Ministry of Health

Quantification of Health Commodities

Trainers Manual and Curriculum

July 2013

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MSH/Health Commodities and Services Management

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ACRONYMS AND ABBREVIATIONS

AMC	Average Monthly Consumption
ARV	Anti-retroviral
DAR	Daily Activity Register
EMMS	Essential Medicines & Medical Supplies
FP	Family Planning
MOH	Ministry of Health
NASCOP	National AIDS & STI Coordinator Program
SDP	Service Delivery Point
SOH	Stock on Hand
TB	Tuberculosis

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1. INTRODUCTION

The success of a health care system is highly dependent on the availability of adequate health commodities[1]. Several factors are involved in ensuring their availability. Among them is proper planning and estimation of quantities required for a given period. Determination of these requirements can be tedious and time consuming. However, the results of the process translate to tangible gains.

To achieve consistent and rational supply of health commodities, health care workers at all levels of healthcare system and supply chain managers need to be equipped with the necessary knowledge and skills on quantification.

2. PURPOSE OF THE COURSE

The main goal of this course is to equip senior, middle level and supply chain managers with the necessary knowledge, skills and attitudes to enable them effectively quantify and forecast their health commodity requirements.

3. TARGET GROUP

The course is designed for pharmaceutical personnel, program managers, supply chain managers and other staff involved in quantification of health commodities at either national, regional or program level. Participants may be drawn from both the public and the non-public sector.

4. COURSE DURATION

The course is designed to take 5 days and will focus on the theory and practice of quantification of health commodity needs.

5. CERTIFICATION

The participants of the course will be awarded a certificate of attendance after attending all sessions as outlined in this curriculum**.**

6. COURSE ORGANIZATION

This course is organized into eleven sessions which are closely related.

[1] In the context of these guidelines, the term 'health commodities' has the same meaning as the terms 'health products', 'health supplies' and 'medical supplies', and denotes all the consumable items required for the provision of health services. As such it includes medicines, medical devices such as dressings, needles & syringes, and laboratory/diagnostic, dental, and radiological consumables. For practical purposes, 'consumable' means any item which will require to be replaced at least once a year.

Session 1: Course Overview
Session 2: Introduction to Quantification
Session 3: Forecasting Methodologies: Introduction
Session 4: Forecasting Methodologies: Practical Applications
Session 5: Data Collection for Forecasting
Session 6: Presentation of and discussion on Forecasting Data
Session 7: Assumptions and Decision Making for Forecasting
Session 8: Introduction to Supply Planning and Procurement Planning
Session 9: Introduction to PipeLine
Session 10: Supply Planning Exercise – PipeLine
Session 11: Way Forward & Action Planning

7. TRAINING/FACILITATION

This course will involve various teaching methods and will emphasize those appropriate for adult learners. They will include lectures, small group discussions, class exercises and demonstrations. This workshop will enable participants to improve skills in quantification including use of PipeLine® Software.

8. COURSE IMPLEMENTATION

The trainers/facilitators for the course will be drawn from the Ministry of Health and foreign/local consultants with specific expertise in health commodity quantification. The recommended number of participants for each course is 25. The participants should have basic skills in commodity management.

The course materials will include lecture power points, trainers and participants manuals, handouts, reference materials and trainers notes. The time schedule for the course will be 8.30 am to 5 pm with two refreshment breaks and a lunch break. The workshop will provide 40 hours of theoretical and practical sessions as outlined in this curriculum.

The practical sessions will require the use of computers, which would have been appropriately checked for compatibility with the quantification software. A computer technician will provide IT support as required.

9. COURSE EVALUATION

There will be session evaluations and an overall workshop evaluation at the end of the workshop. These will allow the training team to identify specific content and performance areas for improvement.

10. REFERENCES & RECOMMENDED READINGS

- *MDS-III: Managing Access to Medicines and Health Technologies*, Management Sciences for Health/WHO (2012) Kumarian Press, Inc.

- *Estimating Drug Requirements,* WHO/DAP, 1988
- *PipeLine® Users Guide,* USAID/Deliver Project (available from http://deliver.jsi.com/dhome/resources/tools/softwaretools/pipeline)

SESSION 1: COURSE OVERVIEW

Duration: 20 minutes

Objective: To describe the course objectives, teaching methodology, course structure and materials

Content: Course goal & objectives, structure, methodology, outline, teaching materials

Trainer's notes:
This session provides a general overview of the overall training and thus gives a roadmap for the Quantification training.

The trainer should be familiar with the general flow of the course, the course objectives and the trainers for the various sessions as they may be introduced during this session.

Lesson Plan Guide

SESSION	CONTENT	ACTIVITY	TIME
1	Course goal & objectives, structure, methodology, outline, teaching materials	Lecture/Discussion	20 minutes

Session 1: Course Overview

Course Overview

Rationale for the course

- Health programs aim at improving access to health commodities
- Limited resources means there is need to ensure minimal wastages and proper quantification of needs
- Overall goal is to enhance skills in quantification at national, regional and all health programs level

Target audience

- Health care workers – Pharmacists, Pharmaceutical Technologists, Medical Practitioners, Nurses, Laboratory Technologists, Dentists, Clinical Officers
- Program Staff – NASCOP, DRH, DOMC, DLTLD, Development Partners
- Ministry of Health Staff

Goal of the training

To establish and maintain adequate capacity at national, county and program levels to quantify health commodity requirements.

(The term 'health commodities' has the same meaning as the terms 'health products', 'health supplies' and 'medical supplies', and denotes all the consumable items required for the provision of health services)

Objectives of the training (1)

- Understand quantification concepts required to use the tools
- Describe the quantification steps, data requirements and expected outcome of each step
- Understand the main forecasting methodologies
- Describe the data types and data collection tools used in quantification

Objectives of the training (2)

- Learn how to manipulate available data to utilize the best practice tools for quantification
- Define the issues unique to quantification of different program commodities
- Understand assumptions that aid decision making during a quantification exercise
- Organize and manipulate data for entry into pharmaceutical forecasting tools in order to obtain forecast results

Objectives of the training (3)

- Learn concepts of pipeline monitoring and how to apply them to supply planning
- Become familiar with purpose and capability of PipeLine
- Have questions about PipeLine and the supply planning process addressed
- Learn to develop, monitor, and update supply plans for health commodities

Objectives of the training (4)

- Understand and analyze key reports used for monitoring and management of commodities
- Demonstrate skills and knowledge in the use of PipeLine software
- Generate forecasts and prepare supply plans

Course Structure & Methodology

Course structure

❖ Five day residential training– Theoretical & practice sessions

Course Methodology

❖Adult learning training methods– lectures, discussions, practice sessions

❖Session and facilitator evaluations

❖Certification

Course outline (1)

This course is comprised of 11 sessions:

- Session 1: Course Overview
- Session 2: Introduction to Quantification
- Session 3: Forecasting Methodologies: Introduction
- Session 4: Forecasting Methodologies: Practical Applications
- Session 5: Data Collection for Forecasting
- Session 6: Presentation of and discussion on Forecasting Data

Course Outline (2)

- Session 7: Assumptions and Decision Making for Forecasting
- Session 8: Introduction to Supply Planning and Procurement Planning
- Session 9: Introduction to PipeLine
- Session 10: Supply Planning Exercise – PipeLine
- Session 11: Way Forward & Action Planning

Course Materials

Participant materials

- Pen, writing pad
- Participants' manuals
- Calculators
- Program specific data for Pipeline exercises
- Computers for practice sessions

SESSION 2: INTRODUCTION TO QUANTIFICATION

Duration: 30 minutes

Objectives:
- To enable participants to share their quantification experiences and challenges
- To ensure a good understanding of:
  - the rationale for proper quantification
  - factors to consider when quantifying health commodities

Content
Definition of quantification, rationale for quantification and supply planning, steps in quantification, signs of good and poor quantification, common challenges and useful lessons in quantification

Trainer's notes

This session is meant to provide an opportunity to the participants to share their experiences in quantification, including their challenges. The session starts with an interactive discussion, followed by a short lecture.

The trainer should facilitate the discussion during the initial part of the session, and list some of the issues and common challenges raised in the discussion on the board or flipchart.

Lesson Plan Guide

SESSION	CONTENT	ACTIVITY	TIME
2	Definition of quantification, rationale for quantification and supply planning, steps in quantification, signs of good and poor quantification, common challenges and useful lessons in quantification	Lecture/Discussion	30 minutes

References and Recommended Readings
- *MDS-III: Managing Access to Medicines and Health Technologies*, Management Sciences for Health/WHO (2012) Kumarian Press, Inc.

INTRODUCTION TO QUANTIFICATION

Module Objectives

At the end of this session, the participants will be able to:

- Define quantification and the steps to follow
- Describe the rationale for quantification and supply planning
- List the good and bad signs of quantification
- Outline the challenges and useful lessons

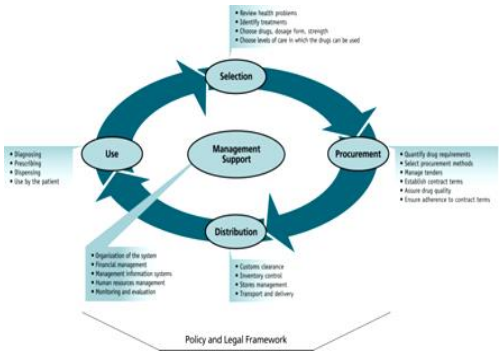
Use this slide to outline the objectives of this session

What is Quantification?

- The process of estimating quantities and costs of health commodities required during a specific period and determining when the products should be delivered to ensure uninterrupted supply for the program

Ask the participants to give their understanding of what quantification entails regardless of the type of commodity involved

Supply Chain Framework



Elaborate on each component of the Supply chain framework and what it entails

Distribute a handout for participants to refer to as the explanation is given

Purpose of the Supply Chain

To ensure the Six Rights

- the ***Right commodities***
- in the ***Right Quantities***
- in the ***Right Condition***
- delivered to the ***Right Place***
- at the ***Right Time***
- for the ***Right Cost***

Also explain what the 'Right Commodity' means (i.e. essential, proven safety, efficacy and quality, appropriate)

Quantification

Has 2 parts:

- **Forecasting** - estimating quantity required of each product to meet demand for the forecast period
- **Supply planning** - adjusting quantities forecasted to determine quantities to procure and time of delivery of the products

Ask participants to define the two terms before showing this slide

Rationale for Forecasting & Supply planning

Technical:

- Eliminate stock out of health commodities
- National program expansion
- New guidelines, interventions, new programs
- Change in list of medicines, dosage, and dosage forms
- New/available data – to be harmonized, on program and product (e.g. price)
- To inform manufacturers

This rationale is from a technical point of view

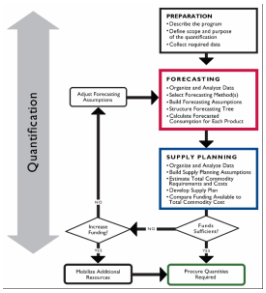
Rationale for Forecasting & Supply planning

Policy:

- Prioritize the most critical requirements
- Plan, mobilize and secure financial resources
- Guide timely, appropriate supply plans and procurement
- Facilitates coordination of program activities

This rationale is from a policy point of view

Steps in Quantification (1)



Highlight the activities in every step for the participants to understand how quantification is undertaken at whichever level of the health system

Include it in the session notes then trainer can refer to that page when explaining.

