as far as the storekeeper is concerned. As a designer, however, you want to set a review period about as often as you would like to have orders processed. For example, orders should not be placed as often as weekly, nor as infrequently as once a

year. As the designer, you should choose a desired review period to factor into the min. The desired review period is also used to help set the safety stock, if no better information is available.

ADVANTAGES AND DISADVANTAGES OF THIS SYSTEM

Continuous review inventory control has both advantages and disadvantages. Advantages include—

- ❒ The storekeeper's decision rule is simple.
- ❒ The system is more responsive and flexible, because orders can be placed at any time.
- ❒ Small orders are eliminated because stock levels are at the min when an order is placed.

Disadvantages of a continuous review system include—

- ❒ Transportation resources are harder to control, because orders may be placed at any time; a single facility may order pills one day, condoms the next, and intrauterine devices (IUD) the following week.
- ❒ In facilities with a large number of products or a great deal of activity, the storekeeper's job is harder because the stock status must be assessed every time stock is issued.

Continuous Review System

To set the max and min for a hypothetical clinic in a continuous review system, the designer begins by setting the min. If the lead time is known to be approximately one month, the min must be at least one month. If no other information is available to guide the designer in setting the safety stock level, the guideline is to use half of the review period stock. No review period is needed in a continuous review system. The designer of the system knows that central management would like the clinic level to order no more often than monthly, so the review period should be at least one month. If the review period is one month, half a month is adequate as the safety stock. Adding this to the lead time (min = lead time + safety stock) means a min of one and one-half months, which, rounded up, equals two months. If the min is two months and the expected review period is one month, the max will be at least three months.

The min for the clinic would, thus, be two, and the max would be three. These happen to be the same as the levels calculated in the forced-ordering example, but the rules for the storekeeper are different. Additionally, the system must be a pull system between the district and the clinic.

CASE STUDIES

Two Continuous Review Systems

Continuous review systems generally are not applicable where transportation is limited and government bureaucracy already requires fixed-interval reporting. Continuous review systems can work in some situations, however. The following are two examples:

GHANA. The Ghana Social Marketing Foundation (GSMF) sells contraceptives at low cost through private sector retailers. GSMF works with hundreds of private chemists, pharmacists, workplaces, and other outlets for contraceptive delivery. To get products to these diverse outlets, GSMF sells contraceptives at low cost to resellers, who, in turn, sell them to the outlets for a small profit. The outlets, then, sell the contraceptives to customers for a small profit. There is no fixed reordering system between the reseller and outlets. Chemists and others simply wait until they are *low* on stock, then call the reseller and ask for additional supplies. Although the outlets may not formally have a definition for *low* (for example, the min), if the product is selling, they will want to avoid a stockout, so they place an order. This is a good example of how the principles of continuous review can be applied, even though the GSMF system is not mathematically rigorous.

KENYA AND BANGLADESH. A second, more common example of continuous review is used for AIDS prevention in Kenya and Bangladesh. In both countries, condoms are placed in dispensers and the dispensers are hung on the wall. Condom customers who want to remain anonymous and yet need access to high-quality condoms can easily take strips of condoms from the dispenser without giving their name or waiting in a clinic line. The dispenser is checked often (i.e., the stock status is checked often), and when the supplies are low (i.e., reach min), the dispenser is filled up. This does not strictly follow the rules established in this handbook for continuous review, because the stock status is not checked after every issue, nor is the min an exact number; however, the condom dispenser is an example of continuous review at work.

A Variation: Two-Bin Continuous Review Systems

One variation of continuous review max-min systems is the two-bin system. In this case, the rules for the storekeeper and considerations for the designer are the same as for any other continuous review system.

The difference between a regular continuous review system and a two-bin system is the way the storekeeper determines when the min has been reached. In the two-bin system, the storekeeper has two equal-sized bins (containers, boxes, cartons, sacks, or other receptacles) of a product. When the first bin is empty, the min has been reached. An order is placed for another bin (i.e., a bin's worth of stock), and the storekeeper begins issuing from the remaining bin. The arrival of a new bin brings the stock level up to the max. The two-bin system is designed to be extremely simple for the provider. No calculations need be made, and paperwork is kept to a minimum. In an even simpler version of the two-bin system, an order form is included at the bottom of each bin, and the provider needs only sign and date the form before posting it.

A two-bin system designer's most challenging task is to choose an appropriate bin size. The min is equal to one bin, and the max is equal to two bins, but because the bin size is fixed, orders may come too frequently if demand increases. The bins must be designed to allow some expansion in the program without risking product expiration.

Two-Bin Continuous Review

Where transport is limited, two-bin continuous review systems generally are not used. They do, however, have enormous potential for community-based distribution (CBD) programs. CBD programs ask local community members (often volunteers) to train as community-based distribution agents (CBD agents). (CBD agents may provide condoms, pills, and vaginal foaming tablets, referring customers to local clinics for injectables, IUDs, and sterilization.)

Because CBD agents are often volunteers, family planning programs try not to overburden counseling and promotion activities with complicated forms and calculations. Two-bin continuous review systems are frequently appropriate in CBD work.

4.3.3 Standard Min-Max System

Theoretically, the standard version of the max-min system is the most effective, because it combines the decision rules of both forced ordering and continuous review and, therefore, shares the advantages of both. However, it also has disadvantages. Under some circumstances, the standard version may be the only choice. To understand why, we need to discuss both the implementation and design of standard max-min systems.

Implementation

Users of standard systems must follow more complex rules to make their orders.

RULES FOR ORDERING

In a standard system, the storekeeper is instructed when to order and how much to order based on the following decision rules:

In a standard system—

- ❒ The review period is fixed, and the stock level is fixed. This means that the storekeeper must know the min, max, and timing of the review period.
- ❒ The storekeeper will need an emergency order point to ensure that a stockout does not occur between review periods.
- ❒ The storekeeper must assess the stock status at the end of each review period and at any time levels appear low enough to warrant an emergency order.

Review all stock levels at the end of each review period. For products that are at or have fallen below the min, order enough stock to bring stock levels up to the max.

If the stock level for any item falls below the emergency order point before the end of the review period, place an emergency order.

HOW TO CALCULATE THE ORDER QUANTITY

The formula to calculate the order quantity is—

Maximum stock quantity - Stock on hand - Quantity on order = Order quantity

—where—

Maximum stock quantity = Average monthly consumption ´ Maximum number of months of stock to be kept

This is exactly the same as the formulas for a forced-ordering max-min system (see figure 4-1).

Designing a Standard System

To design a standard max-min system, our goal remains the same—to avoid stockouts and expiration by setting the max and min levels appropriately.

As a designer of a standard system, you will need to set the min and max levels, the emergency order point level, and the review period.

Standard System

Imagine a clinic in which a storekeeper is given a max level of three months, a min level of two months, and an emergency order point of one month. The review period is monthly. If the stock on hand at the end of the month is 200 condoms, and the average monthly consumption is 100, an order should be placed because the stock on hand is just at the min. The order quantity should be 100 condoms. If the stock on hand at the end of the month were 201 condoms, however, no order would be placed, because the stock level is not at the min. Routine orders are placed only when both of the following conditions are met: (a) it is the end of the review period, and (b) the stock level is at or has fallen below the min. An emergency order would be placed any time stock levels fall below the emergency order point.

In a standard system, the formula for setting the min is—

Min stock level = Lead-time stock level + Safety stock level

We have discussed setting the lead-time stock level in the section on forced ordering. For a standard system, however, the safety stock level must include more than a buffer against uncertainty, because it is possible that at the end of the review period, you may be barely above the min. In such cases you would not place an order, which means that no order would be made until the end of the next review period.

For a standard system, therefore—

Safety stock level = Buffer against uncertainty + Review period stock level

In other words, you must include an entire review period's worth of stock in the safety stock, in addition to the buffer against uncertainty, to ensure that you avoid a stockout.

The formula for setting the max in a standard system is the same as for a forced-ordering system:

Max stock level ³ Min stock level + Review period stock level

Standard System

To set the max and min for a hypothetical clinic in a standard system, begin by setting the min. If you know the lead time is about one month, the min must be at least one month. If the review period is monthly, and no additional information is available to guide you, the safety stock should include at least half a month's stock. In the standard system, however, you must add an additional review period's stock to prevent a stockout. The safety stock, therefore, must be at least one and one-half months. Add this to the lead time (lead time + safety stock = min), for a min of two and one-half months; round up to three months. If the min is three, and the review period is one, the max will be at least four.

The min for the clinic would be three, and the max would be four. The max and min levels are higher than either the forced-ordering or continuous review examples because of the size of the safety stock.

The review period stock level is added for the same reason as in forced ordering; the storekeeper must have enough stock to reach at least the next review period. Since the min stock level is higher due to the addition to safety stock, the max is higher, as well.

The formula for setting the EOP in a standard system is the same as for a forced-ordering system:

Longest emergency lead-time stock ³ Emergency order point

The EOP must be set in a standard system to ensure that no stockouts occur between review periods.

ADVANTAGES AND DISADVANTAGES OF THIS SYSTEM

A standard system has advantages and disadvantages. Advantages include—

- ❒ Small orders are eliminated because an order is placed only when stock levels are at or below the min.
- ❒ In programs with many products, standard systems eliminate the need to assess stock status continually (as in continuous review) and reduce the number of calculations that must be made because fewer products will be ordered than in forced ordering.
- ❒ In programs with many products, fewer items will be ordered, reducing confusion about which items are to be delivered to which locations.
- ❒ Because orders are placed at regular intervals (i.e., at the end of each review period), transportation can be scheduled for specific times, making it easier to ensure the availability of transport resources.

Disadvantages include—

- ❒ The primary disadvantage of a standard system is that buffer stock levels are high, increasing the likelihood of expiry and requiring more storage capacity, both of which also mean increased costs.
- ❒ Storekeepers must learn the max, min, and EOP; know how to assess stock status; and be able to calculate the order quantity. More training for the storekeepers may be required because their decision rules are more complex.

CASE STUDY

Nepal

In Nepal, the Ministry of Health distribution system consists of one central warehouse, five regional warehouses, 75 district warehouses, and more than 3,000 SDPs. During the mid-1990s, the MOH decided that delivery and logistics for more than 300 health products would be integrated. This meant that all items were to be ordered on the same order form, and orders would be delivered at the same time.

Because some facilities are extremely difficult to reach (some require walking for 14 days!), it was thought that delivery of small orders for all 300 products would be impossible. To avoid small orders, the standard max-min inventory control system was chosen.

A continuous review system was not possible. Unfortunately, the decision to implement a standard system has increased the storage space requirements due to higher safety stocks (and, therefore, higher min and max). Nonetheless, Nepal uses a standard system because it is the only practical system for a country in which a large number of items are managed and transportation is difficult.

4.4 Issues in Selecting and Using an Inventory Control System

Two issues arise when designers set up an inventory control system. First, how long should you allow the pipeline to be? Second, is it wise to vary the max-min levels or systems within the same level?

4.4.1 Analyzing Overall Pipeline Length

Setting max-min levels for each level of the system may result in a lengthy pipeline. For example, consider a situation in which the max-min levels are as depicted in table 4-2.

This analysis suggests that it may take as long as 30 months (two and one-half years) for a product to reach a customer after it has entered the country. Add to this the time from the manufacturer until the product has cleared the port and is placed in the central warehouse ready for distribution, and the product could easily be more than three years old by the time the customer receives it.

TABLE 4-2. Sample Max-Min Levels

Level	Min	Max
Central	6	12
Regional	5	9
District	3	6
SDP	2	3
Total	16	30

This is, of course, the maximum time a product might be kept in storage, yet it is possible. For essential drugs, a 30-month in-country pipeline is unacceptable, because some drugs have a shelf life as short as six months.

Solutions to this dilemma include—

- ❒ Shorten the review periods at one or more levels. This will reduce the pipeline length by reducing the max. (Remember that max ≥ min + review period) Shorter review periods, however, mean that orders are placed more often, increasing the frequency of delivery and, perhaps, requiring additional transportation. Additional labor in calculating order quantities will also be required.
- ❒ Reduce the lead time at one or more levels. Lead time is often extended by administrative requirements such as obtaining signatures and approvals. Reducing the lead time reduces the min and max levels.
- ❒ Improve reliability in the system so safety stock levels can be reduced. Safety stocks are kept primarily because of uncertainty about the system's ability to provide routine service. If uncertainty can be reduced, both min and max levels can be reduced. This is more easily said than done, however.
- ❒ Eliminate an entire level. Eliminating an entire level will result in a large resource savings and is probably the single most effective method for reducing the pipeline. For example, eliminating the regional level in this example immediately reduces the total pipeline length by nine months. An additional burden is placed on transportation from the central level to the districts, however, and the supervision burden of the central level is increased, as well. Politically, this may be a difficult proposal to implement. Government units, such as regions, may hesitate to yield control over valuable commodities; yet, where the pipeline is too long, eliminating a level may be the only appropriate solution.

CASE STUDY

Eliminating a System Level

To reduce storage space requirements, Malawi's MOH eliminated the central-level warehouse. Instead, the MOH ships new products immediately to each of three regional stores. The regional warehouse located in the nation's capital, Lilongwe, includes additional office staff, who serve the administrative role of central store managers. Elimination of the separate central store reduces the need for storage space and warehouse staff and shortens the pipeline.

To reduce administrative burden, Kenya's MOH eliminated the management function of the regional level. Each of five regional stores continues to hold supplies, but the central level, which uses the regional stores as satellites for its delivery-truck system, manages these supplies. By eliminating the administrative steps at the regional

4.4.2 Varying Max-Min Levels or Systems

Max-min systems could be implemented in a variety of ways. You might—

- ❒ Recommend using different types of max-min systems at different levels—for example, standard for central to district and forced ordering for district to clinics.
- ❒ Recommend using different max-min levels for different facilities at the same level—for example, a six-month max for rural clinics and a three-month max for urban clinics.

Such strategies, however, usually are not recommended because—

- ❒ Managers at the next level up (e.g., district level) find it extremely difficult to manage facilities with different rules, systems, and levels.
- ❒ Training for lower-level facilities is more complicated if the max level is six for some and three for others.

- ❒ Ordering forms work best when the formula for ordering can be printed on the form. With different max-min levels, this is difficult. (For example, column D may be column C × 3. If some facilities must multiply column C × 4, it is less effective to create a form that reads *C ´ max # of months*.)
- ❒ Usually little is gained from such variations. For example, setting the safety stock level for rural clinics higher than that for urban clinics results in higher min and max levels for rural clinics. Although this may seem advantageous, the lower safety stock level for urban clinics complicates the system unnecessarily, because urban clinics can handle the additional safety stock, and they often have better storage facilities.

An important exception to mixing systems is CBD programs, for which a two-bin continuous review system is recommended in most cases, because it is a relatively simple system and does not complicate inventory control procedures elsewhere in the system.

An often-recommended strategy is that some levels be push and others pull—for example, pull from central to district, push from district to clinics. In chapter 1, we suggested that facilities at the *same* level—for example, clinics—should not be both push and pull; however, *between* levels, different push and pull systems can be recommended where appropriate. Some logistics systems are designed to be pull from the center to the level above the delivery point, where the system changes to a push system. This allows service delivery staff to focus on serving customers, while staff at higher levels take responsibility for determining what quantity to issue.

Some extreme cases may necessitate mixing strategies. In Morocco, for example, a decision was made to differentiate among the provinces. Because the Moroccan system was decentralized, it was believed that large differences in provinces (e.g., urban and rural) meant that each province should determine the max-min levels for its own clinics. This meant sophisticated training for provincial staff, but the training was considered worthwhile because Morocco's 60-plus provinces vary so greatly. Although not recommended in most cases, this level of complexity is possible if it makes sense.

4.5 Selecting an Appropriate Max-Min System

To implement a max-min inventory control system, you must select from five choices, including—

- ❒ Forced-ordering
- ❒ Forced-ordering/delivery truck
- ❒ Continuous review
- ❒ Two-bin continuous review
- ❒ Standard.

