INVENTORY MANAGEMENT ASSESSMENT TOOL (IMAT)

version 1

This 10-page tool is available in hard copy or on an Excel spreadsheet and includes:

- **Instructions and forms for collecting basic data on a representative sample of 25 products**
- **Calculation sheets to produce indicators and graphs**
- **Guidelines for analysis and recommendations for improvement**

This tool for improving warehouse performance was developed by the INFORM Program at Management Sciences for Health (MSH) and tested with the help of the Hôpital Universitaire d'Etat d'Haïti (Port-au-Prince), the Family Planning Association of Nepal (Kathmandu), and the Nepal Fertility Care Center (Kathmandu). MSH is a nonprofit organization dedicated to strengthening health programs worldwide. For information on MSH's tools, training, and technical assistance, contact:

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INVENTORY MANAGEMENT ASSESSMENT TOOL (IMAT)
A. INTRODUCTION

PURPOSE/ OVERVIEW

The Inventory Management Assessment Tool (IMAT) produces indicators to assess the effectiveness of record-keeping and stock management practices in a warehouse and provides suggestions for improvement. The tool guides users through the process of collecting data (based on the stock levels of a group of representative products over a 100 day period), calculating indicators, analyzing and interpreting the results, and identifying appropriate strategies for improvement. The IMAT can be conducted at a single warehouse, health facility, or other institution that manages stock. It can also be used at different levels of the health system to examine record-keeping and stock management practices throughout the country. Evaluators should plan for a half-day to implement the IMAT at each site.

INDICATORS

The IMAT uses four indicators to evaluate stock management practices. Used together, they provide a measurement of the effectiveness of record-keeping and stock level monitoring systems. These indicators are based on the pharmaceutical logistics indicators detailed in the MSH guide "Rapid Pharmaceutical Management Assessment: An Indicator-Based Approach."

Two indicators measure the accuracy of record-keeping:

Indicator 1: **Percentage of stock records that is accurate:** Indicates the quality of the record-keeping system by identifying the proportion of records that is accurate. Two supplementary indicators are provided to analyze the proportion of records that is inaccurate: the first examines the proportion of recorded balances that is less than physical counts; the second examines the proportion of recorded balances that is greater than physical counts.

Indicator 2: **Ratio of inventory variation to total stock:** Indicates the severity of record-keeping errors.

Two indicators measure the effectiveness of monitoring stock levels:

Indicator 3: **Percentage of products in stock:** Measures the system's effectiveness in maintaining a range of products in stock (at the time of the assessment).

Indicator 4: **Average percentage of time that products are out of stock:** Indicates the system's capacity to maintain a constant supply of products over time by minimizing the duration of stockouts.

INTENDED USERS

The IMAT is intended as a team exercise for identifying record-keeping and stock management problems and identifying solutions to improve them. The assessment should be led by managers who are responsible for the warehouse's overall performance, in collaboration with other warehouse staff. The IMAT can also be conducted by a Technical Assistant as part of a consultancy.

FREQUENCY OF ASSESSMENT

The IMAT can be used to calculate a baseline of inventory management at a warehouse and to conduct regular follow-up evaluations, perhaps once a year. It does not replace the need for routine monitoring of the warehouse's management practices.

ORGANIZATION OF THE TOOL

This tool can be used electronically or manually. In either case, the user starts by recording the data in the "Data Collection and Calculation" sheet. The user may either follow the instructions to calculate the indicators manually, or if the user has Excel, the tool can be loaded as a spreadsheet in order to facilitate calculations. The tool contains the following 9 sections:

Cover sheet: Basic information about the tool, including MSH contact information.
A. Introduction: An overview of the purpose and use of the IMAT.
B. Instructions: An explanation of how to use the tool to conduct the assessment.
C. Collection&Calculation: A data collection form. Those who receive this tool in electronic format can enter their data directly into this sheet to facilitate tabulation.
D. Results: The indicator results are displayed on this page. The page also includes a description of the indicators, their ideal values, and possible ranges.
E. Graphs: A graphical representation of the results.
F. Analysis: Analysis and interpretation guidelines to help understand indicator results and consider suggestions for improvement. Space is provided to write actions for improvement.
Annex I: Recommendations and suggestions for improving stock management and record-keeping procedures.
Annex II: Sample stock card referred to in the Instructions and Recommendations sheets.