Steps in Quantification (2)

Preparation process

1. Assemble a quantification team
2. Describe the program (program performance, policies & strategic plans)
3. Define the purpose & scope of the quantification exercise (products, timing)
4. Collect required data (for forecasting and supply planning)

Steps in Quantification (3)

Forecasting process

1. Organize, analyze & adjust the data
2. Build and obtain consensus on the forecasting assumptions
3. Calculate the forecasted consumption for each product
4. Compare and reconcile results of different forecasts

Steps in Quantification (4)

Supply planning process

1. Organize and analyze data
2. Build supply planning assumptions
3. Estimate total commodity requirements
4. Develop supply plan
5. Compare costs to available funding

Health Commodities to be Quantified

- Essential health commodities
  - Essential medicines
  - Laboratory commodities e.g. test kits, reagents
  - Equipment and medical supplies
- Program health commodities
  - HIV/AIDS
  - TB
  - Malaria
  - Family Planning
  - Maternal and Child Health

Before showing the slide, ask the participants to list the types of health commodities we should consider when quantifying needs

Signs of Good Quantification (1)

- Rational use of supplies
- Fewer expired commodities
- Rational adjustment to budgetary constraints
- Satisfied clients

Before showing the next two slides, ask the participants to identify signs of good quantification

Signs of Good Quantification (2)

- Consistent availability of supplies (no stock-outs or under-stocking)
- No overstocking
- Easy management of stock

Signs of Poor Quantification

- Chronic and widespread shortages
- Surpluses of quantified health commodities
- Inequity of supply
- Irrational adjustment to budgetary constraints
- Suppression or distortion of demand
- Poor cost-effectiveness
- Irrational & ineffective use of supplies

Before showing the slide, ask the participants to identify signs of poor quantification

Activity

- Assess the need for quantification in Kenya
  – Can you relate to any of the symptoms of poor quantification to Kenya's commodities supply system?
  – Point out the three most important signs in Kenya's context
  – What could be done to prevent the three pointed out signs of poor quantification?

Divide the class into groups of 6-8 participants to tackle these questions, then have a plenary session to discuss their deliberations

Suggested duration for the activity:
10 mins for discussion
5 mins for plenary

Common Challenges in Quantification

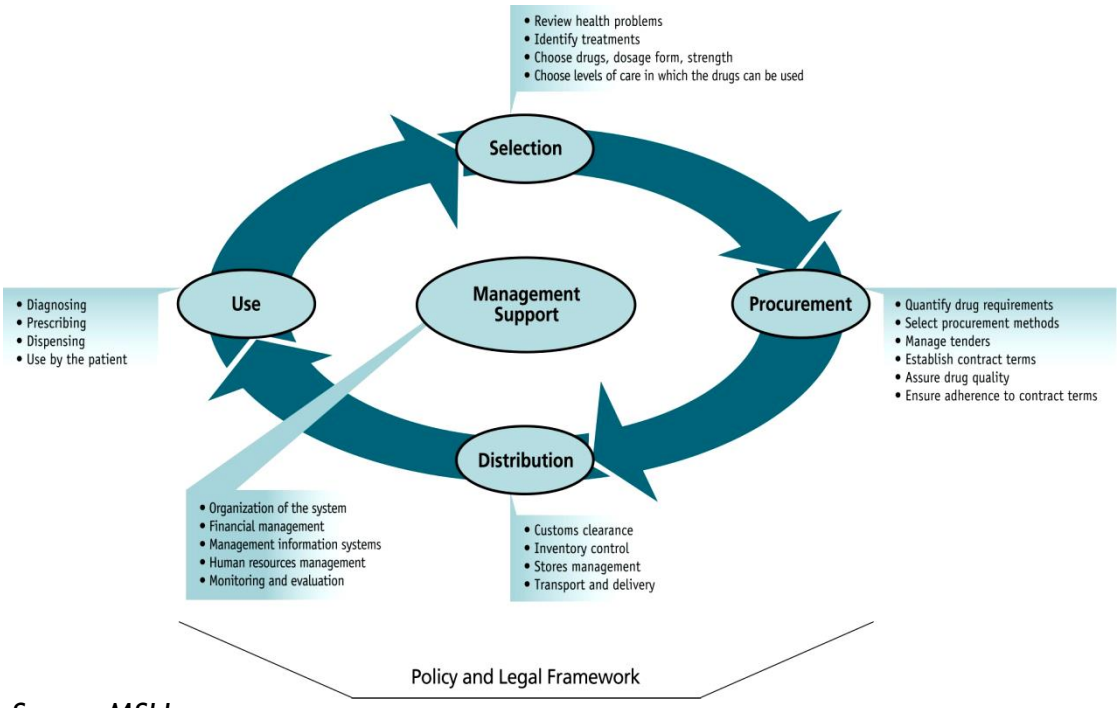
- Limited, often unreliable or insufficient data
- Non-adherence to recommended clinical guidelines and diagnostic/testing protocols implementation
- Program targets vs. service and supply chain capacity
- Lack of procurement coordination

Before showing the slide, ask participants to share challenges they face in their work places as regards quantification

Key Lessons in Quantification

- Quantification requires adequate resources – time, funding and human
- Strong LMIS/HMIS supports evidence based quantification
- Forecasts and supply plans should be routinely updated

Quantification and the Health Commodity Supply Management System



Source: MSH

The management of health commodities involves four basic functions: selection, procurement, distribution, and use.

Selection – the rationale for selecting a limited number of essential commodities is that it should lead to better supply, more rationale use, and lower costs. Essential commodities are those deemed to satisfy the health care needs of the majority of the population and should be available in the appropriate forms at all times. With reference to essential medicines, the process of selection begins with defining a list of common diseases for each level of health care. Essential medicines are then selected on the basis of:

- Relevance to the pattern of prevalent diseases
- Proven efficacy and safety
- Adequate scientific data and evidence of performance in a variety of settings
- Adequate quality
- Favorable cost-benefit ratio
- Desirable pharmaco-kinetic properties and possibilities for local manufacture
- Availability as single compounds

This process may be adapted as appropriate for application to other types of health commodity

Procurement – ensures the availability of the right commodities in the right quantities, at reasonable prices and with recognized standards of quality. Commodities may be acquired through purchase, or donation. Effective procurement is a collaborative process between the procurement office, with requirements for trained staff and appropriate management systems, and technical and policy committees, which make final decisions as to which commodities to buy, in what quantities and from which suppliers.

Distribution – a well designed and managed distribution system should:

- Maintain a constant supply of commodities

- Keep commodities in good condition throughout the distribution process
- Minimize commodity losses due to spoilage and expiry
- Maintain accurate inventory records
- Rationalize commodity storage points
- Use available transportation resources as efficiently as possible
- Reduce theft and fraud
- Provide information for forecasting commodity needs

The distribution cycle includes the following steps: port clearing; receipt and inspection; inventory control; storage; requisition of supplies; delivery; dispensing, issuing or administration to patients & reporting consumption.

Use – the aim of any commodity management system is to deliver the correct commodity to the patient or health provider who requires it. Selection, procurement & distribution are necessary precursors to the rational use of commodities. For medicines, appropriate use entails accurate diagnosis (define the problem), correct prescribing (right medicine), proper dispensing (done in a correct way with clear written and verbal instructions) and correct use by the patient (adherence).

Management support – entails organization of the supply management system, financial management, management information systems, monitoring & evaluation and human resources.

All the five components lie within a policy and legal framework which ensures there are laws and regulations governing these inter-related components.

What Is Quantification?

Quantification is a process that involves estimating how much of a specific item is needed as well as the financial means required to purchase the item. Needs are estimated for a given context; factors to consider when quantifying needs include available finances, human resource capacity, storage space and capacity to deliver services.

Quantifying requirements of health commodities is the first step in the procurement process, which aims at ensuring the availability of the right commodities in the right quantities, at reasonable prices, and at recognized standards of quality.

Signs of Good Quantification

- *Consistent availability* - essential commodities should be available at all times
- *Adequate supplies for projected scale-up/rollout*
- *Minimal wastage* - caused by stock expiring or lack of appropriate storage conditions
- *No overstocking*
- *Cost-effectiveness* - selection and quantification of commodities should support the provision of cost-effective services
- *Rational adjustments* - adjustments caused by budgetary or other constraints are made rationally; for example, a cost-effective approach would be to cut less essential medicines or supplies first
- *Easy management* - of the quantification process
- *Meeting demand*

- *Satisfied clients*

Applications of Quantification Methods

All stakeholders should have a clear and common understanding on the objective(s) of the quantification because these will affect the method selected and the assumptions made. Quantification may be used to estimate needs for central bulk purchases, to forecast long-term needs from manufacturers, or to estimate needs for proposals for funding such as the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFTAM). Similarly, when planning for new or expanding programs, clearly defining goals is essential to ensure that the quantification of medicines and health commodities is appropriate. Goals of scaling-up can include:

- Expanding to provide the same services to more people
- Expanding to provide new services to the same people
- Expanding to provide new services to new target populations

Quantification can also be used to prepare and justify a health commodities budget or to optimize existing budgets based on priority health problems to be treated and the most cost-effective treatment approaches. Where commodities need special storage conditions - for example, insulin, vaccines that require refrigeration - quantification methods can be used to estimate storage needs.

Calculating emergency needs for disaster relief and epidemics or to resupply an existing supply network that has become depleted of products will generally require the use of two or more quantification methods and a team of experts to develop appropriate assumptions. Finally, current commodity consumption can be compared with public health priorities and usage in other health systems to detect the irrational use of commodities.

Health Commodities to be Quantified

These comprise a wide range of items required to provide comprehensive health services and include:

- Essential medicines (as listed in KEML 2010)
- Essential medical supplies or devices (e.g. surgical dressings, needles, syringes, sutures)
- Laboratory/diagnostic supplies
- Dental and radiological commodities

Note: In the context of this training course, quantification is applied to consumable items, i.e. those expecting to require replacement at least once a year

SUCCESSFUL DRUG QUANTIFICATION REQUIRES A TEAM EFFORT AND A MIX OF METHODS

Source: MDS III, MSH (2012)

SESSION 3: FORECASTING METHODOLOGIES: INTRODUCTION

Duration: 45 minutes

Objective:

- To ensure good understanding of the data and various methods used for forecasting

Content: Data for forecasting, forecasting methods; use, data needs and limitations of each method; appropriate method of forecasting & logistics terminologies

Trainer's notes:

This session introduces participants to commonly used types of quantification methods. This can be very confusing to a learner who has no or little exposure to the basics of health commodity management. Hence, the trainer should administer the session in such a way that participants are well able to follow the discussion. Periodic question and answer interactions are encouraged during the session. The trainer should

- have a clear understanding of the different quantification methods, the merits and demerits of each.
- clearly describe the different methods used in quantification, taking time to get any feedback on the slides.

Lesson Plan Guide:

SESSION	CONTENT	ACTIVITY	TIME
3	Data for forecasting, forecasting methods; use, data needs and limitations of each method; appropriate method of forecasting & logistics terminologies	Lecture/Discussion	45 minutes

References and Recommended Readings

- *MDS-III: Managing Access to Medicines and Health Technologies*, Management Sciences for Health/WHO (2012) Kumarian Press, Inc.

Forecasting Methodologies: Introduction

Session Objectives

At the end of this session, the participants will be able to:-

- Describe the various forecasting methods
- Describe the uses, data needs, and limitations of each forecasting method
- Identify the appropriate method of forecasting according to the information available
- Describe commonly used logistics terminologies

This outlines the objectives of this training session

Types of Data for Forecasting

1. Morbidity data - estimated incidence or prevalence rates of health conditions occurring within a defined population group
- Used to estimate the number of cases expected during the quantification period
- Forecasting with this data typically tends to over-estimate pharmaceutical demand

Describe the four data types that can be used for forecasting and ensure that the participants understand

Ask the participants what is the meaning of morbidity data and give an example of such data

Types of Data for Forecasting

2. Consumption data – Quantities used, losses and adjustments to inventory, and the stock on hand at the various levels of the in-country supply chain
3. Demographic or Population data - Population growth and demographic trends
4. Service Statistics data - Number of service delivery sites, the volume of services or number of patients per site, and the type of service received

Again ask participants what they understand each type of data is and give examples for each.