Your selection is critical to the success of the logistics system. In addition to selecting a system, you need to set the max and min levels and determine whether each level should be a push or pull system.

The following factors should influence your decision on an appropriate max-min system:

- ❒ *The number of items managed by your program*

  More than any other factor, the number of items managed will influence your choice of an inventory control system.

  - For a system that manages only a few items (one or two), continuous review may be appropriate.
  - For a system that manages a large number of items (more than 100), however, a continuous review system would be difficult to manage without making transport impossible. A standard system works better, because the number of orders placed will be lower than for any other system, and the timing of the orders will be fixed. A forced-ordering system is usually impractical for a large number of items; many items would be ordered, and many of those orders would be for small quantities.
  - For a system that manages a small number of items (perhaps 1–20 items), a forced-ordering system is likely to be the most appropriate, because it is not difficult to calculate 20 order quantities. There is usually no particular advantage to using a standard

system for a small number of items, and as you have seen, stock levels are much higher in a standard system. A continuous review system would work for a small number of items, but only where reliable transportation is available and inexpensive.

- For a program managing many items (between 20 and 100), your selection depends on many factors, such as the quantity and quality of transport and storage, who is best equipped to make calculations, how well supervision is carried out, and other factors discussed below.

❒ *The quality and quantity of transport available*

Transport availability should be your second consideration in selecting a max-min system. If transport is always available, and the infrastructure (e.g., roads and bridges) good, a continuous review system may be feasible. When transport is limited, either a forced-ordering or standard system is best, because it is easier to make transport available for fixed and limited times (for example, negotiating in advance for trucks to be available the first two weeks of each quarter for central to regional deliveries). With limited delivery schedules, you may also be able to *piggyback* or share transport resources with other programs, such as delivering contraceptives and vaccines at the same time.

❒ *The level of training you want (or can afford) to implement*

Any max-min system will require some training at all levels of the service delivery system. The extent of the training, however, may determine the kind of system you implement. For example, at the clinic level you may want to keep service providers focused on service and not on extensive calculations and stock assessment. You may elect, therefore, to have a push system, either forced-ordering or standard. Consider, also, the number of people to be trained. If you have 75 districts and 5,000 SDPs, it is easier to train the 75 district staff to push supplies to the SDPs than to teach 5,000 SDPs to place their own orders.

❒ *The level of reporting you currently have or the level you expect*

In forced-ordering and standard systems, reports may come in regularly with orders; in continuous review systems, reporting may not be regular. Regular reporting can be used as a supervision tool: if a report is submitted on time, the facility tells you how it is doing. In a forced-ordering delivery truck system, you dramatically improve reporting rates from the level to which you are delivering, because

you collect the report during the delivery. Where reporting systems are poor (e.g., limited or slow postal service and/or having to rely on personal deliveries or expensive express package services), the delivery truck system helps improve reporting.

- *Whether a push or pull system is best*

  Your decisions about push versus pull help determine your choice of max-min systems. To implement a pull system, you need staff with the ability and motivation to make the appropriate calculations. At the service provider level, the system should be as simple as possible to keep providers working with customers rather than filling out forms and making calculations. If you decide to use a push system, you cannot choose continuous review. A push system will mean more extensive training for the upper level, because they have to do all the calculations for those they supervise, and they have to understand how to use the data they are receiving to do the calculations. In some systems, lower levels are expected to pick up supplies on a regular basis from higher levels. In such cases, the difference between push and pull is blurred, because the lower and higher levels may calculate the order together.

- *The level of supervision you expect*

  A delivery truck system helps reinforce supervision because the supervisor comes along with the supplies. This requires additional supervision resources, however, because supervisors must be out of the office for extended periods. Forced ordering also forces routine reporting, which allows supervisors to check math errors and changes in consumption. In a standard system, if no products are needed, a report might be skipped. The same is true in continuous review. It is difficult to supervise outlets that are not visited regularly and do not report regularly; absence of information should not be regarded as a positive sign.

- *The availability of storage space*

  A standard system requires the most storage space, because the buffer stock is higher. The lead time in the delivery truck system is zero, so the min will be lower, and will require less space. For two-bin continuous review systems, the designer must be careful when selecting the bin size and may need to create custom (and perhaps expensive) *bins* for storage. Forced-ordering and continuous review systems require similar amounts of storage space.

Choosing a System

Consider a distribution system with the following characteristics:

The service delivery system consists of one central warehouse, 50 districts, and 1,000 clinics.

- An additional 30,000 CBD agents report to the district level.
- Types of contraceptives are delivered in this system, along with some equipment.
- CBD agents handle only two products: condoms and vaginal foaming tablets.
- Training was conducted two years ago, but only for the central and district levels.
- Mail service is good, but transport is limited, as is the transport budget.
- Reporting from the district to the central level is good.
- Districts report aggregated clinic data in addition to a separate report for the district store, making it unclear what percentage of clinics are reporting regularly.

Given these factors, a forced-ordering system is the most appropriate. Such a system should be a push system from districts to clinics, because clinic staff are untrained and should focus on service delivery. The system could be pull or push from the central level to districts, but more of a pull system is probably better, given the large number of districts. Continuous review is inappropriate because transport is limited. A standard system would work, but its higher level of safety stock is not warranted because there are only two products. Each district has about 600 CBD agents. Therefore, the two-bin continuous review system would be most appropriate for the CBD level. Preferably, CBDs should report to clinics rather than to the district.

CASE STUDIES

Choosing a System

TANZANIA

Because of the limited number of products involved (five contraceptives), Tanzania's MOH decided to implement a forced-ordering system throughout its service delivery network, which consists of a central warehouse, 20 regions, 106 districts, and approximately 3,400 SDPs (including hospitals, health centers, and dispensaries). The Tanzanian government has started to decentralize decision making, so regions pull from the central warehouse. Likewise, districts pull from the regions. The original intent had been to have SDPs pull from districts, but the costs of training all SDP staff exceeded the available budget. It was decided, therefore, to make the system a push system from districts to SDPs. Tanzania uses a forced-ordering system because of the limited number of products involved.

KENYA

Kenya's MOH distribution system consists of a central warehouse, 5 regional depots, 30 districts, and more than 1,900 SDPs (including government clinics, NGOs, and private clinics, all of which receive supplies from government district facilities). The central level has an efficient, computerized LMIS and plenty of reliable transportation. Districts have little transport, so they cannot pick up supplies. In some cases, they have difficulty delivering supplies. Given these factors, Kenya uses a forced-ordering delivery truck system to deliver contraceptives and essential drug kits from the central level to districts. (Regional stores are used only for storage and do not have a management role in logistics.) The computerized LMIS helps the central level make the calculations for all districts; this is a push system. Truck drivers have been trained to act as supervisors during delivery visits, and they also collect forms for processing at the central level. SDPs pull supplies monthly from the district and, in some cases, receive supplies directly from the delivery truck.

The factors involved in selecting max-min systems are summarized in table 4-3:

TABLE 4-3. Factors Involved in Selecting Max-Min Systems

Factor	Forced-Ordering	Forced-Ordering Delivery Truck	Continuous Review	Two-Bin Continuous Review	Standard
Number of items	Few to a small number	Few to a small number	Few	Few	Many
Transport	Needed only at fixed times	Needed only at fixed times	Needed continously	Needed continously	Needed only at fixed times
Training	Staff at all levels must be well trained	Staff receiving supplies do not need as much training	Staff at all levels must be well trained	Staff receiving supplies need not be trained or have good literacy skills	Staff at all levels must be well trained
Reporting	Report required with each order helps improve data submission	Ensures that completed reports are actually picked up	May not receive reports often	May not receive reports often	If no items are needed, no report is submitted
Push or pull	Either	Either (usually push)	Must be pull	Must be pull	Either
Supervision	From reports only	Opportunity to include with delivery but requires more supervisors	From reports only; irregular	From reports only; irregular	From reports only
Storage	Neutral	Lead time is zero, so less room is needed	Neutral	Requires creating numerous "bins"	Extra room needed for additional buffer stock

4.6 Key Concept: Continuous Improvement

In designing a max-min system, you should plan to keep the system and all levels you have set in place for several full ordering cycles before making any modifications.

You will need to monitor lead times, stockout frequency, reporting levels, supervision, and other factors to understand how well your system is functioning. You may find improvements that can be made immediately, such as additional transport resources, additional on-the-job training, or increased supervision. As a system designer, you will always find ways to improve the system. Some solutions will be easy, such as providing additional LMIS forms to a district that has run out, and some will be more extensive, such as partnering with another program in a region where transportation is limited.

Management studies suggest that small, incremental improvements to a system may prove more effective than working with a defective system and waiting for the day when large-scale changes can be made. You should use all sources of information (reports, word of mouth, and others) to improve your system continually.

4.7 Chapter Summary

In this chapter you learned the following:

1. The purpose of an inventory control system is to inform the storekeeper (a) when to order and issue, (b) how much to order and issue, and (c) how to maintain an appropriate stock level of all products, avoiding shortages and oversupply.
2. Key terms in inventory control include the following:
   - ❒ Maximum-minimum inventory control system
   - ❒ Maximum stock level/maximum quantity
   - ❒ Minimum stock level/minimum quantity
   - ❒ Review period/review period stock, safety stock level
   - ❒ Lead-time stock level
   - ❒ Emergency order point.
3. The three types of maximum-minimum inventory control systems use different rules for storekeepers:
   - ❒ **FORCED ORDERING.** At the end of each review period, review all stock levels and order enough stock to bring stock levels up to the max.
   - ❒ **CONTINUOUS REVIEW.** Review the stock level for an item every time an issue is made. If the stock level is at or has fallen below the min, order enough stock to bring the level up to the max.
   - ❒ **STANDARD.** Review all stock levels at the end of each review period. For products that are at or have fallen below the min, order enough stock to bring stock levels up to the max.
4. How to determine order and supply quantities using any max-min system:

   Maximum stock quantity - Stock on hand - Quantity on order = Order quantity

   —where—

   Maximum stock quantity = Average monthly consumption (AMC) ´ Maximum number of months of stock to be kept

5. How to set the maximum and minimum stock levels:

Min stock level = Lead-time stock level + Safety stock level

Max stock level ³ Minimum stock level + Review period stock level

where, when no better information is available,

Safety stock level ³ ½ review period stock

for forced-ordering and continuous review systems and

Safety stock level = Buffer against uncertainty + Review period stock level

6. The advantages of using max-min inventory control include—

- ❒ Avoids overstocking.
- ❒ Avoids understocking and stockout.
- ❒ Minimizes wastage of product.
- ❒ Simplifies inventory control decision making.
- ❒ Consistency of stock levels aids in forecasting.
- ❒ Easier supervision in a system in which everyone uses the same decision rules.
- ❒ Easier training of storekeepers to follow one rule.
- ❒ Easier job for storekeepers with only one, relatively simple rule to follow.
- ❒ Increased confidence of storekeepers and service providers that stockouts will not occur, reducing the likelihood that some facilities will hoard (over order) supplies.

7. To help you select the appropriate max-min system, consider the following factors when you make your decision:

- ❒ Number of items managed by your program.
- ❒ Quality and quantity of transport available.
- ❒ Level of training you want (or can afford) to implement.
- ❒ Level of reporting you currently have or the level you expect.
- ❒ Whether a push or pull system is best.
- ❒ Level of supervision you expect.

5 | Contraceptive Storage

Objectives

In this chapter, you will learn the following:

- ❒ Guidelines for proper storage of contraceptives and other medicines
- ❒ A definition of visual inspection and how the inspections fit together
- ❒ When to conduct a visual inspection of contraceptives and other medicines
- ❒ How to identify and resolve common contraceptive quality problems found during a visual inspection
- ❒ How to calculate warehouse space requirements
- ❒ The purpose of a physical inventory and when to conduct a physical inventory of your warehouse.

5.1 Purpose of Storing Products

Storage is a basic part of warehousing. Warehousing and storage, however, are more than just shelving products. To have viable products available for distribution, a warehouse manager must ensure the quality of a product and its packaging. Excessive quantities of damaged and expired goods could mean that some products will not be available for customers.

All products require procedures for safe storage that maximize their shelf life and make them readily available for distribution.

> *Shelf life is the length of time a product may be stored without affecting its usability, safety, purity, or potency.*

All contraceptives and drugs have a shelf life. The manufacturer usually specifies shelf life, but it often must be approved by a national formulary and therapeutics board, as well. Contraceptives are relatively stable products with a shelf life of four to five years. Essential drugs have much more variation in shelf life, anywhere from six months to more than five years, depending on the drug. Contraceptives and essential drugs must be stored and distributed in a way that ensures they are received by customers in good condition and in time to be used before their expiration dates.

The following are some basic questions and answers on shelf life:

❒ *Where can I find the shelf life for contraceptives?*

The Family Planning Logistics Management (FPLM) project of John Snow, Inc., and the Program for Appropriate Technology in Health (PATH) have developed "Contraceptive Fact Sheets: A Tool for Logistics Advisors" with the latest shelf life information for condoms, oral contraceptives, IUDs, injectable contraceptives, implants, and spermicidal/vaginal barrier methods. The fact sheets also list—

- Description of the method
- Visual indicators of potential quality problems
- Special considerations
- Donor, manufacturer, and brand
- Primary and secondary packaging presentation
- Units per shipping carton
- Dimensions and weight of carton.

Everyone in the logistics system, from the central store to SDPs, should have access to shelf life information and other storage considerations for contraceptive products. (See the suggested reading list at the end of the handbook for information on how to obtain a copy of these contraceptive fact sheets.)

❒ *What is the shelf life in my country?*

Drug manufacturers in the United States are required by the U.S. Food and Drug Administration (FDA) to put their medicines and packaging through numerous tests to determine the appropriate shelf life. Many countries believe that U.S. standards are acceptable, and many national formulary and therapeutics boards accept these guidelines. In some countries, national policies are more restrictive than in the United States. For example, Bangladeshi officials recognized that their storage conditions (heat and humidity) are severe, so they have reduced the shelf life for condoms. In the Philippines, the government's drug regulatory authority requires its own testing for some products. Refer to your country's national formulary and therapeutics board or similar authority for the applicable policy.

❒ *Why does shelf life change?*

If you have worked in family planning for many years, you may have noticed that the shelf life for some products, notably Depo-Provera® and Copper T 380A IUDs supplied by USAID, has changed. The shelf life for Depo-Provera changed from 36 months to 48 months in 1997. The shelf life for IUDs changed from 60 months to 84 months in 1994. Testing for shelf life takes time and cannot be entirely simulated in a laboratory. The shelf life of Depo-Provera and IUDs (and their packaging) was extended when they were proven to maintain purity, potency, safety, and effectiveness for longer periods of time.

Due to a change in manufacturers and packaging, the shelf life for USAID-supplied condoms manufactured from 1998 on was reduced from five years to four years. To reestablish a five-year shelf life, both the manufacturer and USAID need to demonstrate that the product is viable for this length of time.

Shelf life depends on real-time testing, combined with simulated lab testing. When procuring supplies, purchasers should follow the example of USAID and specify the shelf life they require in their procurement documents. It may be necessary to work with the manufacturer to allow for real-life testing to ensure that the packaging and products are acceptable over time.

❒ *How important is the expiration date?*

After a product's shelf life has expired, its usability, purity, and/or potency may be adversely affected. For some medicines, the safety of the product is also affected after the expiration date. As a safety precaution, the expiration date should be considered the last date on which the customer should use the contraceptive or medicine. Staff should not dispense any products that are at or very close to their expiration dates.

5.2 Storage Procedures

Proper storage procedures can help ensure that only high-quality products are issued by a storage facility. When all levels of the pipeline follow these procedures, customers can be assured that the same high-quality product has been put in their hands. Warehouse managers can evaluate how well their warehouse is performing against these procedures and look for ways to improve storage quality.

Table 5-1 shows the storage procedures you should follow, regardless of your facility's size. You may need to adapt these rules to your facility, however. For example, it is unreasonable to expect a small clinic store to have more than a small closet for storing medical supplies. The use of pallets in such cases is inappropriate. Small shelves that keep products away from exterior walls and off the floor may be sufficient.