INVENTORY MANAGEMENT ASSESSMENT TOOL (IMAT)

B. INSTRUCTIONS

Requirements

Set aside a half-day to implement the IMAT. It is recommended that you conduct the assessment at the beginning of the day, before any new transactions have taken place. You will need basic writing implements and a calculator.

Spreadsheet users will require:

- An IBM-compatible computer powerful enough to run Microsoft Excel Version 5.0 or higher
- Microsoft Excel spreadsheet software program, Version 5.0 or higher
- A compatible printer that can print landscape orientation
- Moderate spreadsheet skills

Step 1: Getting started

1a. Save a blank copy of the IMAT spreadsheet for future use

If you have received an electronic copy of this form, save this file so that you will have a blank copy to conduct this assessment again at a later time. Likewise, if you are conducting the study at several warehouses or facilities, create a separate copy for each site.

1b. Update stock records if recent transactions have not been recorded

Determine if stock records are up-to-date. If unrecorded receipts and distributions can be adjusted easily, before beginning the assessment, this should be done, and the recorded totals should reflect the adjustment. If the records are badly behind (e.g., several weeks or months of receipts or distributions have not been entered), use the actual recorded totals on the day of the assessment, and make a note that records are not current.

1c. Print out the "Collection&Calculation" sheet

Make sure you have a hard copy of the "Data Collection and Calculation" Sheet before you start collecting your data. (Click on the "Collection&Calculation" tab to print it out).

Step 2: Collect the data

2a. Determine the beginning of the assessment period

The assessment period should cover the previous 100 calendar days. To identify the beginning of the assessment period, use a calendar to count backward 14 weeks and 2 days (this equals 100 calendar days). Do not estimate the start date by counting back 3 months and 10 days as this may result in over- or under-counting.

2b. Select the products to include in your study

Make a list of the most frequently distributed products (up to 25) that you normally stock in your warehouse (source: reports or warehouse staff). Write these products in column B. Ideally, your list should include products from different categories (see box below). As you write the list of products, record the corresponding issue unit (i.e.: vial, liter, tab, condom, packet, etc.) in column C.

Example: Suggestions of the types of products to include:

- For a **Central Medical Store**, the list should probably include antibiotics, cardiovascular drugs, analgesics, parenteral solutions, and representatives of therapeutic categories used to treat diseases important in the health care system.
- For a **Family Planning NGO**, the list should include contraceptives, consumables (such as needles, syringes, and gloves), and IEC materials.
- For an **Immunization Program**, the list should include vaccines and consumables (such as needles, syringes, cotton, alcohol, and kerosene).

If you are conducting the IMAT at several institutions (for example, at the national, regional, district, and health center levels), try to use the same products at each level. It is recommended that at least 80% of the products on the list be used at all levels.

2c. Count the number of DAYS each product was out of stock within the assessment period

For each product, refer to the transactions on the stock card during the past 100 days. For each stockout during the 100 day period, add up the number of DAYS the product had a 0 balance. Write the total number of DAYS out of stock in column D.

Example: Determining the number of days out of stock

Refer to the sample stock card provided in Annex C as you read the following instructions.

- Starting with the beginning of the assessment period (in our example the assessment period begins on April 26), identify the first time there was a 0 balance. (According to the sample stock card, the first stockout for chloroquine was on May 4.)
- Count the number of days between the day when the 0 balance began and the next receipt of stock. In this example the stockout began on May 4 and continued until a shipment arrived on May 11, it was out of stock for 7 days (11 - 4 = 7).
- Identify the next stockout (June 8).
- Count the number of days until the next receipt (9 days).
- Continue until you have counted the number of days per stockout for each time the product had a 0 balance during the 100 day assessment period.
- Total the number of days the product was out of stock. (7 days + 9 days = 16 days). In this example, you would write 16 in column D.