Forecasting Methods

1. Consumption Based
2. Morbidity Based
3. Adjusted consumption
4. Service-level projection

1. Consumption Method

- The consumption (or Logistics) based method uses historical data on the use of health commodities
- Past consumption trends may be useful in forecasting
- Stock-out periods must be factored in

This slide explains how the consumption method is used to determine health commodity requirements using past data on utilization extracted from inventory management tools such as stock control cards/bin cards

Consumption Method: Data needs

- Reliable consumption data
- Estimation of time out of stock
- Estimations of wastage (losses caused by expiry, pilferage, damage)
- Used in established supply systems e.g. for long term therapy continuing patients
- Records of supplier lead times
- Projected medicine costs

This slide outlines the data requirements for the consumption-based method

Limitations of Consumption Method

- Assumes that current and past usage patterns will continue
- Not useful for newly introduced protocols
- Relies on good inventory records
- Possible changes in the pattern of consumption (Change of prescribers, promotional influence)
- Needs data from a system with relatively uninterrupted supply
- Can perpetuate irrational use

Outlines the shortcomings of utilizing consumption data to quantify and forecast health commodity requirements

2. Morbidity-based method (i)

- Uses STGs, testing algorithms, or other protocols and the projected number of patients/clients expected to receive treatment or services
- Forecasts the quantity of commodities required for the prevention, diagnosis or treatment of specific diseases, based on projections of the incidence of those diseases

The slide outlines the sources of morbidity data

2. Morbidity-based method (ii)

- Does not require any historical data (for example, consumption) and therefore is suitable for use for new treatments & scale up programs or for disaster assistance
- Recommended for developing & justifying a budget proposal
- Can be used to compare use with theoretical needs

The slide outlines the result and usefulness of utilizing morbidity data when quantifying and forecasting

Morbidity Method: Data Needs

- Population data broken down by cohorts
- Prevalence/incidence of diseases
- Current patient numbers
- Estimates on the number of patients to be tested or treated
- Program attrition rates
- STGs, testing algorithms or other protocols

The slide outlines what morbidity data is required from a facility or a catchment population

Limitations of Morbidity Method

- Accurate and reliable data on morbidity and patient attendance
- Assumes that incidence and/or health facility utilization remains the same or increases by an agreed factor
- More complex and time consuming
- May need computer analysis for large datasets
- The accuracy depends on the degree to which STGs are followed and availability of pharmaceuticals
- Morbidity data may not be available for all diseases

The slide outlines the shortcomings of using morbidity data when forecasting and determining health commodity requirements

3. Adjusted consumption method

- Uses data e.g. disease incidence, consumption and/or expenditure from a standard supply system and extrapolates the consumption to the target supply system
- Useful for estimating needs when rolling out services to new sites or when starting new programs

This slide outlines the kind of data that is used in the adjusted consumption method It also describes a suitable scenario for using this method

Adjusted Consumption: Data needs

- Similar area or region with good consumption and population data
- Requires adequate comparability of facilities, morbidity & treatment practices

The slide outlines the data needs for this method

Limitations of Adjusted Consumption

- Difficult to match or adjust for all variables e.g. prescribing practices

The slide shows the shortcoming of using the adjusted consumption method

4. Service-level projection method

- Used for estimating budget needs
- Uses the average medical supply procurement cost per attendance or bed-days in different types of health facilities in one system to project needs for similar types of facilities in another system
- Doesn't directly estimate quantities of health commodities needed

Additional Data Needs for Quantification

- Comprehensive commodity specifications
- Estimations of buffer stock required
- Estimations of wastage (losses caused by expiry, pilferage, damage)
- Records of quantities on order
- Projected unit costs
- Procurement and Supplier lead times
- Shelf life of the pharmaceuticals

The slide outlines other data needed when quantifying because they also have an impact on how much commodities to order/procure

Choosing a Forecasting Method

This is based on the availability and quality of data:

a) Rate of consumption of the pharmaceuticals used
b) Number and type of patients receiving services, treatment and testing guidelines

This slide guides participants on how to choose the most appropriate method based on what data is available and the reliability of that data so that forecasting will be as accurate as possible

Quantification Terminologies

Total Consumption in a Period
– How much has been dispensed or issued during a specific period
Average Monthly Consumption
– How much is used on average in a month (i.e. 3, 6 or 12 months)
Adjusted Monthly Consumption
– AMC adjusted for stock outs, avoidable wastages & losses

Quantification Terminologies

Pipeline stock
– Refers to stock levels within the supply system
Lead Time
– The time between when the commodities are ordered and when they are available for use
Stock on Order
– Quantities ordered that have not yet arrived

Quantification Terminologies

Safety/Buffer Stock
– Reserve stock for prolonged lead times

Losses
- Quantity removed from stock for any reason other than consumption by the client / patient (e.g. expiry, theft, damage)

Adjustments
- An adjustment is a change in stock balance for any reason other than quantities issued to the Use /Dispensing / Issuing point (e.g. Pharmacy) for dispensing to clients / patients or quantities received from the supplier

The following few slides list common terminologies used in quantification that need to be understood by participants.

Quantification Terminologies

Number of Months of Stock (MOS)

– MOS is calculated by dividing the stock on hand by AMC. It gives an indication of how long the stock on hand will last

Scale Up

– Program adjustment required to accommodate an increase or growth in number of patients being treated over a period of time

Methods of Quantification

The consumption method uses data on health commodity consumption and predicts future needs most accurately when reliable consumption data are available and the current usage pattern is assumed to remain unchanged. The consumption data may or may not reflect rational use of the commodities.

The morbidity method is used for new programs or where valid consumption data are not available. It forecasts needs for prevention or treatment of specific diseases based on the incidence or prevalence of those diseases. It requires accurate information on the size and nature population to be covered, clinic attendances, health problem/disease incidences, and uses standard clinical guidelines (SCGs) to project needs. It is the most complex and time-consuming of all four quantification methods.

The adjusted-consumption method uses data (disease incidence, consumption or use, and/or expenditures) from a comparable supply system and extrapolates this for the target supply system. It is useful for estimating needs when rolling out services to new sites or when starting new programs. However, it can be difficult to match or adjust for all variables, e.g. prescribing practices.

*The service-level projection method i*s used for estimating overall health commodity budget requirements and uses the average medical supply procurement cost per attendance or bed-day in different types of health facilities in one system to project needs for similar types of facilities in another system. It does not directly estimate quantities of medicines needed.

Quantification Methods Used When Quantifying for Scaling up Programs

Consumption of products for programs that are scaling up increases over time. As a result, a combination of quantification methods may need to be used. For example, the quantification team may choose to use the consumption method to quantify needs for long-term therapy continuing patients; the morbidity method for new patients; and the adjusted-consumption method for estimating needs of new sites.

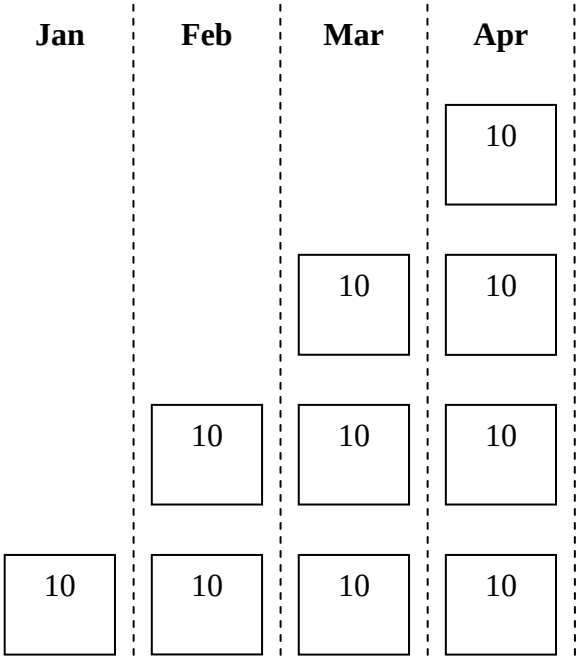
The importance of timely and accurate data, regardless of the quantification method selected, cannot be overemphasized. The impact of proposed changes in SCGs and/or prescribing practices should always be considered. The quantification and procurement process must be flexible enough to allow adjustments to be made based on changes in actual usage, particularly when the interval between procurements is prolonged.

Comparison of Quantification Methods

Method	Uses	Essential Data	Limitations
Consumption	First choice for procurement forecasts, given reliable data Most reliable predictor of future consumption	Reliable inventory records Records of supplier lead time Projected health commodity costs	Must have accurate consumption data Can perpetuate irrational use
Morbidity	Estimating need in new programs or disaster assistance Comparing use with theoretical needs Developing and justifying budgets	Data on population and patient attendances Actual or projected incidence of health problems Standard treatments (ideal, actual) Projected commodity costs	Morbidity data not available for all diseases Standard treatments may not really be used
Adjusted consumption	Procurement forecasting when other methods unreliable Comparing use with other supply systems	Comparison area or system with good per capita data on consumption, patient attendance, service levels, and morbidity Number of local health facilities by category Estimation of local user population broken down by age	Questionable comparability of patient populations, morbidity, and treatment practices
Service-level projection of budget requirements	Estimating budget needs	Use by service levels and facility type Average medicine cost per attendance	Variable facility use, attendance, treatment patterns, supply system efficiency

Quantification Terminologies

- *Quantification* is the process used to determine requirements for health commodities for the purpose of procurement or ordering.
- *Procurement period* is the length of time (in months) between placing one order and the next
- *Lead time* (LT) s the length of time (in months) between when the order is prepared and when it is available for issue.
- *Safety/buffer stock* (SS) is the amount of stock of an item (in terms of months of use) kept in reserve to allow for a delay in supply or a sudden increase in demand. Usually, the quantity of safety stock is equal to lead time multiplied by the AMC (SS= LT X AMC)
- *Scaling up* is the term used to describe an incremental increase or growth in the number of patients being treated over a period of time. Patient-months can be used to estimate needs for scaling up, where one "patient-month" is the quantity of a product needed to treat one patient for one month. The total number of patients (or clients) treated (or reached) over an incremental period of time in patient-months is often used in this situation for estimating needs for chronic conditions. In the example below, the program is scaling up with 10 new patients per month. The number of patient-months of medicines that can be expected to be consumed from January to April is 10+20+30+40 = 100 patient-months.



A formula used to determine the number of patient-months is

$$P\left(\frac{n(n+1)}{2}\right)$$

P = average number of patients added each month
n = number of months covered

For the above example, the calculation would be:

$$10\left(\frac{4(5)}{2}\right) = 100$$ patient-months for the period of January to April

SESSION 4: FORECASTING METHODOLOGIES: PRACTICAL APPLICATION

Duration: 1½ hours

Objective:
To ensure good understanding of:

- the application of consumption-based and morbidity-based quantification methods in the determination of health commodity requirements
- critical issues to be considered in quantifying health commodities

Content: Critical issues in quantification, calculation steps for consumption and morbidity methods and exercises related to the two methods

Trainer's notes:

- When going through the different steps using Consumption method, the trainer should also strive to illustrate each of these using the examples provided in the slides. Thus the trainer should understand all the calculations used to arrive at the answers and the rationale applicable for each step.
- After running through the steps using the consumption-based method, the trainer should allow for questions and thereafter allow the participants to work through the exercise provided.
- On completion of the consumption-based exercise (the spreadsheet), the facilitator should lead the participants in sharing their responses and thereafter take them through the steps for the morbidity based method.
- After running through these, the trainer should similarly allow for questions and thereafter allow the participants to work throughout the exercise provided.
- After the session, the trainer should facilitate a question and answer feedback session to gauge the level of understanding of the participants

Lesson Plan Guide:

SESSION	CONTENT	ACTIVITY	TIME
4	Critical issues in quantification, calculation steps for consumption and morbidity methods & exercises related to the two methods	Lecture/Discussion/Activity	1½ hours

References and Recommended Readings

- *MDS-III: Managing Access to Medicines and Health Technologies*, Management Sciences for Health/WHO (2012) Kumarian Press, Inc.