5.3 Visual Inspection

In a perfect pipeline, all products are stored under ideal temperature and humidity conditions and according to proper storage guidelines. In reality, the quality of storage conditions may vary widely from place to place. You may wonder about and want to verify the quality of some products. In a warehouse facility, storekeepers can best verify quality by regularly checking the condition of all products visually in their facility.

Visual inspection is the process of examining products and their packaging by eye to look for obvious problems with product quality.

TABLE 5-1. Storage Procedures

Storage Procedures	Why This Procedure Is Important
Clean and disinfect storeroom regularly.	Rodents and insects (e.g., termites and roaches) eat oral contraceptives and their packaging. If you clean and disinfect your storeroom (and keep food and drink out), pests are less attracted to storage areas. If possible, a regular schedule for extermination will also help eliminate pests. If rodents are a serious problem, cats may be an inexpensive, non-toxic alternative to traps or poisons.
Store supplies in a dry, well-lit, well-ventilated storeroom out of direct sunlight.	Extreme heat and exposure to direct sunlight can degrade contraceptives and essential drugs and dramatically shorten shelf life. If warehouse temperatures rise above 104 degrees fahrenheit (40°C), the latex in condoms, for example, can begin to break down. If exposed to heat for a long time, condoms may expire well before their stated shelf life. Although air conditioning is an ideal means of controlling the temperature, it is expensive; alternatives include ceiling fans and forced ventilation. Direct sunlight is also a danger, as it raises the temperature of a product. To avoid this, store products in their original shipping cartons and shade the interior of the storeroom from sunlight. At lower levels, store products in the inner boxes (that is, those that came inside the cartons) and leave medicines in their dark-colored or opaque bottles.
Secure storeroom from water penetration.	Water can destroy both supplies and their packaging. Even if a product itself is not damaged by water, damaged packaging makes the product unacceptable to the customer. Repair leaky roofs and windows. To avoid water damage from moisture that seeps through walls and floors, stack supplies off the floor on pallets at least 10 cm (4 in) high and 30 cm (1 ft) away from walls.
Ensure that fire safety equipment is available and accessible and that personnel are trained to use it.	Stopping a fire before it spreads can save thousands of dollars of supplies and the storage space itself. Have the right equipment available; water douses wood and paper fires, but will not work on electrical or chemical fires. Place appropriate, well-maintained fire extinguishers throughout the storage facility (especially near doors). If extinguishers are not available, use buckets of sand. No matter which method you use, train your staff in the use of the available fire safety equipment.
Store condoms and other latex products away from electric motors and fluorescent lights.	Latex products, such as condoms and gloves, can be damaged if they are directly exposed to flourescent lights and electric motors. Electric motors and flourescent lights create a chemical called ozone that can rapidly deteriorate condoms. Condoms and gloves stored in their proper packaging (i.e., boxes and cartons) will not be affected by limited exposure to ozone. Whenever possible, keep condoms and gloves in their paper boxes and cartons. If this is not possible, move them away from lights and motors.
Maintain cold storage, including a cold chain, for commodities that require it.	Cold storage, including the cold chain, is essential for maintaining the shelf life of drugs and vaccines that require it. These items are irreparably damaged if the cold chain is broken. If the electricity is unreliable, you may need to use bottled gas or kerosene-powered refrigeration. During immunization campaigns, cold boxes or insulated coolers may be sufficient for rapid transport.
Keep narcotics and other controlled substances in a locked place.	Narcotics and other controlled substances are dangerous when misused and may be stolen for sale on the black market. Like many other drugs, contraceptives can be sold on the black market. For this reason, stock managers should ensure that all stock movement is authorized. Limit access to the storeroom, and track the movement of products. To deter thieves, lock the storeroom and limit access to persons other than the storekeeper and assistants. Access must not, however, prevent appropriate distribution. For this reason, always have several sets of keys—one for the warehouse manager, one for the assistant, and a spare set in the office of the medical officer in charge. Additionally, by keeping inventory records up-to-date, managers can ensure that both incoming and outgoing stock matches documentation. Physical inventories should be conducted regularly to verify recorded amounts.

Storage Procedures	Why This Procedure Is Important
Store flammable products separately from other products. Take appropriate safety precautions.	Some medical procedures use flammable products. Bottled gas or kerosene powers refrigerators; alcohol is used in sterilization; and mineral spirits power Bunsen burners. Store these highly flammable products away from other products, and near a fire extinguisher.
Stack cartons at least 10 cm (4 in) off the floor, 30 cm (1 ft) away from the walls and other stacks, and not more than 2.5 m (8 ft) high.	Pallets keep products off the floor so they are less susceptible to pest, water, and dirt damage. By keeping pallets 30 cm (1 ft) away from the walls and from each other, you promote air circulation and facilitate the movement of stock, cleaning, and inspection. If storekeepers can walk around the stacks, they are more likely to be able to follow other good storage practices (sweeping, reading labels, and first-to-expire, first-out [FEFO]). For larger warehouses, pallets are frequently more efficient than shelving for storing products. Pallets reduce the amount of unpacking for storage and repacking for delivery, facilitate shipment in lot sizes, are cheaper to construct, and hold more stock for the space they occupy. Stack cartons not more that 2.5 m (8 ft) high, whether or not you use pallets. This is the highest that products can be stacked without crushing the cartons at the bottom. Stacking products at a stable height of less than 2.5 m reduces the possibility of injury to warehouse personnel. At lower levels, where pallets are inappropriate, shelving is an excellent way to store contraceptives. Metal shelving is preferred because wood shelving may attract termites.
Store medical supplies away from insecticides, chemicals, old files, office supplies, and other materials.	Exposure to insecticides and other chemicals may affect the shelf life of medical supplies. Old files and office supplies, although not a direct hazard, may get in the way and reduce space for medical supplies or make them less accessible. Keep medical supplies in a separate area to make them readily accessible.
Arrange cartons so that arrows point up. Ensure that identification labels, expiry dates, and manufacturing dates are clearly visible.	It is essential that goods that are the first to expire are also the first products issued (regardless of when they arrive at the storage facility). If shipping cartons do not show the manufacture or expiration dates, or if this information is difficult to read, use a marker to rewrite the dates on the cartons in large, easy-to-read letters and numbers. Items should always be stored according to the manufacturer's instructions on the carton. This includes paying attention to the direction of the arrows on the boxes; storing cartons upside down, for example, can affect the usability of Depo-Provera.
Store supplies in a manner accessible for FEFO, counting, and general management.	In addition to having visible expiration or manufacture dates, store products so that the first to expire are the easiest to reach. This will ensure that the first product to expire is the first out. Unfortunately, some warehouses base shipping on the date they received a product, rather than the manufacture or expiration date, often called *first-in, first-out* (FIFO). FIFO, a common practice, works well in most cases, but managing by expiration date (FEFO) ensures that the oldest products leave the warehouse first. You should confirm that FEFO is being followed every time you take a physical inventory. At the SDP, old stock should be moved or *rotated* to the front of the shelf, with new stock placed at the back of the shelf. By rotating stock so that the first stock to expire is the most accessible, staff can ensure that the first stock to be issued is the stock that is accessible. The goal is to get the product to the customer, not to have it expire on the shelves.
Separate and dispose of damaged or expired products immediately.	Shipping expired products down the pipeline is a costly mistake. Not only do clinics (or worse, customers) receive unusable products, but also money and resources are wasted in the shipping, storing, and handling of unusable products. To avoid this, designate a part of the warehouse for damaged and expired goods. If possible, quickly dispose of them. Check policies for destruction. Donors and governments usually have specific guidelines for disposing of damaged or expired products.

5.3.1 When to Conduct a Visual Inspection

To ensure the quality of the product in your warehouse and pipeline, conduct a visual inspection whenever the following events occur:

- ❒ You receive products from the manufacturer (usually occurs at the central level).
- ❒ Your warehouse or clinic receives supplies.
- ❒ You conduct a physical inventory.
- ❒ You receive complaints from lower levels or customers.
- ❒ Your supplies are about to expire.
- ❒ Your supplies show signs of damage.

5.3.2 What to Look for in a Visual Inspection

Products suffer two basic types of damage during shipping and storage: mechanical and chemical. Mechanical damage is caused by physical stresses, such as crushing or tearing when loading, off-loading, or stacking cartons or inner boxes. This kind of damage is usually limited to crushed or torn parts. Chemical damage is more difficult to detect and is usually not obvious during visual inspection. Laboratory testing is required.

Generally, mechanically damaged items are removed from stocks, and the balance of the box or carton is distributed as normal. Chemically damaged items should be removed from inventory, and all like items (i.e., from the same lot) should also be removed from inventory and destroyed.

Specifically, you should look for the common quality problems shown in table 5-2 and take the recommended action.

5.4 Storage Space Requirements

Proper storage includes the effective use of storage space. If too much space goes unused, a storeroom is underused and money is wasted. On the other hand, if products are crammed into too little space, they may be damaged because good storage procedures are harder to follow. Thus, warehouse managers must learn how to calculate the space needed to store incoming shipments and how to calculate overall storage requirements for the warehouse.

TABLE 5-2. Common Contraceptive Quality Problems

What to Look for	What to Do about It
Damage to packaging (tears, perforations, water or oil stains, or other damage) and products (such as broken or crumbled pills or tablets or torn packets of condoms or IUDs).	Discard any damaged items, and distribute the remainder as normal.
Cartons unlabeled with the date of manufacture or expiration on outer and inner packaging.	Ensure that lot number, manufacturer's name, and product storage requirements are recorded on bin cards and storage labels. If expiration dates are not visible, open outer carton and check dates on inner boxes. If expiration dates are not visible on inner boxes, check the individual units. Use a large marker to write the expiration date on unmarked boxes and cartons.
Oral contraceptives and spermicidal tablets: Changes in color of pills or crumbling under pressure of a finger. Condoms: Lubricant has dried or changed color and/or the condom is broken.	Check expiration date on cycle or carton. If expired, destroy according to established procedures. If within the shelf life, check to see if any storage history is available. If ideal conditions probably have been followed, remove any broken or crumbled cycles/tablets. Remove any dried out or discolored condoms and condoms with broken packaging. Destroy these as appropriate. Distribute remainder as normal.
Information on boxes or cartons is illegible.	Check inner boxes or products and write on outside of box; distribute normally. If information is illegible due to exposure to water or chemicals, throughly inspect product for damage. If you are unsure that no damage has occured, quarantine supplies for testing or destruction.
Dirty, torn, or otherwise damaged boxes.	Check the product visually for mechanical damage. Remove any damaged products, and destroy according to established procedures. Distribute the rest as normal.
Missing products or empty boxes.	This may indicate pilferage, removal by upper level, or removal by a donor for testing. Notify upper level of missing stock.
Contents not identified on multiple unit cartons.	Open box and check contents. If contents all have the same product and the same expiration date (and lot number, if possible), write information on outer box. If contents are mixed, separate and repackage according to product type, brand, expiration date, and lot number. Visually check for damage. Remove any damaged products and destroy according to established procedures. Distribute the rest as normal.
Water-damaged cartons.	Visually inspect all products. Remove any product that appears damaged or unacceptable. For condoms, if packaging is intact, distribute as normal. IUDs probably will need to be destroyed, as the package is susceptible to water and moisture damage. Distribute Depo-Provera as usual, if the vials are intact, labels are legible, and hypodermics are sealed (if not, hypodermics can be resterilized). Remove damaged pills and foaming tablets and destroy according to established procedures. Distribute Norplant if the packages are sealed and sterilize the insertion tool (trocar). In all cases, repack the products before distributing.
Products found outside the warehouse or clinic.	All such products will almost certainly have been affected by the elements. Any product left outside for almost any amount of time will probably be damaged from moisture, rain, direct sunlight, and/or pests and should be destroyed according to established procedures.
Cartons with holes and/or frayed edges.	Unlike torn or dirty cartons, holes or frayed edges may be the result not of handling, but rather pests. Check boxes for signs of termite damage and rats, which are attracted to pills. Inspect inner boxes and products for mechanical damage, remove any damaged products, and destroy them according to established procedures. Distribute the remainder as normal.

What about Laboratory Testing?

If you have questions about a contraceptive or other medication, laboratory testing may be the most appropriate way to verify product quality. But laboratory testing is expensive and time-consuming, and most countries do not have the facilities to carry out the appropriate tests.

If you need to conduct laboratory tests on a product whose quality is suspect, the entire *lot* or quantity of product manufactured under similar conditions must be quarantined, making it unavailable for distribution. A statistically significant random sample of the product must be removed and sent to a lab for testing. Test results will indicate whether the product should be distributed or destroyed. Given the cost of conducting the tests necessary to verify the quality of most contraceptives and medicines, as well as the cost of drawing and shipping samples, the size of the lot or cost of the product should be large enough to justify testing. In some cases it may be less expensive to destroy suspected product than to test it.

This is not to suggest that lab testing should never be conducted. When preparing procurement contracts, USAID and other donors require lab product testing prior to delivery to the donor warehouse or recipient. This *compliance testing* verifies that the characteristics specified during procurement have been met. Similar steps should be taken to ensure that products procured at the country level meet their specifications.

In either case, your calculations begin with the total number of units of the product you need to store. If you are calculating space for a single shipment, use the number of units in that shipment. If you are calculating space requirements for the entire quantity of a product that you need to be able to keep in your store, use the maximum quantity as calculated in chapter 4 (max stock level x AMC). If you are making a long-term plan for your storage needs, you must use the largest quantity you might need to store during the period of your plan—i.e., the max level times the largest AMC program planners have forecast.

In addition to knowing the total number of units to be stored, the storeroom manager needs to know—

- ❒ Number of units in a carton (exterior packaging)
- ❒ Size of the carton.

If you do not have this information, you should request it from the supplier or donor. (The packaging information is available for many contraceptive products in the contraceptive fact sheets mentioned in section 5.1.)

To calculate the amount of floor space needed to store any product, follow the steps below (also see table 5-3).

For example, to store 1,500,000 cycles of USAID-supplied Lo-Femenal:

- ❒ Divide by 1,200 cycles of Lo-Femenal per carton, which equals 1,250 cartons of Lo-Femenal.
- ❒ Multiply by 0.04 m^3 per carton of Lo-Femenal, which equals 50 m^3 of total volume.
- ❒ Divide by 2.5 m maximum carton stack height, which equals 20 sq. m of floor space.
- ❒ Multiply by 2 to allow 100 percent for handling space, which equals 40 sq. m of total floor space.

The square root of 40 sq. m is 6.33 m. But, because 8 x 5 = 40, you can also compute the area using basic math.

By calculating space requirements for future shipments, warehouse managers can determine whether adequate space exists to receive the shipment. If sufficient space is not available, warehouse managers should ask to receive the order in several small shipments, instead of one large one. However, large shipments are usually less expensive, and some donors may prefer to provide the entire forecasted need in a single shipment. Alternatives, such as renting additional space, may be considered when space is not available. When procurement contracts are set, it is always helpful to set the size of allowable shipments and include a shipping schedule in the contract. Knowing how to calculate storage space before shipments arrive can save a program time and money.

To use the formula to calculate the space needed in an entire warehouse, begin with the maximum quantity of product expected to be stored instead of the number of units expected. You will usually want to add extra room for office and loading dock space.