2d. Record the current stock card balance for each product

Record the most recent balance indicated on the stock card in column E. Do not correct any mathematical errors.

2e. Conduct an inventory to record the current physical balance for each product

For each product on your list, count the physical quantities in the warehouse. Do not include expired products in the count. Record the findings in column F.

Step 3: Calculate the indicators

Option A To calculate the indicators using the spreadsheet:

Enter the data in columns B-F into the table on the "Data Collection and Calculation" sheet. (Note that you must enter 0 for all zero values.) The data in the shaded areas (columns G and H, the total number of products (N), the totals row (of columns D-H), and the counts at the bottom of the page (I-L)) will be calculated automatically. The indicators will be calculated and displayed on the "Results" sheet. Continue to Step 4 to analyze the findings.

Option B To calculate the indicators manually:

3a. Tabulate and fill in columns G and H on the "Data Collection and Calculation" sheet.

3b. Total columns D through H in the "Totals" row provided at the bottom of the table.

3c. Using your recorded numbers, fill in the spaces at the bottom of the sheet by counting: the number of products in the assessment (N), the number of zeros in column G (I), the number of negative numbers in column G (J), the number of positive numbers in column G (K), and the total number of products present (not zero) from column F (L).

3d. Proceed to the "Results" sheet to calculate the indicators using the formulas provided. Then continue to step 4.

Step 4: Analyze the findings

There are three sections included in the analysis: "Results," "Graphs," and "Analysis." Print out these sheets (the spreadsheet is formatted to display the indicator results on each sheet) and use them together to understand your results and identify appropriate solutions. If you do not have Excel, record your results in the appropriate space on each page.

4a. The spreadsheet will display the indicators graphically on the "Graphs" sheet. Although it is not necessary, those who do not have Excel may find it helpful to plot their own graphs for a visual representation of the indicator results.

4b. Consult the analysis and interpretation guidelines provided on the "Analysis" sheet for an explanation of the possible causes of your results. Space is provided on this sheet for you to write the actions you will take to improve record-keeping and stock management practices at your warehouse.

INVENTORY MANAGEMENT ASSESSMENT TOOL (IMAT)
C. DATA COLLECTION AND CALCULATION SHEET

ORGANIZATION _____

TODAY'S DATE _____

A	B	C	D	E	F	G	H
#	Name of product	Unit	# DAYS out of stock within the last 100 days. Starting date / /	Last stock balance recorded on stock cards. *Do not correct errors!*	Physical quantity (based on actual count)	Difference between recorded and physical values *(E-F)*	Absolute value of G |G| *(remove minus signs from results in column G)*
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							

N= _____ **Totals:** _____ _____ _____ _____ _____

Total number of products in the study

I Count of records that are accurate (number of zeros in column G) _____

J Count of records less than physical counts (numb. of negative results in column G) _____

K Count of records greater than physical counts (numb. positive results in column G) _____

L Total products in stock (total number of products present (not zero) in column F) _____

The maximum for L is N, the number of products in the study.

INVENTORY MANAGEMENT ASSESSMENT TOOL (IMAT)