Consumption-Based Exercise:

Assumptions used

Parameter	Value
Consumption Review Period (months)	6
Average Number of Days per Month	30.5
Annual Rate of Growth	20%
Procurement Period (months)	12
Safety Stock (months)	3
Lead Time (months)	3
Loss Adjustment Factor	10%

Exercise on Consumption-based Method										
No	**Item**	**Pack Size**	**Basic Unit (BU)**	**Total Consumption in Period (BU)**	**Days Out of Stock**	**Adjusted Average Monthly Consumption**	**Projected Average Monthly Utilization**	**Total Annual forecast**	**Stock on Hand (BU)**	**Stock on Order (BU)**
1	Didanosine 100mg tab	60	Tab	89,000	34				81,000	58,000
2	Efavirenz 200mg cap	90	Tab	59,500	0				32,000	42,000
3	Efavirenz 50mg cap	30	Tab	2,500	0				1000	8,500
4	Efavirenz 600mg tab	30	Tab	59,500	0				32,000	42,000
5	Lamivudine 10mg/ml	240	ml	45,000	34				150,000	70,000
6	Lamivudine 150mg tab	60	Tab	334,879	0				111	7,600
7	Nevirapine 200mg tab	60	Tab	4,128	0				1,513	3,000
8	Nevirapine 10mg/ml	240	ml	234,878	29				351	929
9	Stavudine 1mg/ml	200	ml	50,000	0				0	62,500
10	Stavudine 30mg cap	60	Cap	2,414	31				3,400	100
11	Zidovudine 100mg cap	100	Cap	141,500	30				142,000	50,000
12	Zidovudine/lamivudine 300/150mg tab	60	Tab	1,318	0				1,486	0

Exercise on Consumption-based Method: Solution								
No	**Item**	**Pack Size**	**Basic Unit (BU)**	**Total Consumption in Period (BU)**	**Days Out of Stock**	**Adjusted Average Monthly Consumption**	**Projected Average Monthly Utilization**	**Total Annual forecast (BU)**
1	Didanosine 100mg tab	60	Tab	89,000	34	*18,218*	*21,862*	*262,341*
2	Efavirenz 200mg cap	90	Tab	59,500	0	*9,917*	*11,900*	*142,800*
3	Efavirenz 50mg cap	30	Tab	2,500	0	*417*	*500*	*6,000*
4	Efavirenz 600mg tab	30	Tab	59,500	0	9,917	*11,900*	*142,800*
5	Lamivudine 10mg/ml	240	ml	45,000	34	9,211	*11,054*	*132,644*
6	Lamivudine 150mg tab	60	Tab	334,879	0	55,813	*66,976*	*803,710*
7	Nevirapine 200mg tab	60	Tab	4,128	0	688	*826*	*9,907*
8	Nevirapine 10mg/ml	240	ml	234878	29	46,518	*55,822*	*669,860*
9	Stavudine 1mg/ml	200	ml	50,000	0	8,333	*10,000*	*120,000*
10	Stavudine 30mg cap	60	Cap	2,414	31	484	*581*	*6,975*
11	Zidovudine 100mg cap	100	Cap	141,500	30	28,208	*33,849*	*406,188*
12	Zidovudine/Lamivudine 300/150mg tab	60	Tab	1,318	0	220	*264*	*3,163*

Forecasting Methodologies - Practical Applications

Objectives

The objectives of this session are:

- To discuss the critical issues in quantification
- To describe the steps in the quantification process
- To practice the consumption based method
- To practice the morbidity based method
- To do exercises illustrating the 2 methods above

This slide outlines the objectives of this session

Critical Issues in Quantification

Preparing an Action Plan

- Plan the quantification process and follow the plan
- Appoint an official in charge and form a team
- List and assign tasks; estimate and obtain resources
- Define the coverage of the quantification and objectives (e.g. for procurement; long-term forecasts)
- List health problems; consult the most current STGs
- Develop the pharmaceuticals list
- Examine availability of data and select best method
- Develop work plan and timeline

This slide outlines the preparation of an action plan of what needs to be done before embarking on quantification

Critical Issues in Quantification

Centralized or decentralized approach

Centralized quantification is easier if consumption is stable while **Decentralized** quantification allows for the following:

- More ownership
- Encourage collection of accurate data
- May be easier for expanding/changing programs

Staff must have necessary skills and tools to quantify before decentralizing as double counting may occur

This slide compares centralized and decentralized approaches to quantification and outlines the advantages of using the former

Critical Issues in Quantification

- Using manual or computerized methods for quantification
  – Automated methods useful for complex calculations and easier to create "what if" scenarios
- Estimating time requirements
- Organizing the commodities list (e.g. alphabetical and/or by therapeutic group)
- Filling the supply pipeline – Depends on number of levels and safety stock

This slide and the next outline other issues that need to be considered when doing quantification

Critical Issues in Quantification

- Adjusting for losses and for program growth
- Cross-checking estimates produced by quantification using other methods
- Estimating total procurement cost
- Adjusting and reconciling final quantities based on finances available

Calculation Steps

- Consumption Method
  - Obtain total consumption over a period
  - Obtain number of days out of stock
  - Calculate adjusted average monthly consumption per item
  - Calculate total number of units needed

The slide outlines the steps that need to be taken when using the consumption-based method to quantify health commodity needs

Calculation Steps

- Morbidity Method
  - Obtain number of patients per regimen
  - Obtain number of existing and new patients in a period
  - Obtain number and type of drugs/regimen
  - Calculate total number of units needed

The slide outlines the steps that need to be taken when using the morbidity-based method to quantify health commodity needs

Calculation Steps

- Adjust for lead time, safety stock, losses, stock on hand and stock on order
- Calculate total order quantity and value of proposed order
- Compare calculated value to available budget
- Adjust order quantity/value

This slide outlines other considerations required in quantification whichever method is used

Logistics Data

- Sources of data
  - LMIS
  - Facility Dispensing Records
  - Inventory Control Records – manual or computerized
  - Receipt/Issue Records
- Problems with Logistics Data
  - Incomplete Data
  - Under Reporting by facilities

This slide lists the sources and the potential problems with logistics data. Let participants share what they know about this before displaying the slide

Adjusting for Incomplete Reporting

Adjusted estimated use during period =

$$\frac{\text{Quantity reported}}{\text{Percent of SDP reported}}$$

This slide shows how to adjust for commodity requirements in case reporting from facilities is incomplete

Average Monthly consumption (AMC)

Average Monthly Consumption =

$$\frac{\text{Total Consumption}}{\text{Period in Months}}$$

This slide shows how to calculate the average monthly consumption. Emphasize that too short a period, e.g. 3 months may not be reliable thus data for 6-12 months is better since it allows for seasonal fluctuations of consumption.

Also if a particular period, e.g. 3 months is used and was a dry period or rainy period, then we need to extend it to at least 6 months so as to cater for both the dry and rainy season and make the quantification more accurate.

Adjusting for Stock-outs

Adjusted AMC (C_A) = $C_T \div [R_M - (D_{OS} \div 30.5)]$

C_A = Average monthly consumption, adjusted for stock outs
C_T = Total consumption during the consumption review period
R_M = Consumption Review period in months
D_{OS} = Number of days item was out of stock during the consumption review period
30.5 = average number of days in a month

This slide outlines the formula for adjusting for stock-outs which is important because if the health commodity was available throughout the stated period, then more of that commodity would have been consumed

Steps in Consumption Method (i)

Step 1. Prepare list of health commodities to be quantified

Step 2. Determine the period of time to be reviewed for consumption (Consumption Review Period)

Step 3. Enter data on consumption and stock-out for each health commodity during the consumption review period

The slide outlines the steps one needs to take when using the consumption-based method for quantification

Steps in Consumption Method (ii)

Step 4. Calculate the average monthly consumption

$C_A = C_T \div [R_M - (D_{OS} \div 30.5)]$

C_A = Average monthly consumption, adjusted for stock outs
C_T = Total consumption during the consumption review period
R_M = Consumption Review period in months
D_{OS} = Number of days item was out of stock during the consumption review period

Adjusted average monthly consumption: Example

For Nevirapine 200mg tablets, total consumption in 6-months was 89,000 with 34 days out of stock

The Adjusted average monthly consumption (CA) in basic units is:

Let the participants first attempt to calculate adjusted average monthly consumption before going through it with them

C_A = 89,000 ÷ [6 mths - (34 days ÷ 30.5)]

C_A = 89,000 ÷ [6 mths – 1.1148 mths]

C_A = 89,000 ÷ 4.8852

C_A = 18,218 tablets

Steps in Consumption Method (iii)

Step 5. Calculate the projected average monthly consumption

$$C_P = C_A + (C_A \times A_U)$$

C_P =Projected average monthly consumption

C_A = Average monthly consumption, adjusted for stock-outs

A_U = Utilization adjustment

Projected average monthly consumption: Example

For Nevirapine 200mg Tablets, the projected average monthly consumption based on a 5% increase is:

Let the participants use the formula given in the previous slide to calculate the projected average monthly consumption before doing it with them

C_P = 18,218 + (18,218 x 5% increase)

C_P = 18,218 + 911 = 19,129 tablets

Exercise

Refer to the exercise for session 4 in Excel on consumption. Calculate:

- Adjusted average monthly consumption
- Projected average monthly utilization
- Total annual forecast

Steps in Morbidity Method (i)

Step 1: Specify the health problems to be addressed by the forecast

Step 2: List the list of health commodities to be quantified

Step 3: Identify standard or average treatments – Actual Vs Ideal

The slide outlines the steps followed when using the morbidity method to estimate requirements

Steps in Morbidity Method (ii)

Step 4: Collect morbidity data for each health condition treated – estimated number of treatment episodes

$$E_T = N_C \times F$$

E_T= Total No. of projected treatment episodes for each condition

N_C= Projected total number of contacts

F = Frequency of occurrence

Steps in Morbidity Method (iii)

Step 5. Calculate quantities of individual commodities required for each standard treatment episode

$$Q_E = D_{BU} \times N_D \times L_D$$

Q_E= Quantity of each commodity needed for each treatment episode

D_{BU} = Basic units per dose

N_D= Number of doses per day

L_D= Length of treatment in days

Steps in Morbidity Method: Example

AZT 300mg/3TC 150mg/NVP 200mg, the quantity of tablets needed for each patient per year is:

$$Q_E = D_{BU} \times N_D \times L_D$$

Let the participants calculate the quantity of tablets needed for each patient per year before doing it with them

QE = 1 × 2 × 365

QE = 730 tablets

Steps in Morbidity Method (iv)

Step 6. Calculate the quantity of medicine needed for each health condition

$$Q_T = E_T \times Q_E \times P_T$$

Q_T = Total quantity of each drug needed in basic units

E_T = Number of projected total treatment episodes

Q_E = Quantity of each drug needed for each treatment episode

P_T = Percentage of cases expected to be treated with that regimen

Steps in Morbidity Method: Example

Assuming 4,200 patients require Nevirapine in their treatment regimens, 75% adults, the total quantity of Nevirapine 200mg tablets needed is, year , bid :

Let the participants calculate the total quantity of nevirapine tablets needed per year if it is given bd as:

$Q_T = E_T \times Q_E \times P_T$

$Q_T = 4{,}200 \times 730 \times 75\%$

$Q_T = 1{,}149{,}750$ tablets

Steps in Morbidity Method (v)

Step 7. Calculate the projected number of treatment requirements for all program areas

$E_T = A_C + P_C$

E_T = No of projected treatment requirements for all program area

A_C = Projected total quantity for ART program

P_C = Projected total quantity for PMTCT

Critical Issues in Quantification

The process of quantifying needs should be *systematic* and should include the following steps:

- *Preparatory phase*

  1. Planning the quantification process, as well as then ensuring that the plan is followed, is one the most critical steps in the process.

  2. Appoint an official in charge and form a quantification team.

  3. Define the coverage of the quantification and its objectives. For example, assumptions made for quantifying needs for procurement may differ from those for preparing long-range forecasts for suppliers.

  4. Examine the availability of data and select the best quantification method based on the availability and quality of existing data.

  5. Prepare the action plan - list and assign tasks, estimate and obtain resources, estimate time requirements, and develop a realistic and feasible timeline for the quantification process.