Table 5-3. How to Calculate Floor Space

Step	What This Tells You
1 Begin with the number of units expected for a single shipment. OR Begin with the maximum quantity of a product you expect to store if calculating overall storage requirements for the warehouse.	Most shipments are expressed in units. You need the number of units expected to tell you the total amount you should place in a stack.
2 Divide the number of units to be stored by the number of units in a carton.	This tells you the number of cartons. Sometimes, the shipping documents list the number of cartons in the shipment. In such cases, just skip this step.
3 Multiply the number of cartons by the volume of a carton.	You need to know the volume per carton. Obtain this information from the supplier or donor. The answer is the total volume of space needed to store the product, but it does not tell you the amount of floor space needed.
4 Divide the total volume by 2.5 m or 8 ft.	Whatever the volume of the cartons, you do not want to stack them higher than 2.5 m or 8 ft high. Divide the volume by the maximum height to determine the floor space needed to store the product.
5 Multiply the floor space needed to store the product by two.	Double the amount of floor space to allow for handling space, aisles, and other variables. This is the total amount of floor space needed. You can multiply by a number larger than 2 to allow more space in which to create a handling area for new or outgoing shipments. In very small facilities, where smaller quantities of product are kept, you may not need as much handling space, so you would multiply by a number smaller than 2.
6 Calculate the square root to get the dimensions of the total amount of floor space needed. You can also estimate the dimensions using your knowledge of mathematics.	The answer is the dimensions of the needed space, assuming the space is square. Of course, may storerooms are not square, For example, 36 sq. m is a square of 6 m x 6 m. It could also be an area of 9 m x 4 m.
7 Repeat these calculations for all products to determine the total amount of storage space you will need.	You can calculate steps 1–6 for each product separately to estimate the floor space needed for each product separately. If you only need to know the total space requirements for the store, follow steps 1–3 above for each product, then total all the volume requirements and perform steps 4–6 on this total.

5.5 Physical Inventory of Stock on Hand

Throughout this handbook, we have discussed how to find stock on hand information on stockkeeping records. But how do you know if the information recorded on the stock card is correct? The only way to be certain is to conduct a physical inventory.

As noted in chapter 3—

> *A physical inventory is the process of counting by hand the total number of units of each commodity in your store or health facility at any given time.*

While conducting the physical inventory, you should be sure to compare the quantities on hand with the quantities that have been entered in stockkeeping records (for example, inventory control cards). A physical inventory enables you to confirm how much stock you have and whether forms are being completed correctly.

> *The purpose of a physical inventory is to compare actual stock on hand for each commodity with the amount recorded on the stock card.*

A physical inventory is also an opportunity to inspect your products visually for quality assurance purposes, as described above.

The frequency of physical inventories may be governed by local regulations. You should conduct a physical inventory at least once a year. Depending on the level of the facility, you may want to conduct a physical inventory more often. At the clinic level, for example, you may want to conduct a physical inventory as often as once a month when completing a monthly report. If you find that the stockkeeping records do not match the actual stock, conduct physical inventories more often and take steps to improve recordkeeping.

When you conduct a physical inventory, remember that when boxes are sealed and the rules of proper storage are followed, only one box or carton is open at a time. A physical inventory, therefore, can be a quick, routine exercise, especially where good storage practices are followed.

One factor that may deter storekeepers from conducting a physical inventory is the large number of products in a warehouse or storeroom that must be counted. Some facilities are able to shut down for a few days each year to do a complete physical inventory, but in many situations this is not possible. In such cases, consider using *cycle counting*. In Bangladesh, for example, hundreds of different supplies are kept in large warehouses. Because of this, warehouse managers conduct a physical inventory of a few dozen items each month. By the end of the year, all items have been counted. When the new year starts, they begin the process again. By comparing the results from this cyclical physical inventory to the stockkeeping records, storekeepers can feel confident in the numbers recorded. Regular cycle counting can keep physical inventory up-to-date without disrupting store operations.

You might also reduce the workload by employing a vital, essential, or nonessential (VEN) or ABC analysis of your items, counting the most essential or most expensive items more often. A VEN analysis breaks down products as vital, essential, or nonessential, allowing you to assess stocks of vital items more often than nonessential items. An ABC analysis breaks down products into three categories based on value. As a logistician, you might use an ABC analysis based not on cost but on how often a receipt or issue is made. Antibiotics may be issued often from the warehouse, whereas x-ray equipment may be issued rarely. In this situation, you would want to count and assess antibiotic supplies more often.

As with assessing stock status, having many items to count need not be a barrier to conducting regular physical inventories or regular assessments of stock status.

5.6 Key Concept: Continuous Improvement

Storage spaces often need continuous improvement. Nonessential items are often stored *temporarily* in storage spaces in urgent situations, only to be forgotten later. Expired, damaged, or unusable products are often separated from other supplies, but may not be destroyed or sent up to higher levels for destruction as soon as is desirable. It is important that warehouse managers continuously examine the stocks in their warehouses to determine how to best use the space. Warehouse managers should ensure that FEFO is followed. Check to see that fire equipment is up-to-date, look for signs of pest infiltration, and eliminate any hazardous situations or conditions. By maintaining a continual watch on the storage space, managers can eliminate lengthy and time-consuming annual *revitalizations* or clean-up days, while maintaining the high quality of the products they handle.

5.7 Chapter Summary

In this chapter you learned the following:

1. Guidelines for proper storage of contraceptives and other medicines:

- ❒ Clean and disinfect storeroom regularly.
- ❒ Store supplies in a dry, well-lit, and well-ventilated storeroom, out of direct sunlight.
- ❒ Secure the storeroom from water penetration.
- ❒ Ensure that fire safety equipment is available and accessible, and that personnel are trained to use it.
- ❒ Store condoms and other latex products away from electric motors and fluorescent lights.
- ❒ Maintain cold storage, including a cold chain, for commodities that require it.
- ❒ Keep narcotics and other controlled substances in a locked place.
- ❒ Store flammable products separately using appropriate safety precautions.
- ❒ Stack cartons at least 10 cm (4 in) off the floor, 30 cm (1 ft) away from the walls and other stacks, and no more than 2.5 m (8 ft) high.
- ❒ Store medical supplies separately, away from insecticides, chemicals, old files, office supplies, and other materials.
- ❒ Arrange cartons so that arrows point up, and ensure that identification labels, expiry dates, and manufacturing dates are visible.
- ❒ Store supplies in a manner accessible for FEFO, counting, and general management.
- ❒ Separate and dispose of damaged or expired products without delay.

2. Visual inspection is the process of examining products and their packaging to look for obvious problems in product quality. To ensure the quality of the products in your warehouse and pipeline, conduct a visual inspection—

   - ❒ Every time you receive products from the manufacturer (usually occurs at the central level).
   - ❒ Every time your warehouse or clinic receives supplies.
   - ❒ When you conduct a physical inventory.
   - ❒ When you receive complaints from lower levels or customers.
   - ❒ When supplies are about to expire.
   - ❒ When supplies show signs of damage.

3. Typically, mechanically damaged items are removed from stocks, and the balance of the box or carton is distributed as usual. Chemically damaged items should be removed from the inventory and all like items (i.e., from the same lot) also should be removed from inventory and destroyed.

4. How to calculate warehouse space requirements:

   - ❒ Begin with the number of units.
   - ❒ Divide the number of units by the number of units in a carton.
   - ❒ Multiply the number of cartons by the volume of the carton.
   - ❒ Divide the total volume by 2.5 m or 8 ft.
   - ❒ Multiply the floor space needed to store the product by 2 or add 100 percent.
   - ❒ Using the square root function on a calculator, calculate the dimensions of the total amount of floor space needed.

5. The purpose of a physical inventory is to compare actual stock on hand for each commodity with the amount recorded on the stock card.

6 | Contraceptive Forecasting

Objectives

In this chapter, you will learn the following:

- ❒ The purpose of forecasting for family planning products
- ❒ The data sources for forecasting contraceptive use
- ❒ How forecasting for family planning contraceptives differs from forecasting for noncontraceptive products
- ❒ How forecasting for family planning contraceptives differs from forecasting for HIV/AIDS prevention
- ❒ The forecasting process outline.

6.1 Purpose of Forecasting

Forecasting, one of the most important activities at the central level of a service delivery system, is completed before procurement takes place. Forecasting is often done by logistics managers, management information systems (MIS) managers, demographic specialists, and program managers. Donors, other program managers involved in similar activities, and consultants may also be part of the process.

> *Forecasting is used to estimate the quantities of each product that a program will dispense to users for a specific period of time in the future.*

It is important for you to know that forecasting is not the same as routine ordering, which relies on the inventory control system to account for minor changes in consumption. In forecasting you must be able to project longer-term trends in usage and procure appropriately. Also, at the program level, the procurement process is lengthy (often more than a year) and generally inflexible (because it is usually contract-based), making it necessary to estimate long-term trends in consumption.

Forecasting is an essential activity because of its enormous impact on the entire logistics system's ability to fulfill all six rights (see chapter 1). In addition to projecting consumption, you need to consider how your forecast affects the following activities:

- ❒ **BUDGETING.** If you forecast usage correctly, can you afford to supply the full demand? What about transportation, storage, handling, personnel, and other costs associated with donated supplies?
- ❒ **PROCUREMENT PLANNING.** When should the product be manufactured, shipped, and delivered?
- ❒ **PIPELINE PLANNING.** What will be the level of stock on hand in the entire pipeline if the forecast is correct? Will there be enough safety stock in the system? Is your forecasted need constrained by your current pipeline—that is, your ability to transport and store at all levels of the system?
- ❒ **QUALITY ASSURANCE.** If you procure the full amount of products forecasted, will the products expire before they reach the customer?

- ❒ **PREVENTING SUPPLY IMBALANCES.** Does the forecast ensure that supplies will always be available? If you order the full amount forecasted now, will overstocking occur?

6.2 Sources of Data for Contraceptive Forecasts

We have emphasized that you should use consumption data from the service delivery level for decision making. In forecasting, however, it is necessary to use data from several different sources. The most relevant types of data are—

- ❒ **LOGISTICS DATA.** As noted in chapter 1, logistics data include dispensed to user data from the service delivery level. When dispensed to user data are not available, issues data from the lowest level possible may be used. As logisticians, we prefer logistics data to other data, because we believe they provide the most realistic forecasts of future contraceptive needs.

- ❒ **SERVICE STATISTICS.** Service statistics include all data collected about clients and their visits to SDPs. They can be useful in contraceptive forecasting. Pay close attention, however, to the definitions that your system uses for new and continuing customers, and first/subsequent visits. For example, is a *new client* new to a method, new to family planning, or new to the facility? Do all staff use the same definitions?

  Service statistics are often collected through the same information system as logistics data, but logistics data are not service statistics data. Program managers use service statistics in a variety of ways, including analyzing workloads and client flow in clinics. They may prefer this data source to others for forecasting.

- ❒ **DEMOGRAPHIC DATA.** Demographic data include information about populations, such as the number of women of reproductive age and the percentage of women receiving contraceptives from public compared with private sector sources. Demographic data are collected through surveys and censuses; for example, Demographic and Health Surveys (DHS) sponsored by USAID usually are conducted every five years. Because demographic survey data are completely independent of routine MIS collection, they are a good source of data for comparison with logistics and service statistics data for contraceptive forecasts. Demographic data can also be useful in new programs that have not had time to collect information through an MIS.

Statisticians and program planners may prefer this data source to others because of their confidence in survey instruments and demographic data's use in long-term forecasting (for example, 10 to 25 years in the future).

- ❒ **DISTRIBUTION SYSTEM CAPACITY.** This forecast measures the volume of the pipeline (i.e., storage facilities and transportation links) to determine the volume of supplies the system is able to transport and store. It is generally recommended that the results of a capacity forecast be used to verify the feasibility of forecasts using the other sources of data—sufficient storage and transport resources must be available to handle the forecasted amounts.

6.2.1 Strengths in Forecasting Data Sources

- ❒ **LOGISTICS DATA**, when based on complete dispensed to user data and free of stockouts, are an excellent reflection of previous years' consumption. Past performance is a strong baseline from which to project future performance.
- ❒ **SERVICE STATISTICS** often receive strong support from program managers and staff as a measure of service impact. Consequently, service statistics forecasts may receive more careful attention from service providers. Service statistics forecasts can be a good way to check the accuracy of logistics data forecasts.
- ❒ **DEMOGRAPHIC DATA** are the only data source to use when other data sources are considered unreliable. When they are based on rigorous surveying methods, demographic data capture a good *snapshot* of current practices. When demographic forecasts are based on targets, they provide a good way to check forecasts made using other sources, generally representing the upper limit of what one might expect in future performance.

Forecasting should always be done using as many sources as possible. This helps ensure the accuracy of the forecast and confirms for those involved in procurement that all points of view have been considered.

6.2.2 Weaknesses in Forecasting Data Sources

Regardless of the source of data, all forecasts make a number of assumptions and/or adjustments. For example—

Logistics Data

- ❒ Using issues data as a proxy for dispensed to user data can result in an overestimate or underestimate of actual consumption, because the quantities issued (especially in a push system) may not correlate well with the actual quantities dispensed.
- ❒ Reporting may be incomplete or delayed; for example, reports may be available for only 80 percent of clinics. This requires adjustments in logistics and service statistics forecasts that can introduce inaccuracy. At low levels of reporting (e.g., less than 50 percent), it is difficult, if not impossible, to adjust the data to account for missing reports.
- ❒ Reports for an entire time period may be missing; for example, there may be no reports available from the district for the first quarter. This, too, requires adjustments in logistics and service statistics forecasts, which can result in inaccuracy.
- ❒ Stockouts may cause underreporting (e.g., all of the available vials of Depo-Provera may have been dispensed, but the number of clients who came to the clinic requesting this contraceptive may have been much higher). This is usually made clear by a careful examination of logistics records (when stock levels were at zero for any period of time), but may be less obvious in a service statistics forecast.

Service Statistics Data

- ❒ Service statistics forecasts, which count either visits or customers, assume a standard dispensing protocol. For example, the dispensing protocol may be one pill packet for the first visit and three pill packets for each subsequent visit. In reality, some customers may receive 3 to 12 packets on subsequent visits; therefore, using the standard protocols may underestimate or overestimate the quantity distributed. For essential drugs, the dispensing protocols are treatment regimes. When drugs are used rationally, the quantities of drugs dispensed closely match the treatment regime. Rational prescribing is not always followed, and, as with contraceptives, an essential drug forecast based on service statistics may underestimate or overestimate the quantity distributed.

- ❒ Service statistics are often poorly defined, creating difficulty in converting the number of visits to the quantities dispensed. For example, a subsequent visit from a current user who does not receive supplies is likely to be coded as a *subsequent visit*. The forecaster will assume that supplies were dispensed according to the protocol, and will overestimate the quantities dispensed. The definition of *current user* can also be confusing. In many systems, current users include those who were expected to return for additional supplies (but have not) as well as clients who are not yet due to return. Nurses in different locations may be unfamiliar with the appropriate definition of terms. If nurses' success is measured by the number of clients counseled, overcounting is a likely result. Consequently, service statistics forecasts must be undertaken with careful attention to definitions and actual practice.

Demographic Data

- ❒ Demographic data are based on surveys and censuses that may be out of date and are always months, if not years, old by the time they are available. Adjusting these data can be tricky, and forecasters should consult an expert source, such as the U.S. Census Bureau or the United Nations.

- ❒ Demographic forecasts include assumptions about how contraceptive prevalence rates (CPR) will change over time. These are often the program targets—that is, the program's stated CPR goal for a period of time. Because these rates are a target, they may not realistically reflect actual consumption patterns.

- ❒ Demographic forecasts describe people, generally married women of reproductive age, who are using contraception at the time of the survey. What surveys do not measure, however, is the quantity of each contraceptive required. Forecasters use demographic data to apply a conversion factor, called the couple years of protection (CYP) factor. This converts the number of users into the quantity needed to protect a couple for an entire year. For example, a couple is assumed to need 120 condoms to protect them for one year. CYP assumptions can distort the forecast because consumption may not be so easy to predict.

6.3 Forecasting for Contraceptive versus Noncontraceptive Products

Forecasting for contraceptive products differs from forecasting for non-contraceptive products, such as vaccines and essential drugs. This handbook does not address noncontraceptive forecasting. (See the suggested reading list at the end of this handbook.)