D. RESULTS

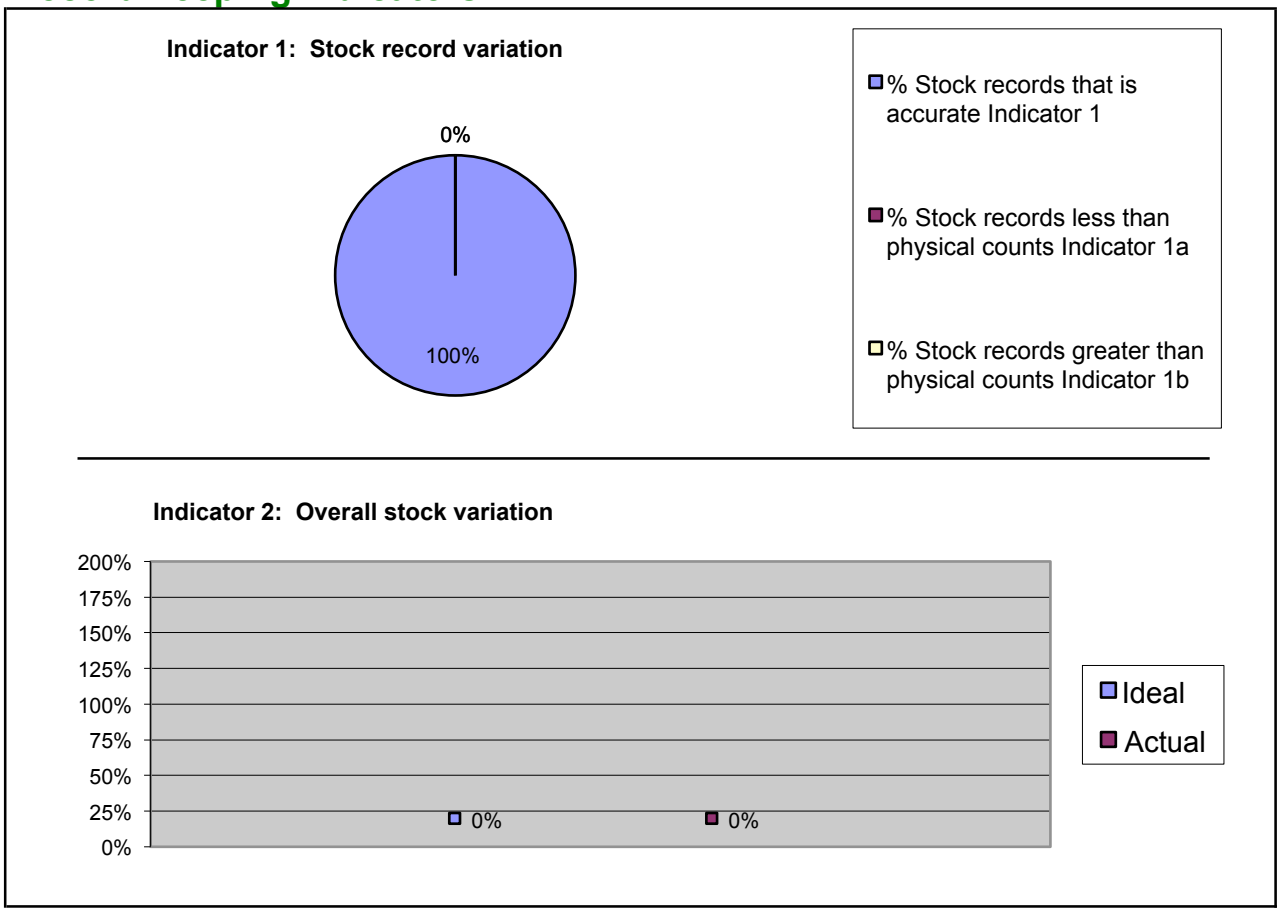
If you are using the Excel version of the IMAT: The spreadsheet will automatically display your results based on the data you entered on the "Data Collection and Calculation" sheet. Print this page out and look at it in conjunction with the "Graphs" and "Analysis" pages. *If you are using the paper version of the IMAT:* Use the formulas provided below to calculate your indicator results and then study this page in conjunction with the "Graphs" and "Analysis" sheets.