- *Decide on centralized or decentralized quantification*

  Decide whether to centralize or decentralize the quantification process. Centralized quantification is easier if consumption is stable. Decentralizing the process gives more ownership to the local level as well as incentives to collect accurate data. Decentralizing the process is easier where programs are expanding and changing and where knowledge of the local context (to understand how the program will expand/change) is important. It is important to take care to avoid double counting when using the decentralized method and to ensure that site estimates are not added to central estimates, for example, at the central medical store (CMS). An important prerequisite before decentralizing quantification is ensuring that staff members have the necessary skills and tools to quantify their needs.

- *Quantification phase*

  1. List the health problems, develop and/or update standard treatment guidelines (STGs), if necessary, and use these to develop the medicines and other commodities lists.

  2. Organize these lists and arrange items appropriately (e.g. alphabetically, by types of item) to facilitate data collection - for example, for collecting consumption data from stock cards.

  3. Collect data on all items listed.

  4. Calculate requirements to fill the supply pipeline. For new programs or where medicines or other health supplies have been depleted, calculating needs to fill the storage facilities at each distribution level will be necessary in addition to replenishing safety stock.

  5. Consider the impact of lead time. Investigate current or projected lead times for the products to be ordered and make appropriate adjustments to the safety stock to allow for this.

6. Adjust for losses and growth. Adjusting for programs that are scaling up may require additional data collection and a team approach to making correct assumptions based on the rate of scale-up.

7. Calculate needs using manual or computerized methods. Consider the tools that are available to assist in the quantification process. Automated methods are useful for complex calculations and make it easier to create "what if" scenarios.

8. Cross-check estimates. Where possible, cross-check calculations using a second quantification method.

9. Estimate procurement costs using projected prices where possible.

10. Adjust and reconcile final quantities. Make rational adjustments based on the finances available. On completion of the quantification, the quantification team often finds that the budget is insufficient. In order to make correct and rational decisions about the medicines to procure with limited funds, VEN (Vital, Essential, and Non-essential) and ABC analysis techniques are usually employed. The VEN analysis classifies medicines according to their health impact, whereas the ABC analysis categorizes medicines according to their economic impact.

11. Provide feedback to the team, stakeholders, and medical personnel on results and assumptions used. In particular, ensure that medical personnel are informed on the nature of and rational used for any quantification reconciliation decisions made.

12. Evaluate how well the quantification process went and identify areas to improve for the next quantification.

Consumption Method

In the consumption method, a list of all health commodities to be procured is prepared, and the most accurate inventory records of past consumption are used to calculate the quantities needed for each product.

Consumption during a recent period of 6-12 months is adjusted for stock-outs and losses to obtain the average monthly consumption. Then the average monthly consumption is multiplied by the number of months to be covered by procurement. Safety stock levels (in months) are also multiplied by the average monthly consumption. These two figures are added to get the gross needs during the period, subtracting the *usable* stock on hand and any stock on order from the gross estimate, to derive the quantity to purchase.

The anticipated unit cost for each product (not the last unit cost) is multiplied by the number of units to be purchased to obtain the expected purchase value for the entire quantity. All purchase values for individual items are added to obtain the total expected procurement cost. If this cost is greater than the budget, adjustments are made, as described in Session 1.

Example: Table 1 (p52) shows a sample consumption-based quantification from an eastern Caribbean country in the early 1990s. It is not the complete quantification list, but it illustrates the estimates for 19 medicines. Box 1 provides a summary of calculations used in consumption-based quantification.

Steps in the Consumption-Based Quantification Method

Step 1. Prepare a list of health commodities to be quantified.
Once prepared, the list of commodities should be sorted into the order that will best facilitate data collection, and distributed to those officials and facilities that will enter consumption data.

Step 2. Determine the period of time to be reviewed for consumption.
If the procurement is to cover a 12-month period, the consumption data for the past 12 months should be reviewed (if a full year's useful data are available). A 12-month review may also be used for a procurement covering 6 months, but if seasonal variations are significant, it may be better to use the same 6-month period from the preceding year. A short review period such as 3 months is inadequate to plan a procurement to cover 12 months, unless the 3 months reviewed reflect a steady state of consumption for the entire year.

Step 3. Enter consumption data for each commodity.
For each item on the list, enter the following:

- The total quantity used during the review period, in basic units
- The number of days in the review period that the item was out of stock (if it is impossible to determine the number of days out of stock with accuracy, the estimated number of months out of stock during the period can be entered)
- The lead time for the last procurement (or preferably the average from the last several procurements)

It is important to use the most accurate and current records available. The likely sources for consumption and lead-time data are:

- Stock records and distribution reports from a central distribution point

- Stock records and reports from regional or district warehouses
- Invoices from suppliers
- Dispensing records from health facilities

If projected pricing data are available at this stage, it may save time to enter prices while entering consumption data (see Step 10).

Step 4. Calculate the average monthly consumption (AMC).
The AMC is a key variable in the quantification formula and should be as accurate as possible. The simplest approach is to divide total consumption by the number of months reviewed. If stock-outs occurred during that period, the average must be adjusted to include the consumption that would have occurred if stock had been available.

There are two ways to account for stock-outs when computing AMC. The recommended method is illustrated in Box 1 (p53) as formula number 1. Enter the total consumption and divide this number by the number of months in the review period minus the total number of days out of stock in the same period (divided by 30.5 to convert to months).

For example, consider the entry for ampicillin 250mg capsules (the second item) in Table 1 (p52). The total consumption for a 6-month review period was 89,000 capsules. The medicine was out of stock for 34 days in the 6-month period. Therefore, the average monthly consumption (C_A) is:

$$C_A = 89{,}000 \div [6 - (34 \div 30.5)] = 89{,}000 \div 4.8852 = 18{,}219$$

An alternative method, which is simpler but less precise, is shown as formula number 2 in Box 1 (p53). It uses the estimated number of months out of stock for adjusting consumption, omitting the step of converting days to months. Using the same medicine from Table 1, the medicine was in stock for about 5 of the 6 months, leaving about 1 month out of stock. Therefore, the average monthly consumption is:

$$C_A = 89{,}000 \div (6 - 1) = 89{,}000 \div 5 = 17{,}800$$

Step 5. Calculate the projected AMC for expected changes in consumption pattern.
When using the example of ampicillin 250mg capsules from Table 1(p53), if use is expected to increase by 5% in the coming year, adjusting the AMC by 5% would be reasonable. This would raise the expected monthly need by 911 capsules, bringing the total to 19,129 capsules.
Some changes in consumption may be independent of trends in overall patient use. One example is predictable seasonal variation in the consumption of cough and cold remedies.
Another would be a potential spike in an epidemic disease such as cholera.. If such variation is anticipated, increasing estimates for medicines such as ORS, parenteral solutions, and some antibiotics would be sensible; however, this anticipated variation does not mean that the need for *all* medicines will increase by the same factor.

If it is known that a new formulary medicine will replace an older medicine by a substantial proportion, the estimate for the older medicine should be reduced. If major efforts are being made to alter prescribing patterns, anticipating at least some success by reducing the expected need for affected medicines by a small percentage would be reasonable. When a turnover occurs in prescribing staff, new prescribers may have different ways of treating common conditions that would substantially affect medicine needs in some therapeutic categories. If such changes can be

anticipated, it is wise to adjust the forecasts to avoid spending resources on medicines that will not be as commonly used as in the past.

Step 6. Calculate the safety stock (SS)needed for each health commodity.
Safety (buffer) stock is needed to prevent stock-outs, although high levels of SS increase inventory holding costs and should be avoided. In some supply systems, the SS is set for each item at a fixed quantity or a fixed number of months' worth of consumption. However, the preferred method is to calculate SS based on the projected AMC and the expected lead time (see formula number 4 in Box 1, p53). The projected AMC from Step 5 is multiplied by the average lead time. This SS level should avoid stock-outs, assuming that the item is reordered when only the SS remains, the supplier delivers within the projected lead time, and consumption is no greater than average. Using this formula, the SS for ampicillin 250mg capsules in the example is 19,129 x 3 months = 57,387.

For vital items (identified from a VEN analysis), it may be necessary to adjust the SS level to cover variations in consumption or lead time. Several options exist for adjusting this. The simplest method multiplies the basic SS by an adjustment factor. For example, an adjustment factor of 1.5 would increase the SS of ampicillin 250mg capsules in Table 1 to 86,081 capsules. If this sort of adjustment is done for all items, the cost of SS will increase substantially; therefore, adjustments should be made only when true uncertainty exists about the lead time or consumption.

Step 7. Calculate the quantity of each health commodity required in the next procurement period.
The suggested formula for calculating the quantity to order is shown as formula number 5 in Box 1 (p53). The calculation is done in three main steps. First, the projected AMC is multiplied by the sum of the lead time and the procurement period, yielding the total needs before considering SS, stock on hand, or stock on order. The second step is to add the quantity needed for SS. Finally, the quantity of stock on hand and the stock on order are added together, and then subtracted from the previous total. When using the example of ampicillin 250mg capsules from Table 1, the quantity to order is:

$$Q_O = 19{,}129 \times (3 + 6) + 57{,}387 - (81{,}000 + 58{,}000) = 90{,}548$$

Because the ampicillin capsules are purchased in packs of 1,000, 91 packs should be ordered.

Step 8. Adjust for losses.
To avoid stock-outs, quantification estimates should be adjusted to allow for losses. If the supply system from Table 1 averaged 10% per year in losses, and this percentage was applied to ampicillin 250mg capsules, the allowance would add 9,055 capsules to the estimate from Step 7, bringing the total purchase quantity to 99,603, or 100 packs of 1,000 capsules.

Step 9. Compile decentralized quantifications (if applicable).
In a decentralized quantification, staff members at each facility or storage point enter their own consumption quantities and stock-out information, and the estimates of the individual facilities are totaled and compiled on the master quantification list.

Step 10. Estimate costs for each health commodity and total these.
In order to estimate procurement costs, multiply the quantities estimated for each item by the most accurate prediction of the expected next purchase price (*not* the last one).

After the expected price has been entered for each item, multiply the price by the estimated quantity needed to obtain the total procurement value for the item. Table 1(p53) uses the pack price as the basis for making these projections, but in many cases using the basic unit price is preferable, because combining information from different sources to arrive at an average allows more flexibility. The basic unit price is also preferable if it is unclear what package sizes will be ordered or if projections are based on average international prices from a source such as the annual *International Drug Price Indicator Guide* (MSH 2012[1]).

After the estimated procurement value has been calculated for each item, the final step in the basic quantification process is to add up the estimated procurement values for all items listed to obtain the total expected cost for the procurement.

Step 11. Compare total costs with the budget and make adjustments.
If the total expected procurement cost exceeds the available budget, only two choices really exist: either obtain more funds or reduce the number of commodities or the particular quantities of each ordered, or both.