Some important differences between forecasts for contraceptives and forecasts for drugs and other health commodities include—

- ❒ Contraceptives are often in *full supply*; enough contraceptives are purchased to make them available to anyone who wants them. Drugs, however, are often in short supply; therefore, historical dispensed to user data for drugs are generally not a good indicator of demand for the drug.
- ❒ Contraceptives have only one use. Many drugs, especially antibiotics, have several uses. When one drug is not available, sometimes another can be substituted. This makes it difficult to forecast the need for any one drug.
- ❒ Contraceptives have a relatively long shelf life—four to five years or more, depending on the product. Most essential drugs have shorter shelf lives, anywhere from six months to more than five years, depending on the product. This limits the ability to procure a large quantity at one time.
- ❒ Contraceptives are often donated products, but countries purchase most of their essential drugs. This often results in severe budgetary constraints on the quantity of drugs that can be purchased relative to the actual demand.
- ❒ Contraceptives are relatively stable products, requiring minimal storage precautions. Most vaccines, however, must be stored according to *cold chain* procedures. This, too, limits ability to procure a large quantity at one time.
- ❒ The usage rate for contraceptives (CPR) is usually relatively steady. Usage rates for essential drugs, however, may vary wildly due to epidemics and seasonal influences. Forecasts for contraceptives assume a relatively stable acceptance rate, an assumption that may not true for drugs.

Forecasting for noncontraceptives is not an impossible task, but different methods of forecasting must be used.

- ❒ **CONSUMPTION FORECASTS.** As with family planning forecasts, you can use consumption data to forecast essential drug needs. Unfortunately, because drugs are in limited supply, stockouts are frequent. Adjusting these data for stockouts is difficult.
- ❒ **DEMOGRAPHIC FORECASTS.** For some products, like vaccines, demographic data (e.g., number of children in a given age cohort) are used to make the forecast, in a process similar to a demographic database based on a contraceptive forecast.
- ❒ **MORBIDITY FORECASTS.** Morbidity data-based forecasts include assessments of the potential numbers of customers or visits for a specific service (e.g., tuberculosis visit), based on disease patterns.
- ❒ **ADJUSTED CONSUMPTION VISITS.** This forecasting method combines consumption and morbidity data to produce an expected need.
- ❒ **SERVICE-LEVEL BUDGET PROJECTIONS.** Budgets are often a limiting factor in essential drug procurement. A budget-based forecast can represent the financial limits on the quantity of drugs that can be purchased, regardless of need.

6.4 Forecasting for HIV/AIDS Prevention

It is frequently difficult to separate condom consumption for HIV/AIDS prevention from condom use for family planning for several reasons:

- ❒ To protect the anonymity of patients who wish to obtain condoms for disease prevention without providing personal information, dispensed to user data frequently are not collected.
- ❒ It is difficult to gather data from clients about whether they are using condoms for family planning, disease prevention, or both.
- ❒ The distribution system for family planning is often the same as for HIV/AIDS control, making it difficult to separate the two. Separate systems for HIV/AIDS control condoms are not recommended. Rather, you should collect the lowest level of issues data possible for HIV/AIDS control.

- ❒ It is important to differentiate among different types of HIV/AIDS condom users—for example, commercial sex workers (CSW), truck drivers, the military, and students, yet few surveys provide this level of detail. Usage rates among members of these groups are very different from usage rates among women of reproductive age—the group of women studied in DHS surveys. Newer DHS surveys often include a module on male condom use, which can be used to estimate condom needs separately from family planning.

Strategies for dealing with these issues include—

- ❒ Use the lowest level of issues data possible. For example, if clinics keep a bowl or dispenser of condoms filled at all times, the clinic could use its issues to the bowl as consumption data.
- ❒ Conduct condom usage surveys. Although costly to implement on a large scale, a small-scale survey may give you enough data to estimate the number of users for a population-based forecast.
- ❒ Where DHS surveys do include male condom use, use a forecast of male condom use compared with female condom use to estimate the quantity of condoms needed for HIV/AIDS prevention.

Where condoms for HIV/AIDS prevention are distributed through a system separate from other contraceptive products, it should be possible to estimate the HIV/AIDS condom needs based on the lowest level of issues data—that is, districts to clinics, even if the clinics do not gather client-specific consumption data. If HIV/AIDS and family planning condoms are distributed through the same system, consumption data for condoms will represent both types of use. In this case, remember that a demographic data-based forecast using only women of reproductive age (WRA) does not account for condoms used for disease prevention. Such a forecast may underestimate condom needs, because the survey data did not focus on men who seek condoms for STD prevention.

6.5 Forecasting Process Outline

The process for forecasting contraceptive needs is outlined in detail in the *Contraceptive Forecasting Handbook* (see the suggested reading list at the end of this handbook). The basic process is as follows:

1. Collect data from as many sources as possible (logistics, service statistics, and demographic data).

2. Adjust logistics and service statistics data to estimate what, theoretically, consumption would have been if supplies had been available continually throughout the past two years. Document the methodology used for making any adjustments.

3. Graph consumption during the past two years. The visual image will help you estimate future consumption.

4. Extrapolate future consumption based on historic trends.

5. Adjust your forecast for planned program changes. For example, the addition of a CBD program may cause consumption to increase slightly in the first year, but, in future years, may cause rapid increases in consumption of some products. Likewise, the addition of a new product, such as Depo-Provera, may cause overall consumption to rise by attracting new customers to the program. But these interventions may cause consumption to decrease elsewhere in the program; for example, customers who used to get supplies from clinics may now obtain the same supplies from CBD agents. Pill users may switch to Depo-Provera. Also, remember that planned program changes are often delayed by administrative and political concerns, and, in any case, the effect of such changes may not be immediate.

6. Repeat steps 1–5 for each data source. Then compare your forecasts for each data source and produce a final forecast. Remember that not all your forecasts will be equally good. Averaging them will not necessarily produce a better result than using one forecast. You will need to analyze the strengths and weaknesses of each data source and forecasting methodology to select a final forecast. If possible, prepare a capacity forecast to ensure that storage capacity is sufficient for storing the quantities that the final forecast indicates.

7. Data for forecasting change constantly. Update your forecasts as health systems implement new interventions and as DHSs provide newer information, particularly on condom usage. Generally, conduct a forecast at least annually and review it quarterly for possible updates.

6.6 Key Concept: Data for Decision Making

It is tempting to believe that forecasting is a discrete activity, separate from other logistics functions. Forecasts, however, are based on logistics or service statistics data, and the forecast should be updated regularly. In other words, it is almost impossible to make a forecast without routinely (i.e., monthly or quarterly) making an effort to collect data. Even demographic forecasts are driven by routine data collection; information about current usage rates and goals for future usage rates are needed to prepare a demographic forecast.

Forecasts are used to determine not only how much supply will need to be procured, but also how much staffing will be needed, how much storage space is required, and what transport will be needed. Ensuring that these data are available for program managers should be part of a logistics manager's responsibilities.

6.7 Chapter Summary

In this chapter, you learned the following:

1. The purpose of forecasting for family planning products is to estimate the quantities of each product that a program will dispense to users for a specific period of time in the future.
2. The data sources for forecasting contraceptive use are logistics (dispensed to user or issues) data, service statistics data, and demographic data.
3. Forecasting for contraceptives differs from forecasting for noncontraceptive products in that—
   - ❒ Contraceptives are often in *full supply*, whereas drugs are not.
   - ❒ Contraceptives only have one use, whereas some drugs have several uses.
   - ❒ Contraceptives have a relatively long shelf life compared with many drugs.
   - ❒ Contraceptives are often donated products, but countries purchase most of their essential drugs.
   - ❒ Contraceptives are relatively stable products, whereas some drugs require special handling.
   - ❒ The usage rate for contraceptives is often relatively steady, whereas drug use can fluctuate more widely.

4. Forecasting for family planning contraceptives differs from forecasting for HIV/AIDS prevention in that—
   - ❒ Dispensed to user data frequently are not collected in HIV/AIDS prevention programs.
   - ❒ It is difficult to separate condom usage for family planning purposes from usage for disease prevention; indeed, a single use may be for both.
   - ❒ The distribution system for family planning is often the same as for HIV/AIDS control, making it difficult to separate the two needs.
   - ❒ Few surveys differentiate among different types of HIV/AIDS condom users, making it difficult to estimate usage rates of condoms for disease prevention.
5. The forecasting process outline—
   - ❒ Collect data from as many sources as possible (logistics, service statistics, and demographic data).
   - ❒ Adjust logistics and service statistics data for an estimate of what, theoretically, would have been consumed if supplies had been available continually throughout the past two years. Document the methodology used for any adjustments.
   - ❒ Graph consumption during the past two years.
   - ❒ Extrapolate future consumption based on historic trends.
   - ❒ Adjust your forecast for planned program changes.
   - ❒ Produce a final forecast by reconciling your forecasting data sources. Compare the final forecast with a capacity forecast, if possible.

7 | Logistics System Assessment

Objectives

In this chapter, you will learn the following:

- ❒ The purpose of conducting a logistics system assessment
- ❒ The steps in conducting a logistics system assessment as a team
- ❒ How to use and select indicators to measure system performance
- ❒ How to use the composite indicator
- ❒ How to write recommendations for system improvement
- ❒ How to construct an implementation strategy for system improvement
- ❒ Your role in assessing and improving a logistics system.

7.1 Steps in Conducting a Logistics System Assessment

This section explains the reasons for conducting a logistics system assessment and how to plan and select sites for one.

7.1.1 Purpose of a Logistics System Assessment

The ultimate purpose of a logistics system assessment is to verify that all facilities at all levels can fulfill the *six rights*. A system that ensures that customers receive the supplies they want and need probably has few weaknesses to overcome. When you conduct a general logistics assessment, remember—

The purpose of a logistics system assessment is to—

- *Assess the entire system's strengths and weaknesses.*
- *Present the results of your assessment (your findings) to senior managers and policymakers.*
- *Present your recommendations for reducing or eliminating weaknesses.*
- *Propose an implementation plan with specific steps, based on your recommendations.*

7.1.2 Planning a Logistics System Assessment

You should begin by creating a plan for conducting the assessment. The planning phase of the assessment should ensure that you gather the data you need and that you avoid being overwhelmed by the volume of information you could collect. A logistics system assessment plan should include the following steps:

1. *Determine the size of your assessment team.*

   Although you may be the only advisor to the program, you are rarely the only person available to conduct the assessment. You will usually have a *counterpart*, such as the program manager, who has responsibility for managing supplies. This person could be the family planning nurse in charge, a reproductive health services manager, or, in an increasing number of programs, a logistics manager. Your counterpart will implement your recommendations, so he or she should always accompany you to the field and help you draft both the recommendations and the implementation plan.

Your Role as an Advisor

Because you are reading this handbook, you probably already recognize the ways that logistics management affects your work. You may be—

- An advisor from an international organization that makes recommendations to ministries of health about medical, service, finance, or other issues, for which logistics is an integral part of your suggested system improvements.
- A staff member of a donor agency, providing services and supplies to a host-country program.
- A Ministry of Health staff member, NGO, International Planned Parenthood Federation (IPPF)-affiliate, or other in-country organization staff member, with responsibility for overseeing the smooth functioning of the health program, including logistics.
- Warehouse manager responsible for managing the supplies in your system.
- Logistics manager, trained in the health field and now responsible for managing the day-to-day operations of logistics management for general health, reproductive health, sexually transmitted infection (STI) and HIV prevention, or family planning products.

Regardless of your role, you may be asked to analyze the logistics function of your program from the national level. We will assume that you are unfamiliar with the program to be analyzed when your assessment begins, and we show all the steps you might have to take.

You may also be fortunate enough to have other program staff available to assist you, or another advisor may accompany you. By forming small teams (for example, two people each) during field visits, you can cover more sites. Your team size will also influence how you carry out steps 2 through 5.

2. *Determine the length of time to conduct your assessment.*

   Regardless of the size of the program, a logistics assessment should usually take a minimum of two to three weeks. If you can divide into smaller teams, you may be able to shorten the time needed for data collection. The cost of your assessment increases as the study lengthens, and it may be difficult to obtain the financial resources to arrange a longer visit.

3. *Schedule site visits with your team.*

   No logistics assessment can be conducted in a hotel or program office. Visits to offices, warehouses, and SDPs at all levels are crucial for assessing the system. Plan to visit as many sites as is realistic, but leave time to write your report and present your findings. Smaller teams will increase the number of sites you can visit. The next section of this chapter discusses site selection.

4. *Design an assessment instrument with appropriate indicators.*

   An assessment plan should include a precise methodology for gathering the data you will need. For example, will your assessment include budget discussions at all levels? Supervision? A stock status assessment? By outlining the questions to be asked during each visit, you can ensure a complete analysis at each level. When you work in smaller teams, a written instrument will ensure that all facilities are asked the same questions, and that the same data are collected. Your instrument should include indicators of how well the program is performing. Later in this section, we discuss general guidelines to help you develop instruments and select performance indicators.

5. *Make site visits and collect and analyze data.*

   The most time-consuming part of your assessment will be collecting data and analyzing them. When you work in small groups, you will need to reconvene your team to discuss your findings and observations. In later sections of this chapter, we discuss data collection and interviewing techniques.

6. *Write a draft report of your findings and recommendations.*

   We also discuss how to write recommendations later in this chapter.

7. *Present your findings and recommendations.*

   With your counterpart, present your findings to stakeholders, policymakers, donors, and other organizations that will be involved in improving logistics practices or will provide related resources (e.g., money, staff, and materials). It is always better if your counterpart leads these discussions.

8. *Write a final report and disseminate it.*

   Based on discussions following the presentation of your findings, finalize your report, incorporating the needs and concerns you have heard. Disseminate your report to everyone to whom you presented your findings, and include other organizations affected by the report's recommendations.

9. *Prepare an implementation plan with your counterpart and other stakeholders.*

   An implementation plan may be included in your final report, or it may be presented as a separate document; it outlines the actions, resources, and timing of improvements to the logistics system. In later sections of this chapter, we will discuss how to write an implementation plan.

7.1.3 Site Selection in a Logistics System Assessment

To plan site visits, begin by drawing a diagram of the pipeline to be assessed. For each level of the pipeline, record the number of facilities. Based on the number of facilities, select the sites most appropriate for your assessment, visiting as many as possible in the time allowed. Be sure that you visit all types of facilities at each level. For example, the district level may include district warehouses and district hospitals. District-level hospitals have more resources than clinic-level health posts and are a different type of SDP. Remember that you will need a minimum of two hours at each site, and perhaps much longer, depending on the depth and complexity of your analysis.

One strategy for site selection is to ask *key informants*. These should be highly placed (usually central-level) managers involved in day-to-day program operations. They are probably your counterparts. Key informants may suggest, however, that you visit only facilities that are performing well, believing that your report might be overly critical of poorly performing sites. They might also suggest visiting only those sites that are easy to reach.

As an advisor, you should encourage your counterpart to select both high-performing and poorly performing sites as well as easy- and difficult-to-reach sites, so that your assessment thoroughly examines the strengths and weaknesses of the entire system.

You do not have to select a *statistically significant* or *random* sample, although a random sample is preferable. Initial country assessments are intended to identify large, systemic issues (e.g., absence of a functional LMIS, unclear inventory control policies) rather than gaps in individual facilities' performance. It may not be necessary to visit a statistically significant number of facilities to discover such weaknesses. You do want to visit as many different facilities as possible, selecting both rural and urban sites.

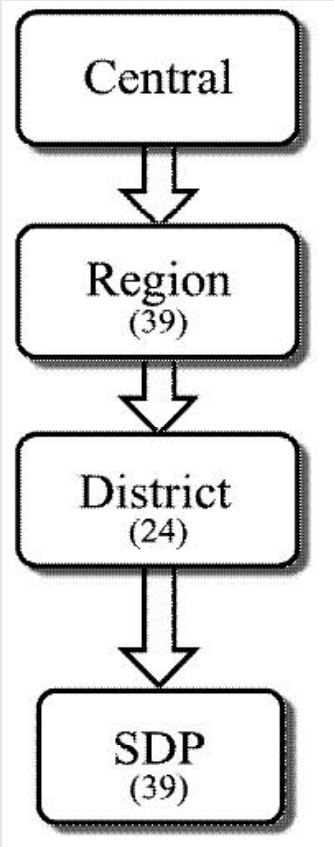
The size of your sample also depends on transportation, distance, and, perhaps, political conflicts. Your counterparts' availability is also important; their ability to introduce you to local staff and guide your work will bolster your credibility when you are in the field.