INDICATOR	PURPOSE	FORMULA	RESULTS	IDEAL	RANGE
Record-keeping indicators: **Use indicators 1 (including 1a and 1b) and 2 together to determine the accuracy of your record-keeping system.**					
Indicator 1: Percentage of stock records that is accurate	Indicates the quality of the record-keeping system by identifying the proportion of records that is accurate.	I / N x100	INDICATOR 1	100%	0 to 100%
Indicator 1a: Percentage of recorded balances that is less than physical counts	Indicates the proportion of records that under-count physical counts.	J / N x100	INDICATOR 1A	0%	0 to 100%
Indicator 1b: Percentage of recorded balances that is greater than physical counts	Indicates the proportion of records that over-count physical counts.	K / N x100	INDICATOR 1B	0%	0 to 100%
Indicator 2: Ratio of inventory variation to physical stock (expressed as a percentage)	Indicates the severity of record-keeping errors.	Total Column H / Total Column F x100	INDICATOR 2	0%	0 to total of column F x100
Stock level monitoring indicators: **Use indicators 3 and 4 to determine your system's capacity to maintain a range of products in stock.**					
Indicator 3: Percentage of products available	Measures the system's effectiveness in maintaining a full range of products in stock (at the time of the assessment).	L / N x100	INDICATOR 3	100%	0 to 100%
Indicator 4: Average percentage of time that products are out of stock	Indicates the system's capacity to maintain a constant supply of products over time by minimizing the duration of stockouts.	Total Column D / N x 100 days x100	INDICATOR 4	0%	0 to 100%

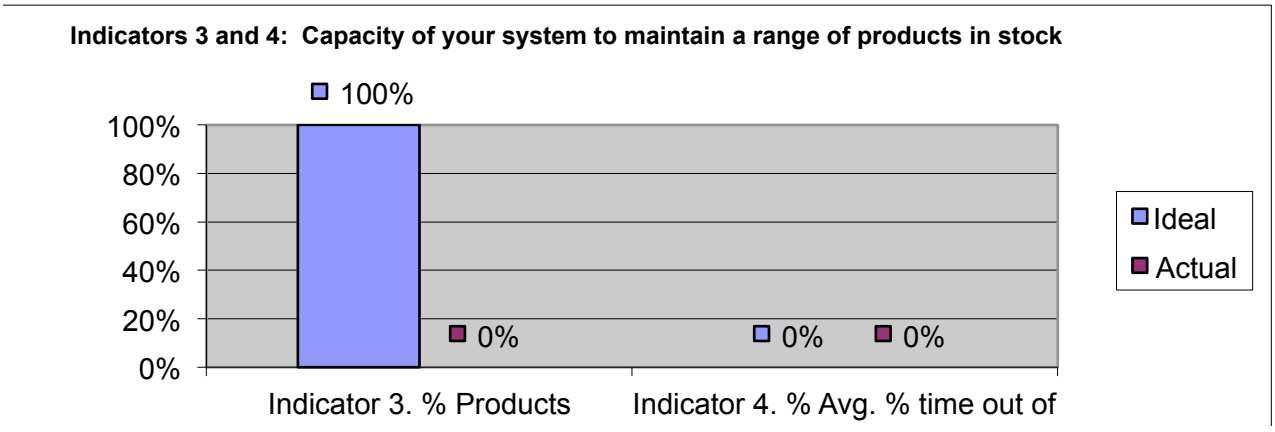
INVENTORY MANAGEMENT ASSESSMENT TOOL (IMAT)
E. GRAPHS OF INDICATOR RESULTS

If you are using the Excel version of the IMAT: These charts are formatted to automatically display your indicator results. Print this page out and look at it in conjunction with the "Results" and "Analysis" pages.
If you are using the paper version of the IMAT: Simply plot your indicators based on your calculations on the "Results" sheet. For indicator 1, make a pie chart to show: the proportion of stock records that is accurate, the proportion that is less than physical counts, and the proportion that is greater than physical counts. For indicators 2 and 3, draw bars to show your results. Use this page in conjunction with the "Results" and "Analysis" pages.

Record-keeping indicators



Stock level indicators



INVENTORY MANAGEMENT ASSESSMENT TOOL (IMAT)

F. ANALYSIS GUIDELINES

Use this page in conjunction with the "Results" and "Graphs" sheets to analyze your performance and identify some of the possible explanations for your results and next steps. T actions to improve your performance and write them in the last column. (Note that the possible causes and next steps that are suggested are not exhaustive. Brainstorm with your refer to annex I for additional suggestions).