[1] Available at http://erc.msh.org/dmpguide/index.cfm?search_cat=yes&display=yes&module=dmp&language=english&year=2012

Table 1. Consumption-Based Forecast for an Eastern Caribbean Country

				C_T	D_{OS}	C_A	C_P	S_I	S_O	SS	Q_O	Q_A			
Medicine	**Strength**	**BU**	**Pack Size**	**Total Cons. in Period (BU)**	**Days O/S**	**Adjusted Average Monthly Cons. (BU)**	**Projected Ave Mthly Cons. (BU)**	**Stock on Hand (BU)**	**Stock on Order (BU)**	**Safety Stock Level (BU)**	**Sugg. Order Qty (BU)**	**Adj'd Order Qty**	**Order Qty (Packs)**	**Prob. Pack Price (USD)**	**Proposed Order Value (USD)**
Ampicillin	500mg	Cap	1,000	59,500	0	9,917	10,413	32,000	42,000	31,238	50,950	56,045	57	69.30	3,950.10
Ampicillin	250mg	Cap	1,000	89,000	34	18,218	19,129	81,000	58,000	57,387	90,548	99,603	100	35.10	3,510.00
Ampicillin sodium injection	500mg	Amp	100	3,879	0			111	7,600					29.95	
Ampicillin suspension	125mg/ 5ml	Bottle	100mL	4,128	0			1,513	3,000					0.75	
Antihistamine decongestant elixir	250ml	Bottle	250mL	853	29			351	929					1.57	
Antihistamine decongestant	(Any)	Tab	500	50,000	0			0	62,500					12.00	
Bacitracin antibiotic ointment	—	Tube	1	2,414	31			3,400	100					0.54	
Bendrofluazide	5mg	Tab	500	141,500	30			142,000	50,000					1.90	
Benzathine benzylpenicillin inj	2.4 MU	Amp	50	1,318	0			1,486	0					25.00	
Cephradine inj	500mg	Amp	100	2,695	0			2,300	1,100					75.00	
Chlorhexidine gluconate solution (Hibitane)	5%	L	5L	302	0			433	0					17.95	
Chlorhexidine/ cetrimide (Savlon)	5% / 0.05%	L	5L	438	0			418	250					14.70	
Chlorpropamide	250mg	Tab	1,000	162,000	0			169,000	0					8.99	
Cimetidine inj.	200mg	Amp	10	1,090	0			2,580	0					8.36	
Cimetidine	400mg	Tab	1,000	24,000	0			23,500	25,000					42.00	
Cloxacillin susp.	125mg/ 5ml	Bottle	100mL	882	0			1,446	0					1.00	
Co-trimoxazole susp.	200/40mg/ 5ml	Bottle	100mL	1,152	0			374	1,930					0.75	
Co-trimoxazole	400 / 80 mg	Tab	1,000	81,000	0			82,000	0					21.00	
Dextrose/saline (IV)	5% / 0.9%	Bottle	1L	1,525	32			0	2,288					1.35	
													Total order cost:		

Notes: BU = basic unit; USD = US dollars; consumption period = 6 months; lead time = 3 months; procurement period = 6 months; utilization adjustment for 6 months = 5%; loss adjustment = 10%.

Box 1. Consumption-Based Calculation Formulae

Number	Formula	Calculation
1	Adjusted average monthly consumption (AMC) (preferred)	$C_A = C_T \div [R_M - (D_{OS} \div 30.5)]$
2	Adjusted AMC (alternative)	$C_A = C_T \div (R_M - M_{OS})$
3	Projected AMC	$C_P = C_A + (C_A \times A_U)$
4	Basic safety stock requirements	$SS = C_P \times LT$
5	Quantity to order	$Q_O = C_P \times (LT + PP) + SS - (S_I + S_O)$
6	Quantity to order adjusted for losses	$Q_A = Q_O + (Q_O \times A_L)$

C_A = Average monthly consumption, adjusted for stock-outs
C_T = Total consumption during review period, in basic units
R_M = Total consumption review period in months
D_{OS} = Number of days an item was out of stock during the review period
M_{OS} = Estimated number of months an item was out of stock during the review period
C_P = Projected AMC
A_U = Utilization adjustment
SS = Quantity needed for safety stock
LT = Average lead time (for projected supplier or worst case), in months
Q_O = Quantity to order in basic units, before adjustment for losses or programme change
PP = Procurement period (number of months to be covered by order)
S_I = Stock now in inventory, in basic units
S_O = Stock now on order, in basic units
Q_A = Quantity to order adjusted for losses or programme change
A_L = Loss adjustment

Table 1. Consumption-Based Forecast for an Eastern Caribbean Country (with Answers)

				C_T	D_{OS}	C_A	C_P	S_I	S_O	SS	Q_O	Q_A			
Medicine	**Strength**	**BU**	**Pack Size**	**Total Cons. in Period (BU)**	**Days O/S**	**Adjusted Average Mthly Cons. (BU)**	**Projected Ave Mthly Cons. (BU)**	**Stock on Hand (BU)**	**Stock on Order (BU)**	**Safety Stock Level (BU)**	**Sugg'd Order Qty (BU)**	**Adj'd Order Qty**	**Order Qty (Packs)**	**Prob. Pack Price (USD)**	**Proposed Order Value (USD)**
Ampicillin	500mg	Cap	1,000	59,500	0	*9,917*	*10,413*	32,000	42,000	*31,239*	*50,956*	*56,052*	*57*	69.30	*3,950.10*
Ampicillin	250mg	Cap	1,000	89,000	34	*18,218*	*19,129*	81,000	58,000	*57,387*	*90,548*	*99,603*	*100*	35.10	*3,510.00*
Ampicillin sodium injection	500mg	Amp	100	3,879	0	*647*	*679*	111	7,600	*2,037*	*437*	*481*	*5*	29.95	*149.75*
Ampicillin suspension	125mg/ 5 ml	Bottle	100mL	4,128	0	*688*	*722*	1,513	3,000	*2,166*	*4,151*	*4,566*	*4,567*	0.75	*3,425.25*
Antihistamine decongestant elixir	250ml	Bottle	250mL	853	29	*169*	*177*	351	929	*531*	*844*	*928*	*929*	1.57	*1,458.53*
Antihistamine decongestant	(Any)	Tab	500	50,000	0	*8333*	*8,750*	0	62,500	*26,250*	*42,500*	*46,750*	*94*	12.00	*1,128.00*
Bacitracin antibiotic ointment	—	Tube	1	2,414	31	*484*	*508*	3,400	100	*1,524*	*2,596*	*2,856*	*2,856*	0.54	*1,542.24*
Bendrofluazide	5mg	Tab	500	141,500	30	*28,208*	*29,618*	142,000	50,000	*88,854*	*163,416*	*179,758*	*360*	1.90	*684.00*
Benzathine benzylpenicillin inj	2.4 MU	Amp	50	1,318	0	*220*	*231*	1,486	0	*693*	*1,286*	*1,415*	*29*	25.00	*725.00*
Cephradine inj	500mg	Amp	100	2,695	0	*449*	*471*	2,300	1,100	*1,413*	*2,252*	*2,477*	*25*	75.00	*1,875.00*
Chlorhexidine gluconate solution (Hibitane)	5%	L	5L	302	0	*50*	*53*	433	0	*159*	*203*	*223*	*45*	17.95	*807.75*
Chlorhexidine/ cetrimide (Savlon)	5%/0.05%	L	5L	438	0	*73*	*77*	418	250	*231*	*256*	*282*	*57*	14.70	*837.90*
Chlorpropamide	250mg	Tab	1,000	162,000	0	*27,000*	*28,350*	169,000	0	*85,050*	*171,200*	*188,320*	*189*	8.99	*1,699.11*
Cimetidine inj.	200mg	Amp	10	1,090	0	*182*	*191*	2,580	0	*573*	*0*	*0*	*0*	8.36	*0.00*
Cimetidine	400mg	Tab	1,000	24,000	0	*4,000*	*4,200*	23,500	25,000	*12,600*	*1,900*	*2,090*	*3*	42.00	*126.00*
Cloxacillin susp.	125mg/ 5 ml	Bottle	100mL	882	0	*147*	*154*	1,446	0	*462*	*402*	*442*	*443*	1.00	*443.00*
Co-trimoxazole susp.	200/40 mg/5 ml	Bottle	100mL	1,152	0	*192*	*202*	374	1,930	*606*	*120*	*132*	*132*	0.75	*99.00*
Co-trimoxazole	400/80 mg	Tab	1,000	81,000	0	*13,500*	*14,175*	82,000	0	*42,525*	*88,100*	*96,910*	*97*	21.00	*2,037.00*
Dextrose/saline (IV)	5%/0.9%	Bottle	1L	1,525	32	*308*	*323*	0	2,288	*969*	*1,588*	*1,747*	*1,747*	1.35	*2,358.45*
													Total order cost:		$26,856.08

Note: USD = US dollar; BU = basic unit; consumption period = 6 months; lead time = 3 mths; procurement period = 6 mths; utilization adjustment for 6 months = 5%; losses adjustment = 10%

Morbidity Method

The morbidity method uses data on patient/client use (attendances at health facilities) and morbidity (the frequency of common health problems/needs) to project the need for health commodities based on assumptions about how the problems will be treated. Those who plan to undertake a morbidity-based quantification are strongly advised to consult the WHO manual *Estimating Drug Requirements* (WHO/DAP, 1988)[2], which provides a more detailed discussion of the steps involved in this type of quantification.

The morbidity method requires a list of common health problems, an essential medicines list that includes the medicines used to manage these, and a set of standard treatments for quantification purposes (based on either average current practices or "ideal" treatment guidelines). For most health problems, at least two alternative treatments exist, and a percentage must be assigned based on how frequently each regimen is used. Next, the expected incidence (number of treatment episodes) of each health problem must be estimated. The incidence of a health problem can be estimated from total patient contacts or from a subgroup, for example, "number of TB-infected patients" or "number of women attending antenatal clinic services."

The quantification formula involves multiplying the quantity of each commodity included in standard treatments for each health problem by the number of treatment episodes expected for the health problem. The expected total need for each item is the sum of the estimates from all treatment regimens in which the item is included. Then the estimates are adjusted to fill the supply pipeline, allowing for losses caused by theft and wastage. Finally, the expected cost is calculated based on the expected purchase price of each item, and estimates are reconciled with available funds.

Given the limited data likely to be available on morbidity patterns and the difficulty in defining standard treatments that are meaningful for quantification, it is difficult to apply this method for more than 50 to 100 health problems. This difficulty limits the method's utility for a complex health system with many types of health problems and several levels of health facilities. In general, the morbidity method is most useful when estimating health commodity requirements for a relatively small number of different health problems, for example, for primary care or special-purpose facilities and programs.

Because a limited number of health problems is likely to be addressed in most morbidity-based quantification procedures, the resulting estimates for each item must be adjusted to cover health problems not considered in the quantification. Adjustments may also be required to fill the supply pipeline, to account for losses, and, in most cases, to reconcile the quantities needed with the funds available.

In a simple quantification for one health problem, such as cholera, or for a small group of health problems and medicines, the process can be done manually (although it is easier with a

[2], available online at http://whqlibdoc.who.int/hq/1988/WHO_DAP_88.2.pdf

computer). A computer is virtually required to conduct a large-scale morbidity-based quantification covering a large number of health problems and related commodities. Figure 1 is a flow diagram that illustrates how the data inputs on population, percentage of coverage, health problems, standard treatments, and unit costs are used to calculate the quantities needed and projected procurement costs.

Example. Table 2 is an example of morbidity-based quantification. The table shows a number of opportunistic infections for which medicines are to be procured, morbidity estimates for a 1-year period, and sample treatment regimens expected to be prescribed for the health problems[3]. Total medicine needs for these health problems are calculated in basic units. This information, together with projections for losses, adjustments made to reflect available funds, and quantities required to fill the pipeline, is used to produce a procurement list. Box 2 provides a summary of calculations used in morbidity-based quantification.

Steps in the Quantification

Step 1. Specify the list of problems

List the major specific health problems encountered (see Table 2). If an existing information system reports on diseases, those disease codes should be used; if there is no existing coding system, the ICD system should be used.

The health problem list should not be broken down in too much detail but should be defined according to the diagnostic capacity and health problems treated at each type of health facility. At the lowest level of the system, only a limited number of problems are recognized and treated; the range of problems diagnosed and treated normally increases at the health center, district hospital, and referral hospital levels.

Because treatments differ markedly for adult and pediatric patients, it is important to include at least two categories (under five years and over five years) for most problems. Although providing several categories may be tempting (under 5, 5-12, 13-65, and over 65), it is best to avoid overcomplicating the development of treatment guidelines (see below) and the process of compiling data on treatment episodes. In the example in Table 2 (p61), most treatments for health problems are for adult patients.

Step 2. Establish the list of medicines to be quantified

The objective here is a list of essential medicines that covers the major health problems and forms the basis for standard treatment schedules. A current and appropriate national or health system formulary or essential medicines list should be used when available. If no official list exists, one needs to be developed; it may grow out of the process of developing standard treatments.