CASE STUDY

A Visit to Malawi

In the Malawi logistics system assessment, the advisor and his counterpart's first step was to draw the Malawi MOH pipeline showing the number of storage and service delivery facilities at each level.

They decided to visit the central warehouse, all three regional warehouses, 11 district offices, and four clinics. Because all district-level facilities also serve as SDPs, the assessment emphasized the district level. District nurses often serve as SDP nurses and have had many of the same experiences as clinic nurses. Given the scope of work for the visit, the selection was appropriate, although more clinic visits would have been better.



7.2 Designing an Evaluation Instrument with Appropriate Indicators

Your assessment should identify the strengths and weaknesses of the logistics system as objectively as possible. An indicator is an objective measure of a specific logistics function that tells you how well that function is being performed.

Some indicators of logistics system functioning are—

- ❒ Actual lead time compared with expected lead time
- ❒ Frequency of stockouts
- ❒ Frequency of emergency orders
- ❒ Frequency and accuracy of physical inventories
- ❒ Percentage of stock expired or damaged
- ❒ Facilities stocked according to plan (i.e., holding stock within max-min levels)
- ❒ Percentage reporting/percentage of complete reporting/ percentage reporting on time
- ❒ Percentage of storage facilities in compliance with storage guidelines
- ❒ Percentage of physical inventory counts that match records
- ❒ Percentage of actual budget available compared with budget needed for logistics activities
- ❒ Number of personnel trained in logistics.

These indicators are both objective and measurable, and they help you understand how the system performs. For example, during your site visit, you can determine the number of emergency orders that were placed during the past year. A large number of emergency orders indicates that the resupply process is not working properly.

You will need to investigate further to discover why the resupply program is failing. For example, consider a facility that should order quarterly, but whose records indicate that it orders more frequently. You should ask the staff how often they believe they are supposed to order. If the answer is that they order "whenever we run low on supplies," then the problem is that they do not understand the resupply process. This may mean a recommendation to train staff in routine ordering. If they know they are supposed to order

quarterly but order more often because they run out too quickly, you should suspect problems with the max and min levels, or the way the AMC is being calculated. Or, perhaps the program is simply expanding faster than anyone expected. Using indicators focuses your attention on the appropriate changes to recommend.

Using objective and measurable indicators will also strengthen your assessment report. For example, compare the following:

> *Many facilities place numerous orders without regard to when these orders are placed.*
>
> —with—
>
> *Seventy percent of district facilities placed orders more often than quarterly, although all staff understood that routine ordering was supposed to be quarterly. Investigation revealed that reorder quantities are always calculated correctly, but lead times are too long for current max and min levels.*

The solution in the first case is unclear. Do staff understand the system? How large is the problem? When are orders supposed to be placed? What levels are affected?

7.2.1 Individual Indicators for Assessing a Logistics System's Performance

There are many possible indicators of logistics system performance. In an effort to identify a reasonable number of critical measures, the Working Group on Commodities and Logistics of the Evaluation Project and USAID's Family Planning Logistics Management project, narrowed the list of potential indicators to the five key indicators shown in table 7-1. Although the key indicators are stated in terms of contraceptive availability, they are equally applicable to any other commodity.

Your initial individual or composite indicators (baseline) may be low or impossible to assess. For example, to assess *pipeline wastage,* you must know total consumption and total wastage to determine the percentage wasted. If the LMIS does not collect consumption data, and you cannot estimate with confidence, you cannot measure this indicator. But your attempt to gather the data demonstrates an important weakness in the system—it does not collect essential data.

TABLE 7-1. Five Key Indicators for Logistics

Indicator	Definition	Purpose and Issues
Pipeline wasteage	The ratio of total contraceptive supplies that are wasted compared with the amount issued to customers during a specified period of time (e.g., one year). *Wastage* refers to supplies that expire, are damaged, or are lost.	The ratio of total contraceptive supplies that are wasted compared with the amount issued to customers during a specified period of time (e.g., one year). A poor logistics system will not have the information required to calculate this indicator. Some level of wastage is expected, even in the best systems. Thus, the indicator is not expected ever to reach zero. However, a small amount of wastage is deemed preferable to the alternative of occasional (or frequent) stockouts.
Percentage of storage capacity meeting acceptable standards	The percentage of total storage capacity available to the program that meets acceptable standards with respect to temperature, humidity, ventilation, etc.	This indicator provides an overall measure of the adequacy of program storage facilities for contraceptive commodities. The indicator could be applied at each level of the commodities and logistics system (i.e., at the central, district, and clinic levels) to provide a more detailed assessment of the program commodities storage situation at different levels. It should be noted, however, that storage requirements differ by method; for example, condoms require more storage space by CYP that do IUDs. Thus, the indicator gives more weight to condom storage of methods requiring less space. Evaluation of the adequacy of storage facilities should consider proper storage guidelines (see table 5-1).
Frequency of stockouts	The percentage of service delivery points (SDP) that encountered a stockout of any method/brand during the past 12 months.	This indicator provides a measure of the extent to which SDPs have been unable to serve customers with the full range of authorized contraceptive methods or services during the past year due to inadequate supplies. A more sensitive indicator would be desirable, but alternative specifications are viewed as posing problems in collecting and aggregating information by method and brand. Under the definition of stockout adopted for this indicator, a stockout is deemed to occur when an SDP has no supplies of a particular brand, even though there may be supplies of other brands for the same method. Caution should be used in interpreting this indicator since family planning workers can avoid stockouts by rationing supplies.
Percentage of service delivery points (SDP) stocked according to plan	Percentage of SDPs having stock levels between their calculated minimum and maximum levels at a given time.	This indicator provides an overall measure of the efficiency of the forecasting and distribution components of the commodities and logistics system, but does not provide information on the components responsible for observed deficiencies. This indicator assumes that a max/min system is in place for SDPs.
Percentage of key personnel trained in contraceptive logistics	The percentage of key program staff that have been trained in aspects of logistics management relevant to their role/position. Key personnel are defined as those with significant responsibility for the procurement, storage, distribution and/or disbursement of contraceptive commodities.	This is again a crude indicator of staff development since it does not provide information on the quality of the training nor the extent to which performance has improved as result of the training. Nevertheless, it is preferred to indicators such as "Number of persons trained per year" or " Number of training sessions held," since the ideal levels of these indicators will vary according to program needs.

Note: This table was adapted from J. T. Bertrand, R. J. Magnani, and J. C. Knowles. 1994. *Handbook of Indicators for Family Planning Program Evaluation*. Evaluation (contract number DPE 3060-C-00-1054-00), Carolina Population Center of the University of North Carolina at Chapel Hill, Chapel Hill, N.C.

7.2.2 The Composite Indicator

The individual indicators in table 7-1 help tell you whether the logistics system is performing well, but they do not tell you why performance is good or bad. The composite indicator is designed to evaluate an entire national logistics system. An overall composite index summarizes in a single measure the many elements or dimensions, both quantitative and qualitative, thought to contribute to well-functioning commodities and logistics systems. Like the individual indicators, the composite indicator helps pinpoint areas needing improvement. Each section of the indicator gives the evaluator a detailed view of each aspect of the logistics system. In brief, the composite indicator asks the following questions:

- ❒ **LMIS.** Does the program include the basic elements of an LMIS? Is information used for decision making? Is information returned to lower levels in the system? Are commodity data crosschecked against other data sources?
- ❒ **FORECASTING.** Are periodic forecasts of consumption prepared, updated, and validated? Are forecasts incorporated into cost analysis and budgetary planning?
- ❒ **PROCUREMENT.** Are consumption forecasts used to determine short-term procurement plans? Are the correct number of contraceptives obtained in an appropriate amount of time?
- ❒ **WAREHOUSING AND STORAGE.** Are storage space and conditions adequate? Are physical inventories conducted at least once a year at every facility? Do staff know and comply with standards for maintaining product quality? Is stock issued according to first-to-expire, first-out (FEFO) inventory control procedures?
- ❒ **DISTRIBUTION.** Is there an appropriate distribution plan and schedule for stocking each level? Is each level stocked adequately? Has the system experienced minimal stockouts during the previous year? Is there a system for tracking and documenting system losses? Is transportation adequate for moving supplies?
- ❒ **ORGANIZATION AND STAFFING.** Is there an appropriate logistics unit with adequate resources and authority to effect change? Is effective supervision maintained at all levels with written policies and procedures? Is there a logistics training plan, and are an adequate number of active personnel trained in logistics? Do a sufficient number of personnel perform appropriate logistics activities?

- ❒ **POLICY.** Is logistics information provided to appropriate policymakers?
- ❒ **ADAPTABILITY.** Can the entire logistics system successfully adapt to changes? Does it have the ability to obtain the necessary resources to make change possible?

For each of these elements the advisor should ask two questions:

- ❒ How well is the logistics system functioning?
- ❒ Is the system functioning independent of outside assistance?

Because so many systems depend at least in part on donor assistance, it is necessary to assess the ability of the system to function on its own resources. For example, staffing may be evaluated highly on performance, but, if a donor pays the salaries of the majority of employees, the organization's sustainability is low.

The composite indicator is a more effective tool if the questions are answered by both the advisor and by a group of local, central-level managers (e.g., your counterparts) who are familiar with the system. Although completing the composite indicator requires some knowledge of logistics, the advisor can help local staff understand the basic principles, enabling the group to understand its own strengths and weaknesses and identify areas for improvement.

7.2.3 Using an Assessment Instrument with Multiple Teams

If you are dividing your group into smaller teams to collect data at lower levels, ensure that everyone has a written copy of the assessment instrument. The same data should be collected at all facilities.

Your initial assessment often forms a *baseline* for evaluating the success of the system improvements you recommend. The individual and composite indicators taken together measure how well the system is functioning. The results can be compared with a subsequent assessment after action is taken.

7.3 Making Site Visits and Collecting and Analyzing Data

Site visits generally start from the top of the system (i.e., the central level) and move down the pipeline. Your counterpart should accompany you on all visits. Although some staff may find you intimidating, most will be receptive to a consultant who is introduced by his or her counterpart. As you move further down the supply chain, you should also ask the higher-level supervisor to accompany you on your visit to his or her facilities. The supervisor may be able to recommend sites to visit if your counterpart is uncertain of the location. At a minimum, ask the supervisor for permission to visit the facilities he or she supervises.

Collect data in the following ways:

- ❒ Interview local staff.
- ❒ Visit the storage space and count the stock.
- ❒ Review local records and reports.

These activities are described in more detail in the following section.

7.3.1 Interview Local Staff

The first step in your assessment of a facility is to interview local staff. If you know the indicators you seek and have developed an appropriate assessment instrument, your interview will be more efficient.

Be sure to include the following steps in the interview:

- ❒ *Greet the person in charge of the facility*.

  Explain that the purpose of your visit is an assessment of both strengths and weaknesses of the logistics system and that you are visiting other similar facilities, as well. Assure staff that they are not being audited or personally assessed; rather, this is an assessment of how well the entire logistics system is functioning. Ask for permission to interview staff involved in logistics and review records. Note that you will return at the conclusion of your visit to debrief the person in charge.

- ❒ *Locate and greet logistics staff*.

  Explain the purpose of your visit, asking staff to provide frank answers. Explain that you expect to find both strengths and weaknesses in the current system.

- ❒ *Ask permission to take written notes.*

  Because you will visit a number of sites, take extensive notes at each site, if the staff gives you permission to do so.

- ❒ *Avoid questions that imply judgment.*

  For example, the question, "I'm sure you wouldn't be foolish enough to keep petrol in the storeroom with contraceptives, so where do you keep it?" may upset staff and lead to their being reluctant to answer additional questions. Instead, ask, "Where do you keep the petrol?"

  If you do find petrol in the storeroom with the contraceptives, it may be appropriate to suggest politely that it should be stored elsewhere. (See the box, "Should You Learn or Teach?" for more information.)

Should You Learn or Teach?

During a site visit, you are likely to encounter someone who has completed a form incorrectly or incompletely or who does not understand a specific policy or procedure. This could be opportunity to instruct the staff member in the correct procedure or about the correct policy.

Although this may be the perfect *teachable moment*, *you should not interrupt your assessment to provide training.* You probably will not have time for extensive training, and it may not be appropriate for you as a consultant to provide any training. Additionally, you want to encourage local staff to provide open, honest answers to your questions; correcting their work may make them less willing to share their insights with you.

At the end of your visit, you may take a few minutes to explain or correct mistakes. When the supervisor is present, allow this person to take the lead. The supervisor should schedule a time for the necessary training. If the staff member clearly does not understand his or her role in supplies management, and the supervisor is not present, report this on your return.

- ❒ *When you hear the answer to a question, repeat or paraphrase the answer if possible.*

  For example, "If I understand correctly, you conduct an annual physical inventory because you feel that the supplies are not issued often enough to justify taking the time to do a monthly count. Is that correct?" Avoid repeating a question you have already asked. This may lead staff to think that you are not listening carefully to what they are saying.

- ❒ *Base the specific questions you ask on your assessment tool and the indicators you seek, but do not insist on following your questionnaire exactly.*

  Be open to the discussion and direction indicated by the responses to questions as you ask them. A more natural conversation will likely lead staff to suggest improvements they have identified and strengths and weaknesses they understand best.

- ❒ *Ask the staff questions about their background and experience.*

  In addition to questions about how the system is functioning and knowledge of policies and procedures, ask how the staff got to their current positions and how long they have been in their positions. Staff turnover and transfers are common, and new staff may not be trained in all procedures.

- ❒ *Your final comments should reflect your willingness to listen.*

  Ask staff if they have any questions for you, if they have information or suggestions they would like you to take to their supervisors, and whether they can suggest any solutions to issues that have been identified. You may be surprised at how much you learn during the final minutes of the interview. Be prepared to record information to convey to supervisors.

At the conclusion of the interview, ask for permission to visit the storeroom to review records and reports.

Guidelines for Conducting Interviews

The following are guidelines for conducting interviews at all levels:

- Gather as much background information as possible prior to the interview.
- Take time to prepare questions ahead of time.
- Introduce yourself.
- Make eye contact (as appropriate).
- Be polite.
- Gain your interviewee's trust by being honest and clear about the purpose of the interview.
- Select an informal and nonthreatening environment for the interview.
- Establish a positive attitude; show interest in whatever is said without passing judgment.
- Help your interviewee by restating or clarifying questions, if asked.
- Use language and terms easily understood by the person you are interviewing.
- Be a good listener and observe what is being communicated, both verbally and silently through body language.
- Probe for the *why* of things, but be sensitive if the person does not want to discuss a particular topic.
- Record the information you are gathering accurately; do not try to interpret it.
- Use follow-up questions to learn more.
- Follow the interests and energy of the person being interviewed.
- Thank your interviewees for their information and time.
- Send the interviewee a copy of your final report, as appropriate.

Three tips:

- Listen carefully.
- Write down responses.
- Do not repeat questions (unless asked to).

7.3.2 Visit the Storeroom and Count the Stock

Include your counterpart, the program person in charge (e.g., family planning nurse), and the storekeeper in your visit to the storeroom.

Always carry out the following steps during a storeroom visit:

- ❒ *Conduct a physical inventory.*

  You should take a physical inventory of at least a limited number of products at every facility you visit, and use it to verify stock levels recorded on bin cards and inventory control cards. Record the results of the physical inventory in your notes.

- ❒ *Verify that the facility follows proper storage practices.*

  Review all of the storage procedures in table 5-1 and note whether they are being followed. As you walk around the store, try to get as far into the back corners as possible, to look for damaged goods, evidence of pests, and so forth. Always ask whether there are additional storerooms, and see these storerooms, too.

7.3.3 Review Local Records and Reports

In addition to interviewing the local staff, you and the staff will need to review available records and reports. Records frequently reveal many issues that the staff may not have mentioned.

Look for the following during this review:

- ❒ *Check whether all records and reports are easily accessible to the person in charge and/or program manager and are well organized.*

  If records are not accessible, it is unlikely that keeping them up to date is a priority. Poorly organized reports are difficult to use in making the calculations described in previous chapters.