If you are using the Excel version of the IMAT: This page will automatically display your indicator results. Simply print it out and use it as above. *If you are using the paper version IMAT:* Copy your indicator results from the "Results" page into the "Indicator" column and then use this sheet as described above.

Record-keeping indicators

INDICATOR	ASK:	IF SO...*	SUGGESTED NEXT STEPS:	OUR ACTION PLAN
INDICATOR 1 Percentage of stock records that is accurate Our result: ____ Ideal: 100% Range: 0 to 100%	Is the result at the high end of the range?	Good. If your result is close to the ideal, your record-keeping appears accurate.	Congratulate your staff.	
		If there is still room for improvement, it is likely that there are problems with only a few products.	Look down column G ("Collection&Calculation" sheet) to identify products that have discrepancies. If they are processed differently or received from different sources, standardize procedures for all products.	
	Is the result at the low end of the range?	Is the same unit size used for procuring, receiving, and shipping?	Use the same unit size (the smallest unit in which a product is dispensed) at all levels.	
		Are physical inventories infrequent?	Conduct periodic inventories and reconcile records.	
		Is the same product stored in more than one location?	Consolidate products in one location.	
			Record store location on stock cards.	
		There may be several other reasons why many of your records are inaccurate.	Refer to indicators 1a and 1b to determine if problems occur when receiving or distributing products.	
INDICATOR 1A Percentage of recorded balances that is less than physical counts Our result: ____ Ideal: 0% Range: 0 to 100%	Is the result at the high end of the range?	Problems seem to occur when recording receipts of supplies.	Verify that all receipts are recorded.	
	Is the result at the low end of the range?	Your system for recording receipts seems to be working.	If indicator 1 identified recording discrepancies, your problems probably occur during distribution. Continue to indicator 1B.	
INDICATOR 1B Percentage of recorded balances that is greater than physical counts Our result: ____ Ideal: 0% Range: 0 to 100%	Is the result at the high end of the range?	In many cases physical stock is less than your records indicate. Problems seem to occur when recording issues of supplies.	Verify that: Stock issues are recorded correctly. Adjustments (for expired or damaged items removed from your stock) are recorded correctly.	
		Is it possible that products have been stolen?	Establish measures to improve security.	
	Is the result at the low end of the range?	Your system for recording issues seems to be working.	If indicator 1 identified recording discrepancies, your problems probably occur during receipt.	

Record-keeping indicators, cont.

INDICATOR	ASK:	IF SO ...*	SUGGESTED NEXT STEPS:	OUR ACTION PLAN
INDICATOR 2 Ratio of inventory variation to total stock Our result: ____ Ideal: 0% Range: 0 to total of column Fx100	Is the result at the high end of the range?	There appears to be a general problem with the record-keeping system. It is possible that there are either many products with insignificant errors or a few products with large errors.	Develop procedures to ensure that: Stock cards are updated regularly. Stock cards are verified in order to reduce math and counting errors.	
	Is the result at the low end of the range?	Good. Your record-keeping system appears to be up to date.	Congratulate your staff.	

Stock level indicators

INDICATOR	ASK:	IF SO ...*	SUGGESTED NEXT STEPS:	OUR ACTION PLAN
INDICATOR 3 Percentage of products in stock Our result: ____ Ideal: 100% Range: 0 to 100%	Is the result at the high end of the range?	Great! If the result is close to the ideal, the full range of products is in stock.	Congratulate your staff.	
		If there is still room for improvement, consider the suggested next steps.	Ask the following questions and then identify appropriate strategies based on your response. Is your supplier able to provide you with the quantities you request? Do you maintain an adequate minimum stock which takes into account variation in lead time? Is there enough space in the warehouse to handle receiving and distribution in separate areas? Have there been unanticipated changes in the demand for products because of new activities? If so, consider making a special order to take such changes into account.	
	Is the result at the low end of the range?	You have problems maintaining appropriate stock levels.		
INDICATOR 4 Average percentage of time out of stock Our result: ____ Ideal: 0% Range: 0 to 100%	Is the result at the low end of the range?	Good. If your result is close to the ideal, your stock level monitoring system appears to work well.	Congratulate your staff.	
		If there is still room for improvement, consider the suggested next steps.	Consider the following suggestions for improving stock availability: Increase the minimum stock levels to account for delays in deliveries. (It may be necessary to increase your lead time estimates.) Try to monitor stock levels more frequently. Update and write minimum stock levels on stock cards and check against them with each distribution.	
	Is the result at the high end of the range?	Your system is not responsive to stockouts.		