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[3] Although the example used shows only medicines requirements and Standard Treatment/Guidelines only list medicines used in management regimes, it will be necessary to also quantify the requirements of any other health commodities used in each regime. E.g. syringes and needles, injection swabs used for administration of injectable medicines.

The medicines list must be available in two formats—one organized in alphabetical order by generic name (INN) and one by therapeutic categories. The therapeutic category list is most useful in developing standard treatment schedules, and the list organized by generic name is used for the procurement list.
Similarly any list of other health commodities required should be organised by category or type of item and then items listed alphabetically within each category.

Step 3. Establish standard or average treatments

Standard or average treatment regimens for each health problem are required to forecast medicine needs, as in Table 2 (p61). Developing this information is the most complicated part of the method. Two basic options exist for developing standard treatments: *average actual treatments* or *ideal standard treatments*. The components are the same, but an important difference exists between the approaches: *average* regimens are based on observed or reported practices and are more likely to predict what will actually happen, whereas *ideal* regimens define what should happen if prescribers correctly follow the guidelines.

Which should be used? Perhaps both, in a combination approach. For example, if one treatment regimen is viewed as ideal but another is commonly used, include both regimens in the guidelines for quantification and estimate the percentage of treatment episodes that will receive each of the two regimens.

For some health problems, particularly in severely ill patients, the duration of treatment varies significantly between individual patients, depending on treatment response. Expert advice should be sought to estimate average treatment duration. The same applies for preventive treatment, where adherence to treatment can significantly influence treatment duration.

In most quantification exercises, developing (or modifying) the treatment guidelines is necessary. Ideally, STGs should be developed by expert committees (with additional expert assistance brought in if needed). Unless reliable information is available on medicine use and prescribing patterns, a special study may be needed to determine average actual treatment patterns; this study can be combined with a study to determine morbidity patterns and incidence of health problems (see Step 4).

Whichever option is used, the same information must be compiled:

- The percentage of treatment episodes in which the medicine will be prescribed
- The name and strength of each medicine , with separate treatments listed for each age level/range, as appropriate
- The basic unit of the medicine (e.g. tablet, capsule, ml, gram)
- The number of basic units in each average single dose for the health problem in question
- The average number of doses of each medicine per day for the problem
- The average number of days of treatment for each medicine per episode

These components are combined to project the quantity of each medicine needed for each treatment episode (Q_E) in each standard treatment regimen. This projection is made by multiplying the basic units per dose (D_{CU}) by the number of doses per day (N_D). This result is multiplied by the length of treatment per episode, in days (L_D). The entire formula is:

$$Q_E = D_{CU} \times N_D \times L_D$$

In the example from Table 2 on p61, two different pharmaceutical products are prescribed for candidiasis for both age groups; the medicines are the same, but the dose and dosage form differ. The quantity of nystatin suspension needed to treat candidiasis in patients under five years old is calculated as:

$$Q_E = 4\text{ml} \times 4 \text{ doses/day} \times 7 \text{ days} = 112\text{ml}$$

This calculation is done for all medicines in all the standard treatment regimens.

If different treatment regimens (perhaps with multiple medicines) are used for the same disease according to its severity, separate standard regimens must be considered and assigned for each. For candidiasis and vaginitis (Table 2), two levels of severity are treated. Patients categorized as Severity 2 may either have been directly started on this regimen or been put on this regimen after first-line treatment failed.

If major differences exist in the way common problems are treated by different levels of prescribers, it may be useful to estimate how many (or what percentage of) treatment episodes of each disease will be managed by each category of prescriber; then specify separate treatment regimens common for each prescriber category. In the example from Table 2, 70% of prescribers are expected to use a combination of pyrimethamine and sulfasalazine to treat toxoplasmosis, while 30% of prescribers will continue to use sulfadoxine/pyrimethamine.

Note: It is important that practitioners involved in developing STGs for quantification understand that the guidelines are for quantification only and that a prescriber's freedom will not necessarily be curtailed as a result. In one West African country, a committee was formed to develop STGs for quantification, with the assistance of an outside expert. The committee met but decided that STGs would restrict doctors' freedom to choose a therapy, and instead they produced a simple therapeutics manual. When the external quantification team arrived in the country, there were no lists of common diseases with guidelines for quantification, and the process ultimately failed to produce a useful list for procurement.

Step 4. Collect morbidity data for each health problem treated

This step estimates the expected number of treatment episodes for each health problem from Step 1. A treatment episode is "a patient contact for which a standard course of drug treatment is required" (WHO/DAP 1988, 6.1). Table 2 shows one way to organize morbidity data for the health problems from Step 1 and to estimate the number of treatment episodes.

Information on morbidity patterns and treatment episodes from the regular health information system can be used for quantification. In many cases, however, this information is not available,

and a special study is needed in sentinel facilities, from which data can then (with caution) be extrapolated. The study can take two forms: a retrospective review of records in selected facilities (if those records are relatively accessible, complete, and accurate) or a prospective study in a sample of health facilities. The study must be completed before actually starting the quantification. Some key issues in conducting these studies include:

- Both the number of contacts and the number of treatment episodes must be obtained in the study of sample facilities.
- Only patient contacts that normally result in treatment with medicine/s should be counted, separated from those contacts that do not (such as well-child programs).
- The sample data should specify the frequency of each health problem in terms of a common denominator, such as per 1,000 inpatients or per 1,000 outpatient visits (for example, number of acute diarrhea cases per 1,000 outpatient contacts).
- Separate frequencies must be developed for all age groups specified in the STGs. Table 2 shows one format for doing this.
- It may be impossible to separate curative from non-curative contacts in a retrospective review of records. Even for curative contacts, not all patients who come to facilities with health problems receive medicine therapy (although the vast majority do if medicines are in stock). If this factor is thought to be important, the proportion of cases that will be treated with medicines can be estimated.
- If different types of prescribers (such as doctors, paramedical staff) use different treatment regimens, the number of treatment episodes must be compiled separately for each prescriber type.
- The sample data should also specify the number of patient contacts per total population in the area served by the sample facilities. For example, if the total population in the sample area was 3.9 million, and there were 3,123,408 patient contacts per year (as in Table 2 p61), on average there were 0.8 patient contacts per inhabitant. This average could be used to project the number of contacts in another area, as in the adjusted-consumption method.

The WHO Manual *Estimating Drug Requirements* (WHO/DAP 1988) provides guidelines for surveying health facility records, doing a prospective study of morbidity, and constructing morbidity projections.

Step 5. Calculate the number of treatment episodes for each health problem.

There are two options for calculating the number of treatment episodes. If the number of expected patient contacts (outpatient contacts, inpatient admissions, or both) can be estimated directly in the target facilities, the calculations are done in one step based on the number of contacts. If the information on contacts is not reliable, the number of treatment episodes must be estimated from the population in the area served and the frequency of contacts per inhabitant in the target population.

First, the number of treatment episodes must be adjusted for expected changes in patient use. In the Table 2 example, there were 3,123,408 contacts (C), separated into two categories:

under five years of age and over five years of age. Most of the patients expected to be treated for opportunistic infections are adults. In Table 2, a 5% increase is expected (A_u). Therefore, the estimated number of treatment episodes for each age group and each health problem is multiplied by 1.05.

$$C_E = C + (C \times A_U)$$

$$C_E = 3{,}123{,}408 \times 1.05$$

Next, multiply the expected total number of contacts (C_E) by the expected frequency of the problem (F) to obtain the number of treatment episodes (E_T) based on last year's data. The estimated total number of patient contacts for the past year is divided by 1,000, so that the denominators of contacts and treatment frequency are the same. (The frequency of treatment episodes is usually expressed in treatment episodes per 1,000 contacts.) This step must be done separately for each discrete age range used in the process. If multiple levels of treatment exist, the number of treatment episodes at each level must also be estimated.

$$E_T = C_E \times F$$

In the Table 2 example, there were 3,123,408 expected contacts, and in the past year there were 55 episodes of oral candidiasis out of 1,000 patients over the age of five. Therefore, the calculation is:

$$E_T = 3{,}279{,}578 \times 55 \div 1{,}000$$

Step 6. Calculate the quantity of each medicine needed for each health problem.

For each health problem, the projected number of treatment episodes from Step 5 (E_T) is multiplied by the quantity of basic units (Q_E) specified in the guidelines for each age group (and each level of disease severity from Step 3). This result is then multiplied by the percentage of cases expected to be treated (P_T). The full formula is:

$$Q_T = E_T \times Q_E \times P_T$$

In Table 2, 70% of patients under age five with oral candidiasis (thrush), Severity 1, are expected to receive paracetamol oral solution. Therefore, the calculation is:

$$Q_T = 1{,}193{,}767 \times 112\text{ml} \times 0.7\ (70\%)$$

This calculation gives a total of 16,529,075 ml needed for this treatment regimen.

Step 7. Combine the estimates for each medicine from the various health problems into a master procurement list

This step combines the estimated quantities from different treatment regimens into one master list for procurement. For example, in Table 2, co-trimoxazole tablets are included in two regimens (PCP and prophylactic therapy). For the master procurement list, the two separate estimated quantities must be added to yield the total number of tablets of co-trimoxazole needed. Master list quantities usually then need to be adjusted to cover factors such as health

problems not considered in the basic estimates, shortages in the supply pipeline, and losses caused by theft and wastage.

Step 8. Adjust quantities to cover other health problems

The reliability of morbidity-based quantification increases as the number of health problems addressed increases, but getting reliable data or estimates for all major health problems is rarely feasible. When getting such data is not possible, morbidity-based quantification cannot predict total medicine needs and must be adjusted for medicine needs not addressed in the quantification. Otherwise, stock-outs will occur.

Because reliable consumption data from the target system are not available for comparison (if they were, the consumption-based method would probably have been used for the quantification), the adjusted consumption method or "expert opinion" may be used to estimate the percentage adjustment that should be made to the morbidity-based estimates.

If data on medicine use (consumption) are available from another, similar health system, it may be possible to extrapolate requirements for 20 or 30 commonly used medicines and then determine the average percentage difference between the estimates produced by each method. For example, if the extrapolated method produces estimates that average 10% higher than those produced by the morbidity method, the quantities of all medicines could be increased by 10%.

An alternative is to survey local experts ("expert opinion") to determine what percentage of overall patient contacts have been captured in the list of health problems used for morbidity quantification. For example, if local experts agree that about 90% of the medicine needs are covered in the standard treatments, estimated quantities could again be increased by 10% to arrive at the total need (100%).

Step 9. Adjust for filling the pipeline and current stock position

So far, the calculations assume that the supply pipeline is relatively intact and that the procurement is only replacing medicines being consumed. If major stock-outs have occurred that need to be corrected, additional stock will be necessary to fill the pipeline.

If applicable, make adjustments for stock on hand, stock on order, and lead time as described in the consumption method (Step 6) to finalize the preliminary estimates.

Step 10. Adjust quantities for expected losses

In most supply systems, losses are a reality, and unless they are considered in the quantification process, stock-outs will be unavoidable.

Step 11. Estimate costs for each medicine and total costs

With adjustments made to cover needs for additional health problems, losses, and filling the pipeline (if necessary), the total estimated quantity can be divided by the purchase-pack size to determine the number of packs to be ordered. In the Table 2 example, 4,414,313 paracetamol 500mg tablets are the estimated need. If this medicine is produced in 100-tablet packs, 4,414 packs should be ordered.

If the basic unit price is used as the basic estimate of cost, multiply the basic unit price by the expected pack size to determine the expected pack price. If the available prices are based on pack price, enter this price directly.

To calculate the estimated procurement value, multiply the expected pack price by the estimated number of packs to be purchased. The prices used in the estimate should be the expected next purchase price, *not* the last purchase price.