- ❒ *Check whether records are complete and that the math is correct.*

  For self-balancing reports, see whether the report balances correctly. As appropriate, determine whether the opening balance on the current report equals the ending balance from the previous report.

- ❒ *On consumption records, check whether dispensing protocols are being followed.*

  Dispensing protocols determine how many of each type of contraceptive or medication should be given to each customer. Consumption records often collect information about the number of customers who have visited the clinic. The total quantity dispensed should correlate with the number of customers served.

- ❒ *Verify the date that reports were submitted.*

  If you have visited higher-level facilities, compare the completion date with the date that the higher level received the report. Check to see that the person in charge is aware of when the report is due at the higher level. If the facility receives reports from lower levels, check the dates completed and inquire about the date received.

- ❒ *At intermediate facilities, check the method of aggregating data and check whether it is followed correctly.*

  At the district level, depending on the reporting system (a) clinic reports may be aggregated, added to district data, and submitted as one report to the central level; (b) clinic reports may be aggregated on one form, and district data sent on a separate report; or (c) district data and each clinic's separate report may be sent to the central level. Check whether the correct procedure is followed and whether the math is correct. See section 2.4.2, for more information.

- ❒ *Assess the stock status for a sample of products.*

  If consumption data are not available, use issues data and the results of your physical inventory to determine the number of months of stock available for a sample of items. Record this information for your report.

- ❒ *Review the stockkeeping records.*

  Check a sample of stock cards to see whether cards are complete and mathematically correct. Verify that physical inventories are conducted routinely and recorded on the cards. Look at the levels of losses and adjustments, and ask for information about the adjustments. If you have already visited higher levels, verify that the quantities received at this facility equal the quantities shipped from the higher-level facility. If you have not already been to the higher-level facility, copy

down the quantities received and verify them. If possible, calculate the lead time, based on the recorded dates. Ask about stockouts, note their duration, and ask what actions were taken to obtain additional stock.

When reviewing records or reports, you may not understand how the form was completed or where a specific number came from. The best questions to ask are, "Can you tell me how you got this number?" or, "Can you tell me how you completed this box on the form?" Neither question implies a judgment, but both questions encourage the staff member to tell you how the form should be completed. The general question, "Are you having any difficulty completing any of the forms?" may also be an effective way to get staff to tell you about any problems they may be having.

Your review of records and reports may contradict what you were told during your interview. For example, you may have been told that physical inventories are taken monthly, but the stock cards may indicate only an occasional inventory. When you find such discrepancies, ask for clarification. Do not assume that the person interviewed was dishonest; items such as physical inventories may not always be recorded even though they were conducted. During the interview, the staff member may have thought you were asking about the policy rather than the actions actually taken at the facility.

Be sure to record consumption rates, stockouts and their duration, levels of losses and adjustments, level of knowledge of policies and procedures, and other management issues, so you can include these in your report.

At the conclusion of your site visit, thank the staff for their assistance and cooperation in helping you with your assessment. Report what you observed to the supervisor (if he or she did not accompany you), explaining the strengths and weaknesses you observed. You can also use this second interaction with the supervisor as an opportunity to verify your findings.

7.3.4 Additional Considerations for Interviewing and Data Collection at the Central Level

At the central level, in addition to the tasks mentioned above, your assessment should include collecting additional information about the program as a whole. You should try to meet with senior members of the staff, such as the director of family planning, preventive health services, HIV/AIDS prevention or reproductive health; the central warehouse manager; and the program's logistics manager. Include the following questions in your interview:

- ❒ What are the program's goals? What is the level of coverage? Are there objectives for contraceptive prevalence rate (CPR) or total fertility rate (TFR)?
- ❒ What program changes are planned for the next several years that might affect logistics operations? For example, will there be an increase in information, education, and communications (IEC) efforts? Will community-based distribution (CBD) be introduced?
- ❒ Will management of different programs be integrated (e.g., family planning with other reproductive health services)? What will happen to resources previously assigned to individual programs? What changes in the number of managers and their duties are expected?
- ❒ Will responsibility for logistics be decentralized? To what level? What problems are anticipated?
- ❒ Are new drugs or treatment protocols to be introduced?
- ❒ Are national essential drug lists (EDL) to be updated in the near future? How will this affect the number of products intended to be available at each level of the system?
- ❒ What level of financial support is available for logistics? What level of other resources, particularly human resources, will be available?
- ❒ How does the program interact with donors? What donors are involved?
- ❒ What logistics data are used to make decisions? What types of decisions are based on these data? What is the level of confidence in the quality of the logistics data that are received?

Meet with donors, as appropriate, particularly the donor sponsoring your assessment, and ask them these questions, as well. Your recommendations should reflect the policies of your sponsoring agency and should not commit the sponsor beyond agreed-upon goals.

Your draft report should address how your recommendations would support the goals of the program.

Program Goals and Central–Level Interviewing

At the central level, ambitious goals may have been set for progress in family planning. When you conduct your interview at the central level, listen carefully to the types of new activities planned for the next two years. Determine what makes these activities different from previous efforts. Make sure your report describes how your recommendations support these efforts.

When meeting with donors, listen carefully to their level of support for program goals. Remember, donors may not be able to support all program goals. Your report should reflect the gap between available resources and the resources needed, if such a gap exists. Be sure, also, that your recommendations do not contradict donor policies.

7.3.5 Analyzing Strengths and Weaknesses of the System

After you conduct all your site visits, reconvene your working team or teams and collect all data in one location for analysis. Your findings should include both the strengths and weaknesses discovered during your data gathering. It is often true that strengths may also have a component of weakness. For example, the system may collect all essential data (stock on hand, losses and adjustments, and consumption). This is a powerful strength, but, if central-level decision makers do not use the data, it is also a weakness. Your report should provide a balanced discussion of strengths and weaknesses. Program managers will not respond positively if their systems are only criticized.

In analyzing the available data, separate all information not related to logistics. Save important information on other functions, such as quality of care, for the last part of your report. Also, remove mention of problems that are beyond the system's control. For example, difficult weather conditions and political challenges usually cannot be overcome by program-level logistics interventions. These important considerations should be included in your report as outside the scope of your analysis, although they have an impact on your overall recommendations.

7.4 Writing and Presenting Findings, Recommendations, and Implementation Plans

You should base your recommendations on the information you found during your visits. Remember, only real problems deserve recognition. Focus on substantial problems.

You can organize your findings and recommendations by functional area in the order in which you believe they will be received most effectively. For example, you can organize by—

- ❒ Administrative level (central, district, and clinic)
- ❒ Cost (e.g., cost to add more staff or cost to add more forms)
- ❒ Program goals (e.g., quality of care or level of customer service)
- ❒ Elements of the composite indicator (LMIS, forecasting, distribution, and others).

How you organize your analysis depends on how the problems present themselves. For example, if most logistics issues involve data collection, you could organize by the composite indicator elements, with findings about the LMIS at the beginning. If the program you are advising reports to a ministry of finance, you could organize your analysis according to the financial implications of the issues you identified.

7.4.1 Writing Recommendations

Recommendations should be formatted as follows—

- ❒ *Define or state the problem.*

  Include in your statement of the problem the indicators or facts that demonstrate that the problem is real. Include the opinions of the other members of the team, particularly your counterpart, as appropriate. Issues should include only problems that have a significant impact on the system. Remember that some problems result from larger problems. (For example, if there is no published policy for disposing of expired products, this will explain why you found expired products at several facilities.) State specific issues. Saying, “the LMIS is bad” is not helpful.

- ❒ *State the consequences of the problem.*

  The consequences should be directly related to the issue. Do not suggest overly broad consequences and do not overstate the consequences. Saying, "the system will collapse because of this problem" is probably an overstatement.

- ❒ *Suggest a course of action or actions to solve the problem.*

  Suggest a *SMART* (the acronym for *specific, measurable, attainable, realistic, and timely*) course of action. The action should resolve the problem at the lowest cost, with as little disruption as possible. Do not suggest revising and reprinting the LMIS forms, for example, if training or a new job aid is sufficient.

- ❒ *Identify who should take action on the recommendations.*

  Remember that donors and outside organizations also play a role in taking action. Donors may be asked to provide additional resources, and other organizations may be involved where training is necessary. Make sure that donors agree that the action is within their scope of interest and ability to support before you recommend it.

- ❒ *Identify the levels of the logistics system that will be affected by the recommendations.*

  If you organized your report by administrative level, this will be obvious. Otherwise, the implications of the recommendation should be explained.

- ❒ *Identify the types of resources necessary to complete the recommended actions.*

  Include all the resources you think will be required. Because most organizations prepare work plans annually, this may be your only opportunity to gain financial and human resource commitments.

- ❒ *Identify the timeframe required to complete the actions.*

  The timeframe should be realistic, but it should also reflect the urgency of the problem.

- ❒ *Describe the expected outcome of the action, if it is taken.*

  Perhaps the most important part of your recommendation is your description of the outcome of the action and its impact on the program. The expected outcome should reinforce the goals of both the program and its donors.

TABLE 7-2. Common Logistics Problems, Causes, and Examples of Possible Solutions

Problem	Probable Causes	Possible Solutions
Under-supply	■ Poor forecasting ■ Inaccurate or incomplete count of products on hand ■ Seasonal increase in product use ■ Slow administrative procedures ■ Failure to move products rapidly ■ Inadequate or infrequent supply	■ Improve data used for forecasting. ■ Review inventory control procedures. ■ Adjust subsequent issue quantities; transfer product from low-use areas. ■ Improve port clearance and inspection procedures. ■ Streamline distribution procedures; seek alternate transport. ■ Find alternate donor or other source of supply.
Over-supply	■ Poor forecasting ■ Inaccurate or incomplete counts of products on hand ■ Seasonal decline in product use ■ Decline in product use due to user preference ■ Administrative bottlenecks ■ Failure to move products rapidly to SDPs ■ Same product now available from other sources	■ Improve data used for forecasting. ■ Review inventory control procedures. ■ Adjust subsequent issue quantities; transfer products to high-use areas. ■ Train staff to deal with side effects and rumors. ■ Streamline bureaucratic procedures. ■ Transfer products to areas of high use. ■ Improve coordination with other programs; investigate why customers use other sources.
Expired stock	■ Oversupply ■ Failure to use oldest products first ■ Accepting products at or near expiration date ■ Nonuse due to deteriorated packaging	■ See the solutions for oversupply above. ■ Implement first-to-expire, first-out procedures; improve warehousing practices. ■ Implement policy that products must have a minimum shelf life remaining when received. ■ Improve storage and shipping procedures; reduce handling; use damaged items for training; implement policy not to receive damaged products.
Damaged stock	■ Improper handling ■ Improper storage ■ Inadequate packaging ■ Poor shipping practices	■ Give warehouse staff feedback; increase supervision to improve handling procedures; reduce handling; encourage supply transactions in lot sizes. ■ Review policies on proper storage of supplies with warehouse personnel and increase supervision; repair/renovate storage facilities; reduce product exposure to light, water, chemicals, and pests. ■ Specify type of packaging that supplier should use; use better materials for repackaging. ■ Improve shipping conditions; seek alternate transportation.
Stock records disagree with physical inventory	■ Incorrectly recorded receipts and issues and faulty arithmetic ■ Tardy entries ■ Use of improper counting units ■ Failure to conduct physical inventories frequently enough ■ Same products stored in different locations ■ Theft and pilferage	■ Promote care in recording entries and doing computation; simplify forms and records; provide refresher training for staff. ■ Encourage prompt entries and checking of all transactions. ■ Implement policy that everyone uses the same units (e.g., cycles of pills). ■ Ensure that inventories are conducted periodically; provide funds to conduct inventories. ■ Consolidate same products in one location. ■ Improve security.

7.4.2 Common Logistics Problems, Causes, and Possible Solutions

Table 7-2 lists common logistics problems, causes, and solutions. This can serve as a resource as you think through your recommendations.

7.4.3 Presenting Recommendations

After you develop your recommendations, present them to the appropriate implementers. You can do this as a series of meetings with each implementing agency or through a single meeting of all concerned. A single, larger meeting of all implementers is preferred to allow collaboration and sharing of resources. Include all donors and related program heads, as appropriate.

Focus your presentation on the program you are assisting. Although your assessment may be donor-sponsored, your customer is the program you have assessed. During your presentation, be prepared to modify your recommendations and take note of specific plans for implementation. These will form part of your implementation plan.

7.5 Writing an Implementation Plan

The implementation plan describes specifically how your recommendations will be carried out. You may include your implementation plan during the presentation of your recommendations or you may develop the implementation plan during your presentation (although it is often best to have a draft plan before the meeting). Whichever method you use, an implementation plan should, at a minimum, consist of the following:

- ❒ Activity to be undertaken
- ❒ Indicator/measurement of completion/success
- ❒ Responsible parties
- ❒ Proposed dates of action
- ❒ Resources required.

Although recommendations are general, the implementation plan is specific and detailed. Your implementation plan, like your recommendations, should be SMART. Arrange the activities in the plan in a logical sequence, particularly when one task depends on another (for example, you would not want to provide training if the reporting formats are not available). To proceed quickly, try to undertake some tasks simultaneously.

Implementation plans that involve new procedures frequently must be comprehensive. It would not be helpful, for example, to implement a new inventory control procedure in some clinics and not others within a single district. Rather, all clinics reporting to that district should be trained in a short time, and they should all implement the new procedure during the same review period.

CASE STUDY

Implementation Lesson in Tanzania

Logistics advisors in Tanzania recommended adoption of a comprehensive package of improvements to the LMIS and the inventory control system. Initially, the recommendation for a pull system from SDPs to the districts was adopted. But when the time came to develop the implementation strategy, MOH officials recognized that funds were not sufficient: too many clinic-level staff would have to be trained. The system was changed to a push system between the district and SDPs.

When developing an implementation plan, ensure that the necessary resources and timing are made clear, and be prepared to alter the recommendation to suit the available resources and time.

7.5.1 Implementation Involving Training

Many implementation strategies involve some level of training. Even small changes in policy or procedure may suggest the need for formal training. Training may be needed only at the central level (for forecasting or using data for decision making, for example) or it may be needed for all personnel involved in supply management at all levels. Training is both time-consuming and costly, and an implementation strategy including training should be designed to ensure that all materials, including forms and supplies, are available for implementing the revised procedures as soon as the training ends.

A number of training strategies involving different levels of resources can be used, including:

- ❒ **TRICKLE-DOWN TRAINING.** Expert advisors train central-level staff who, in turn, train regional staff, who train district staff, who train clinic staff, and so on.

- ❒ **CENTRAL TRAINING TEAM.** Expert advisors train a team of central-level staff who conduct training at all other levels.
- ❒ **REGIONAL TRAINING TEAMS.** Expert advisors train a team of staff in each region who conduct training at all other levels.
- ❒ **TRAINING INSTITUTION.** Expert advisors train a local institution that specializes in training, and the institution's trainers train all levels.
- ❒ **TIERED TRAINING TEAMS.** Expert advisors train teams of trainers at each administrative level who teach others at the same level.

Each method has advantages and disadvantages, including varying levels of impact, the ability of the system to institutionalize the technical knowledge gained, and the ability to replicate the training in the future.

A more complete description of each strategy is outlined in *Developing National Training Strategies in Family Planning Logistics: How Hard Can It Be?* by Walter Proper and Barbara Felling. This document can be obtained from the Family Planning Logistics Management project of John Snow, Inc.

CASE STUDY

Malawi Coordination

Following a system assessment, logistics advisors visiting Malawi recommended implementing a unified LMIS system throughout the country. As a result of an effective presentation meeting, the Reproductive Health Unit was able to arrange with other local organizations (the Christian Health Association of Malawi, Central Medical Stores, MOH Training Unit, National Family Planning Council, and USAID Support to AIDS and Family Health project) to have trainers seconded for more than six months, enabling them to provide training. USAID agreed to pay the costs of training more than 1,000 people. United Nations Population Fund (UNFP) covered much of the cost of printing the new LMIS forms. The British Department for International Development increased its support for contraceptive supplies. Such a successful collaboration would not have been possible without everyone involved attending the presentation meeting.