*Note: Math errors on stock cards and/or stock records that are not kept up-to-date might explain some of your results, but do not excuse poor performance. Implement procedure these errors (as suggested above) and then conduct the IMAT again to identify other sources of problems that might exist in your warehouse.

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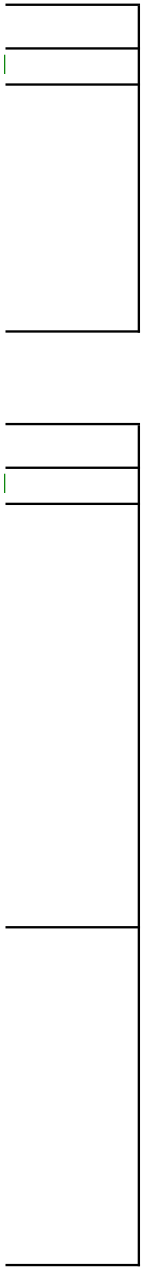

es to rectify

INVENTORY MANAGEMENT ASSESSMENT TOOL (IMAT)
ANNEX I: RECOMMENDED MANAGEMENT PROCEDURES

RECOMMENDED PROCEDURE	RATIONALE	INSTRUCTIONS (*Refer to the sample stock card in Annex II for an example.*)
Recommendations for improving record-keeping practices		
Maintain stock cards accurate and up-to-date.	Updating stock cards after each transaction and verifying calculations regularly will ensure accuracy, thus helping in ordering and distributing.	Warehouse staff should record each transaction (stock in and out) as it occurs and should record and double-check the new balance. The supervisor should regularly review stock cards to verify that transactions are entered immediately, that calculations are accurate, and that balances reported on the stock card reflect the physical stock levels.
Recommendations for improving stock level monitoring practices		
Use Average Monthly Consumption (AMC) as a basis for estimating reorder quantities.[1]	Average Monthly Consumption helps adjust for seasonal variation and minimizes the effect of stockouts.	Determine "x," the number of months to be averaged (usually 3 or 6). Then, for each product, add the monthly consumption over the past x months, then divide by x. To ensure that AMC is always up-to-date, recalculate the AMC at the end of each month.
Convert current stock balances into months of stock.	Knowing how long the stock on hand will last helps determine if supplies need to be ordered urgently.	For each product, divide the balance on hand by its AMC.
Set maximum and minimum stock levels (max-min system). *Use the max-min system to monitor stock levels:* If the quantity on hand is at or below the minimum stock level, place an order. *Use the max-min system to determine how much to order:* At each ordering period, subtract the quantity on hand + the quantity on order from the maximum stock level.	By allowing the warehouse to monitor stock levels rationally, the max-min system can prevent stockouts and frequent orders of small quantities.	*To determine the number of months of stock to set as minimum & maximum (to assist in monitoring & ordering), follow steps a-d. To calculate minimum & maximum stock levels per product, follow steps e-f.* a) Write down the ideal number of months between each order. **Procurement Period:** [ ] b) Write down the number of months between placing an order and receiving the supplies. **Lead Time:**[2] [ ] c) Multiply b x 2. **Minimum number of months of stock:** [ ] d) Add a + c. **Maximum number of months of stock:** [ ] e) Multiply c x AMC. **Minimum stock level:** [ ] f) Multiply d x AMC. **Maximum stock level:** [ ]

1 For quantifying drug requirements for long-term procurement purposes, it is recommended that program managers and procurement officers calculate and compare both consumption-based and morbidity-based estimations. Refer to chapter 14 of Managing Drug Supply (see below) for more information.