7.6 The Logistics Advisor's Role in Assessing and Improving a Logistics System

We have just discussed how a logistics advisor can conduct an assessment of a logistics system. From this discussion, we can see that a logistics advisor needs many skills to create an appropriate assessment, including the following:

- ❒ Technical knowledge of logistics
- ❒ Ability to gather and analyze information
- ❒ Ability to prepare and prioritize appropriate questions
- ❒ Interviewing skills
- ❒ Communication skills
- ❒ Presentation skills.

During the course of an assessment, and to ensure that the activities listed in the implementation plan are carried out, the advisor may collaborate with staff from other components of a family planning program. Table 7-3 shows one example of such collaboration. You need the same skills you used to work with logistics managers.

Advisors must also be able to facilitate coordination among program units, and among programs, donors, and other agencies. The presentation and implementation meetings discussed in this chapter are also referred to as *collaboration* meetings, at which all donors and program managers meet to discuss how to best implement your recommendations. In some countries, these meetings are held on a regular basis, at least quarterly. When determining how best to use their limited budgets, donors often agree to undertake that part of your plan they believe they can best handle. For example, USAID can obtain oral contraceptives at a lower price than most other donors, but USAID-procured condoms are relatively more expensive. If your assessment reveals the need to increase the volume of condoms and pills for the program, USAID might agree to provide the pills if another donor supplies the condoms.

Your role is often to facilitate collaboration and cooperation and to encourage implementation of your proposal in your absence. The program needs to take *ownership* of the implementation plan, and your role is to facilitate its work in implementation. A working group of donors and program managers can troubleshoot any problems that arise during implementation and reallocate resources as needed. The advantages of such a group include (a) better planning and management, use of available resources, and decision making; (b) less waste; and (c) better access to necessary information and data.

TABLE 7-3. Examples of Interactions Between Advisors and Staff

FP Program Component	Examples of Interaction
Service delivery	▪ Coordinate delivery of supplies to health centers. ▪ Conduct interviews to determine if logistics training is needed. ▪ Provide information on storage procedures to SDPs.
Management information systems	▪ Share logistics information with the health information system (HIS).
Information, education, and communications	▪ Plan for the impact that education will have on increased use of contraceptives.
Training	▪ Include logistics supervision in supervisor training. ▪ Incorporate logistics training into nurse and pharmacy technician training.
Personnel management	▪ Write job requirements for logistics personnel.
Policy	▪ Provide product selection information (i.e., method mix) for decision making.
Finance	▪ Coordinate forecasting information with funding needs. ▪ Prepare a budget for logistics activities.
Research	▪ Study the impact of logistics system improvements. ▪ Conduct a study on how to improve distribution of contraceptives.

7.7 Key Concepts: Five Concepts in an Assessment

Five key concepts apply to a logistics system assessment:

- ❒ **CUSTOMER SERVICE.** During an assessment, you serve many customers: the agency sponsoring the assessment, the program being assessed, donors who will support the implementation plan, and other involved agencies. Remember, ultimately, you should design your assessment to improve service to the client who needs the contraceptive or medication.

- ❒ **DATA FOR DECISION MAKING.** In an assessment, you should gather all data that will help you make a decision about appropriate actions to alleviate program weaknesses. You should not spend time gathering data that will not assist you in identifying system strengths and weaknesses. Additionally, you should not present data unless they will assist decision makers in reviewing

your recommendations and creating the implementation plan. The plan should also include mechanisms for ensuring that decision makers are receiving data on how implementation of the plan is proceeding.

- ❒ **SYSTEMS APPROACH.** Your implementation activities will affect other program functions (MIS, finance, research, and so on) and will be affected by these functions (policy and IEC, especially). In designing an implementation strategy, you must keep all program goals and functions in mind.
- ❒ **POLICY-LEVEL VISIBILITY.** A system assessment report is of little use unless policy-level managers are aware of the strengths and weaknesses of their system, are convinced that action is needed, and then take action. It is essential that your presentation of recommendations be attended by those policy-level managers who will support the program managers who, in turn, will implement the plan.
- ❒ **CONTINUOUS IMPROVEMENT.** Your assessment and implementation plan can have an impact beyond the scope of immediate actions. For example, implementation of a more comprehensive LMIS can improve the ability of program managers to use data for their decision making. Your plan should include a way for managers to continue improvement long after your consultancy has ended. Your implementation plan should also include a monitoring component. For example, by rescoring individual indicators and composite indicators, program staff can understand how well their actions are helping to eliminate weaknesses, and can review the implementation plan accordingly, continuing the work you have begun.

7.8 Chapter Summary

In this chapter, you learned the following:

1. The purpose of conducting a logistics system assessment—
   - ❒ Assess the entire system's strengths and weaknesses.
   - ❒ Present the results of your assessment (your *findings*) to senior managers and policymakers.
   - ❒ Present your recommendations for reducing or eliminating weaknesses.
   - ❒ Propose an implementation plan with specific steps, based on your recommendations.

2. The steps in conducting a logistics system assessment as a team—

   - ❒ Determine the size of your assessment team.
   - ❒ Determine the length of time needed to conduct your assessment.
   - ❒ Design an assessment instrument with appropriate indicators.
   - ❒ Schedule site visits with your team.
   - ❒ Make site visits and collect and analyze data.
   - ❒ Write a draft report of your findings and recommendations.
   - ❒ Present your findings and recommendations.
   - ❒ Prepare an implementation plan with your counterpart and other stakeholders.
   - ❒ Write a final report and disseminate it.

3. How to use and select indicators to measure system performance. Five individual indicators for logistics, including the following—

   - ❒ Pipeline wastage
   - ❒ Percentage of storage capacity meeting acceptable standards
   - ❒ Frequency of stockouts
   - ❒ Percentage of SDPs stocked according to plan
   - ❒ Percentage of key personnel trained in contraceptive logistics.

4. How to use the composite indicator, with its eight elements—

   - ❒ LMIS
   - ❒ Forecasting
   - ❒ Procurement
   - ❒ Warehousing and storage
   - ❒ Distribution
   - ❒ Organization and staffing
   - ❒ Policy
   - ❒ Adaptability.

Include both the program's ability to perform the task, and its ability to perform without outside assistance (sustainability).

5. How to write recommendations for system improvement—
   - ❒ Define or state the issue.
   - ❒ State the consequences of the issue.
   - ❒ Suggest a course of action or actions that can be taken to resolve the issue.
   - ❒ Identify who should take action on each recommendation.
   - ❒ Describe the levels of the logistics system affected by the recommendations.
   - ❒ Identify the types of resources necessary to complete the actions recommended.
   - ❒ Identify the timeframe required to complete the actions.
   - ❒ Describe the expected outcome of the action, if it is taken.
6. How to construct an implementation strategy for system improvement—
   - ❒ Describe in detail how to carry out your recommendations, including the activity to be undertaken, the responsible parties, measures of completion or success, proposed dates of action, and resources required.
7. Your role in assessing and improving a logistics system—
   - ❒ Use your skills as a logistics expert and consultant.
   - ❒ Coordinate work with other components of the family planning program.
   - ❒ Assist in collaboration among donors, the program, and other agencies in implementation.

Glossary

adjustments. Changes recorded when quantities of a product are issued to or received from other facilities at the same level of the pipeline. Also, sometimes used to explain administrative corrections—e.g., a physical stock count that is different from quantity listed on stockkeeping records.

aggregate summary report. A summary report that combines data from different facilities at the same level, or may combine data from different levels.

bin card. A stockkeeping record that keeps information about a single lot of a single product.

clients. People who receive supplies. Used interchangeably with *customers* and *users* throughout this handbook.

commodities. Used interchangeably with stock, goods, products, supplies, and other terms in this handbook to refer to all the items that flow through a logistics system.

consumption records. Records kept on products consumed. See also *stockkeeping records* and *transaction records*.

customers. People who receive supplies. Used interchangeably with *users* and *clients* throughout this handbook.

daily activity register. Record that gives the quantity of each product dispensed to a user by user name or user number and by date. Used only at service delivery points, such as clinics, hospitals, or community-based distributors.

demographic data. Information on populations, such as the number of women of reproductive age or percentage of women receiving contraceptives from public and private sector sources. Usually collected through surveys and censuses.

dispensed to user data. Information on the quantity of products actually given to customers. Sometimes referred to simply as dispensed or consumption data. Also see *issues data*.

distribution system capacity forecast. Forecast that measures the volume of the pipeline (i.e., storage facilities and transportation links) to determine the volume of supplies that can be transported and stored in the system. Generally recommended as a way to check on other forecasts.

emergency order point. The level of stock that triggers an emergency order, regardless of the timing within the review period. It is always lower than the min.

essential data items. These include stock on hand, consumption, and losses and adjustments.

feedback report. A report that (a) informs lower levels about their performance, in some cases providing additional information about reporting from other facilities; and (b) informs managers at higher levels about how the system is functioning.

forecasting. Management function that estimates the quantities of products a program will dispense to users for a specific period of time in the future.

goods. Used interchangeably with stock, commodities, supplies, products, and other terms in this handbook to refer to all the items that flow through a logistics system.

integrated system. A logistics system that supplies and manages products for more than one program. Also see *vertical system*.

inventory control card. An individual stockkeeping card that keeps information about all lots of a product.

issue voucher. Transaction record that lists the items and quantities of products issued to a facility.

issues data. Information on the quantity of goods shipped from one level of a system to another (not quantities given to customers or users). Also see *dispensed to user data*.

lead time. The time between when new stock is ordered and when it is received and available for use. Lead time varies, depending on the system, speed of deliveries, availability and reliability of transport, and, sometimes, weather.

lead-time stock level. In a max-min system, the level of stock used between the time new stock is ordered and when it is received and available for use.

logistics data forecast. Forecast based on dispensed to user data from the service delivery level. When these data are unavailable, issues data from the lowest possible level can be substituted.

losses. The quantity of stock removed from the pipeline for any reason other than consumption by clients (e.g., losses, expiration, and damage).

maximum-minimum inventory control system. A system to control supplies so that quantities in stock generally fall within an established range. Abbreviated in this handbook as *max-min system*.

maximum stock level/maximum quantity. The level of stock above which inventory levels should not rise under normal conditions. Abbreviated in this handbook as the *max*. Also see *minimum stock level/minimum quantity*.

minimum stock level/minimum quantity. The level of stock at which actions to replenish inventory should occur under normal circumstances. Abbreviated in this handbook as *min*. Also see *maximum stock level/maximum quantity*.

packing slip. Transaction record sent with products that lists the names and quantities of each product shipped. Usually paired with a receiving record.

physical inventory. The process of counting by hand the total number of units of each commodity in a store or health facility at any given time.

pipeline. The entire chain of storage facilities and transportation links through which supplies move from manufacturer to consumer, including port facilities, the central warehouse, regional warehouses, district warehouses, all service delivery points, and transport vehicles.

products. Used interchangeably with stock, commodities, goods, supplies, and other terms in this handbook to refer to all the items that flow through a logistics system.

pull system. A distribution system in which the personnel who receive the supplies determine the quantities to order.

push system. A distribution system in which the personnel who issue the supplies determine the quantities to be issued.

rate of consumption. The average quantity of stock dispensed to users during a particular time period.

receiving record. Transaction record that lists the names and quantities of items received. Usually paired with a packing slip.

report and request report. A report and request report in a pull system is a summary report that reports logistics data to the next higher level and requests new supplies.

requisition and issue voucher. Transaction record used in a pull distribution system that lists the items and quantities requested by a facility and the quantity actually issued.

review period. The routine interval of time between assessments of stock levels to determine if an order should be placed.

review period stock. The quantity of stock dispensed during a normal review period.

safety stock. The buffer, cushion, or reserve stock kept on hand to protect against stockouts caused by delayed deliveries or markedly increased demand.

service delivery point. Any facility that serves clients directly and where clients (users) receive supplies. Service delivery points are frequently clinics and hospitals, but may be district-level hospitals.

service statistics. Data collected about clients and their visits to SDPs. Used in a variety of ways, including for forecasting.

shelf life. The length of time a product may be stored without affecting its usability, safety, purity, or potency.

simple report. A summary report that lists the name of the facility, reporting period, beginning stock on hand, receipts, quantities issued or dispensed, losses and adjustments, and ending stock on hand for each product.

stock. Used interchangeably with commodities, goods, products, supplies, and other terms in this handbook to refer to all the items that flow through a logistics system.

stock card. A generic name for either an inventory control card or a bin card.

stock on hand. The quantity of usable stock in inventory at a particular point in time. (Items that are unusable are not considered part of stock on hand. They are considered losses to the system.)

stockkeeping records. Records kept on products in storage. Also see *transaction records* and *consumption records*.

stores ledger. A stockkeeping record that keeps information about all lots of a product.

summary report. Report that includes all essential data items for a specific facility and a specific time period (usually monthly or quarterly).

supplies. Used interchangeably with stock, commodities, goods, products, and other terms in this handbook to refer to all the items that flow through a logistics system.

tick sheet. Consumption record that records the quantity of each product dispensed to users without recording the day or client.

transaction records. Records kept on products being moved from one facility to another. Also see *stockkeeping records* and *consumption records*.

users. People who receive supplies. Used interchangeably with *clients* and *customers* throughout this handbook.

vertical system. A logistics system that supplies and manages products for only one program. Also see *integrated system*.

Suggested Reading List

Bertrand, J. T., R. J. Magnani, and J. C. Knowles. 1994. *Handbook of Indicators for Family Planning Program Evaluation*. Chapel Hill: MEASURE Evaluation, Carolina Population Center of the University of North Carolina.

Centers for Disease Control and Prevention. 1993. *Family Planning Logistics Guidelines* (English, French, or Spanish). Atlanta: Centers for Disease Control and Prevention.

Centers for Disease Control and Prevention (CDC) and Family Planning Logistics Management (FPLM). 1998. *The Pocket Guide to Managing Contraceptive Supplies*. (English and French) Atlanta: CDC and FPLM/ John Snow, Inc., for USAID.

Dixon, Glenn. 1996. *Contraceptive Logistics Guidance for Refugee Settings*. Arlington, Va.: Family Planning Logistics Management/ John Snow, Inc., for USAID.

Felling, Barbara, and Walter Proper. 1993. *Developing National Training Strategies in Family Planning Logistics: How Hard Can It Be?* Arlington, Va.: Family Planning Logistics Management/John Snow, Inc., for USAID.

Family Planning Logistics Management (FPLM). 1999. *Contraceptive Fact Sheets* (English, French, or Spanish). Arlington, Va.: FPLM/John Snow, Inc., for USAID.

Family Planning Logistics Management (FPLM). 1999. 8 x 11 Contraceptive Warehouse Charts (English, French, or Spanish). Arlington, Va.: FPLM/John Snow, Inc., for USAID.

Family Planning Logistics Management (FPLM). 1994. *Pest Management for Warehouses Storing Contraceptive Products in Developing Countries*. Arlington, Va.: FPLM/John Snow, Inc., for USAID.

Family Planning Logistics Management (FPLM). 2000. *Programs That Deliver: Logistics' Contributions to Better Health in Developing Countries*. Arlington, Va.: FPLM/John Snow, Inc., for USAID.

Management Sciences for Health and World Health Organization. 1997. *Managing Drug Supply, 2nd Edition*. West Hartford, Conn.: Kumarian Press, Inc.

Owens, Rich. 2000. *Contraceptive Forecasting Handbook for Family Planning Programs*. Arlington, Va.: Family Planning Logistics Management/John Snow, Inc., for USAID.

Owens, Rich. 1994. *Forecasting Cookbook* (French). Arlington, Va.: Family Planning Logistics Management/John Snow, Inc., for USAID.

Owens, Rich, and Tim Warner. 1996. *Concepts of Logistics System Design*. Arlington, Va.: Family Planning Logistics Management/John Snow, Inc., for USAID.

MEASURE Evaluation, Family Planning Logistics Management (FPLM), and Centers for Disease Control and Prevention. 1999. *Composite Indicators* (English, French, and Spanish). Arlington, Va.: FPLM/ John Snow, Inc., for USAID.

USAID

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