2 Consider the variation in lead time to estimate the amount of stock you will need to avoid stock out. If lead times vary greatly, it is recommended that you use the maximum lead time. See chapter 15 of Managing Drug Supply.

Consult the following references:

Binzen, Suzanna. "Pocket Guide to Managing Contraceptive Supplies," Centers for Disease Control and Prevention, Atlanta, 1998.

Binzen, Suzanna C., Suttenfield, Linda J., Wolff, James A. "Getting Contraceptives to the Client," *The Family Planning Manager's Handbook: Basic Skills and Tools for Managing Family Planning Programs*, W. Hartford, CT: Kumarian Press, 1991.

Management Sciences for Health and the World Health Organization. *Managing Drug Supply: The Selection, Procurement, Distribution, and Use of Pharmaceuticals*. 2d.ed. W. Hartford, CT: Kumarian Press, 1997.

For more information on conducting a complete indicator-based assessment, refer to the "Rapid Pharmaceutical Management Assessment: An Indicator-Based Approach." Boston: Management Sciences for Health, 1995.

INVENTORY MANAGEMENT ASSESSMENT TOOL (IMAT)
ANNEX II: SAMPLE STOCK CARD

GENERIC NAME: Chloroquine
ISSUE UNIT: 1Tab

Complete the table below in pencil. Update the AMC, MAX/MIN stock levels at the end of each month.

DATE OF LAST UPDATE:	**30-Jul-98**		
LOCATION IN WAREHOUSE	**B1-1**		
PROCUREMENT PERIOD (IN MONTHS)	**2**		
LEAD TIME (IN MONTHS)	**1**		
AVERAGE MONTHLY CONSUMPTION (AMC)	**35,833**		
MINIMUM NUMBER OF MONTHS OF STOCK	**4**	MIN STOCK	**143333**
MAXIMUM NUMBER OF MONTHS OF STOCK	**5**	MAX STOCK	**179167**

**Calculate the monthly consumption at the end of each month*

DATE	RECEIVED FROM / DISTRIBUTED TO	QTY RECEIVED	QTY DIST.	BALANCE	SIGNATURE (initials)	MONTHLY CONS.*
2-Feb	INVENTORY			50,000		
12-Feb	PHC II		5,000	45,000		
17-Feb	PHC I		11,000	34,000		
23-Feb	HOSP I		3,000	31,000		
27-Feb	HOSP II		13,000	18,000		32,000
10-Mar	PHC I		7,000	11,000		
13-Mar	HOSP I		6,000	5,000		
16-Mar	CMS	50,000		55,000		
25-Mar	PHC II		12,000	43,000		
30-Mar	HOSP III		4,000	39,000		29,000
3-Apr	PHC IV		5,000	34,000		
15-Apr	PHC II		10,000	24,000		
28-Apr	PHC I		14,000	10,000		
30-Apr	HOSP I		6,000	4,000		35,000
4-May	PCH III		4,000	0		
11-May	CMS	70,000		70,000		
18-May	PHC IV		12,000	58,000		
26-May	HOSP II		20,000	38,000		36,000
2-Jun	PHC II		14,000	24,000		
5-Jun	HOSP I		10,000	14,000		
8-Jun	PCH 1		14,000	0		
17-Jun	NOVAPHARM	5,000		5,000		
23-Jun	PHC III		2,000	3,000		
30-Jun	CMS	100,000	2,000	101,000		42,000
2-Jul	PHC IV		8,000	93,000		
7-Jul	PHC 1		10,000	83,000		
9-Jul	INVENTORY			80,000		
14-Jul	HOSP 1		8,000	75,000		
20-Jul	PHC II		10,000	65,000		
29-Jul	PHC III		5,000	60,000		41,000