Step 12. Compare total costs with the budget and make adjustments

Reduce the estimated quantities, the number of medicines, or both to conform with budget realities, if necessary. The morbidity-based method lends itself to considering the relative therapeutic value of medicines on the list. In the example illustrated by Table 2, it might be determined that, because miconazole cream has not been proved to be useful in vaginitis, the percentages allotted for this medicine could be reduced. The important point is that when reductions are required, they should be made rationally, with the goal of maximizing the therapeutic benefit of the expenditures which will be made in procuring the required items.

Figure 1. Morbidity Method

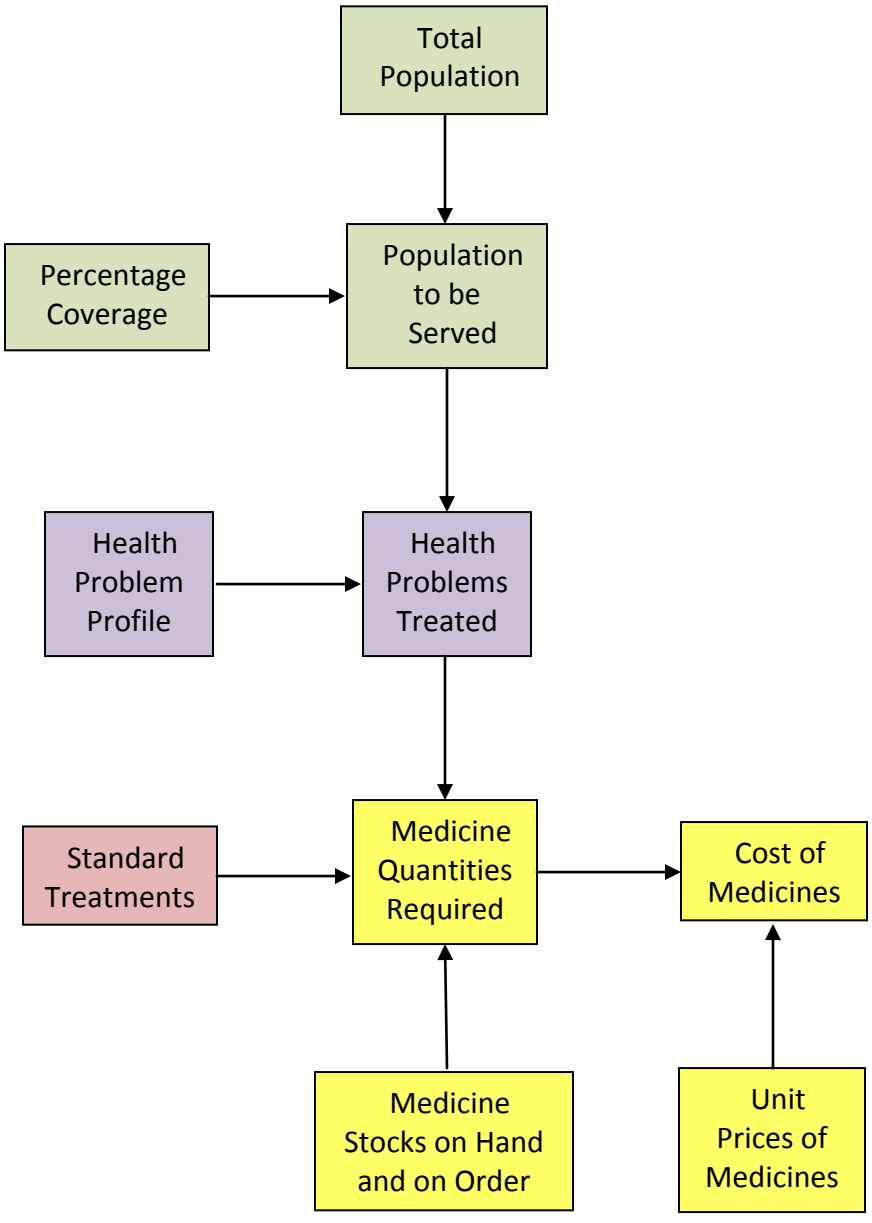


Table 2. Medicine Needs Based on Morbidity

			F	C_E	E_T		P_T			D_{CU}	N_D	L_D	Q_E	Q_T
Condition	Severity	Age Group	Episodes/ 1,000 Contacts	Expected No. of Contacts	Expected No. of Episodes	No. of Regimens	% Cases Treated with Regimen	Medicine	Basic Unit (BU)	BU/ Dose	Doses/ Day	No. of Days	BU/ Episode	Total BU Needed
Candidiasis	1	>5	55	*3,279,578*	*180,377*	1	100	Nystatin 500,000 IU	Tab	1	4	7	*28*	*5,050,551*
						2	70	Paracetamol 500mg	Tab	1	4	5	*20*	*2,525,275*
		<5	45	*3,279,578*	*147,581*	1	100	Nystatin 100,000 IU/ml	ml	4	4	7	*112*	*16,529,075*
						2	70	Paracetamol solution 120 mg/5 ml	ml	7.5	4	5	*150*	*15,496,005*
	2	>5	15			1	100	Fluconazole 100mg	Tab	1	1	14		
						2	80	Paracetamol 500mg	Tab	1	4	12		
Vaginitis	1	>5	23			1	100	Miconazole 2% cream	50g	0.1	1	7		
	2	>5	12			1	100	Fluconazole 100mg	Tab	1.5	1	2		
							80	Fluconazole 100mg	Tab	1	1	26		
Pneumocystis jiroveci (PCP)	1	>5	16			1	100	Co-trimoxazole (80+16) mg	Amp	9	3	3		
							100	Co-trimoxazole 480 mg	Tab	2	3	18		
		>5	3			1	100	Co-trimoxazole (80+16) mg	Amp	1	4	21		
	2		3			1	100	Pentamidine 200 mg/vial	Vial	1	1	21		
Cryptococcosis		>5	22			1	100	Amphotericin B 50mg/vial	Vial	1	1	14		
							100	Fluconazole 100mg	Tab	1	1	14		
							90	Fluconazole 200mg	Tab	2	1	56		
							60	Fluconazole 20mg	Tab	1	1	295		
Toxoplasmosis (acute infection)		>5	40			1	70	Pyrimethamine 25mg	Tab	8	1	1		
							70	Pyrimethamine 25mg	Tab	0.5	4	42		
							70	Sulfasalazine 500mg	Tab	0.5	4	42		
						2	30	Sulfadoxine-pyrimethamine 500+25 mg	Tab	0.5	4	42		
Prophylaxis		>5	50			1	100	Co-trimoxazole 480mg	Tab	2	1	365		
		<5	5			1	100	Co-trimoxazole suspension 240mg/5 ml	ml	5	1	365		

Note: Based on 3,123,408 contacts in the past year; 5% expected rate of increase

Box 2. Formulae Used in Morbidity-Based Calculations

Number	Formula	Calculation
1	Quantity of medicines needed/treatment episode	$Q_E = D_{CU} \times N_D \times L_D$
2	Expected total number of contacts (in thousands)	$C_E = C + (C \times A_U)$
3	Expected treatment episodes	$E_T = C_E \times F$
4	Total quantity of medicines needed	$Q_T = E_T \times Q_E \times P_T$

Q_E = Quantity of each medicine needed for each treatment episode
D_{CU} = Basic units/dose
N_D = Number of doses/day
L_D = Length of treatment (in days)
C = Past total number of contacts
A_U = Utilization adjustment
C_E = Expected total number of contacts
F = Frequency of health problem (per 1,000)
E_T = Expected treatment episodes
Q_T = Total quantity required
P_T = % of cases expected to be treated

Table 2: Medicine Needs Based on Morbidity (with answers)

Problem	Severity	Age Group	Episodes per 1,000 Contacts	Expected Number of Contacts	Projected Number of Episodes	Number of Regimens	% Cases Treated with Regimen	Pharmaceutical Product	Basic Unit	Basic Unit per Dose	Doses per Day	Number of Days	Basic Units per Episode	Total Basic Units Needed
Candidiasis	1	>5	55	*3,279,578*	*180,377*	1	100	Nystatin 500,000 IU	Tablet	1	4	7	*28*	*5,050,551*
						2	70	Paracetamol 500mg	Tablet	1	4	5	*20*	*2,525,275*
		<5	45	*3,279,578*	*147,581*	1	100	Nystatin 100,000 IU/ml	ml	4	4	7	*112*	*16,529,075*
						2	70	Paracetamol solution 120 mg/5 ml	ml	7.5	4	5	*150*	*15,496,008*
	2	>5	15	*3,279,578*	*49,194*	1	100	Fluconazole 100mg	Tablet	1	1	14	*14*	*688,711*
						2	80	Paracetamol 500mg	Tablet	1	4	12	*48*	*1,889,037*
Vaginitis	1	>5	23	*3,279,578*	*75,430*	1	100	Miconazole 2% cream	50 g Tube	0.1	1	7	*1*	*75,430*
	2	>5	12	*3,279,578*	*39,355*	1	100	Fluconazole 100mg	Tablet	1.5	1	2	*3*	*118,065*
							80	Fluconazole 100mg	Tablet	1	1	26	*26*	*818,583*
Pneumocystis jiroveci (PCP)	1	>5	16	*3,279,578*	*52,473*	1	100	Co-trimoxazole (80+16) mg	Amp	9	3	3	*81*	*4,250,334*
							100	Co-trimoxazole 480mg	Tablet	2	3	18	*108*	*5,667,111*
		>5	3	*3,279,578*	*9,839*	1	100	Co-trimoxazole (80+16) mg	Amp	1	4	21	*84*	*826,454*
	2		3	*3,279,578*	*9,839*	1	100	Pentamidine 200mg/vial	Vial	1	1	21	*21*	*206,613*
Cryptococcosis		>5	22	*3,279,578*	*72,151*	1	100	Amphotericin B 50mg/vial	Vial	1	1	14	*14*	*1,010,110*
							100	Fluconazole 100mg	Tablet	1	1	14	*14*	*1,010,110*
							90	Fluconazole 200mg	Tablet	2	1	56	*112*	*7,272,793*
							60	Fluconazole 200mg	Tablet	1	1	295	*295*	*12,770,678*
Toxoplasmosis (acute infection)		>5	40	*3,279,578*	*131,183*	1	70	Pyrimethamine 25mg	Tablet	8	1	1	*8*	*734,626*
							70	Pyrimethamine 25mg	Tablet	0.5	4	42	*84*	*7,713,568*
							70	Sulfasalazine 500mg	Tablet	0.5	4	42	*84*	*7,713,568*
				3,279,578	*131,183*	2	30	Sulfadoxine-pyrimethamine 500+25mg	Tablet	0.5	4	42	*84*	*3,305,815*
Prophylaxis		>5	50	*3,279,578*	*163,979*	1	100	Co-trimoxazole 480mg	Tablet	2	1	365	*730*	*119,704,612*
		<5	5	*3,279,578*	*16,398*	1	100	Co-trimoxazole suspension 240 mg/5ml	ml	5	1	365	*1,825*	*299,261,529*

Note: Based on 3,123,408 contacts in the past year; 5% expected rate of increase.

SESSION 5: DATA COLLECTION FOR FORECASTING

Duration: 1½ hours

Objectives:
To ensure that participants have a good understanding of:

- the process of data collection for forecasting
- the various types of data needed for different quantification methods and their potential sources

Content: Types of data needed and its potential sources, minimum data requirements, data collection for quantification & a practical activity

Trainer's notes:
This session is aimed at improving participants understanding of data processes and the related procedures required for successful quantification. The session combines a lecture presentation with discussion/buzz sessions[5]. The trainer should thus be able to manage the buzz sessions in a way that the time allocated for the whole session is maintained.

- In listing and describing the various types of data and their potential sources, the trainer should strive to obtain as much information as possible from participants so that they are the ones providing the responses. Depending on the size of the group, this may be done through a simple buzz session with the whole group or through smaller discussion groups and plenary presentation where possible.
- The minimum data sets for use in quantification which are collected at facility level can also be worked out in much the same way as above even though a simple buzz session will do.
- The steps to be taken in obtaining the required data will be a good illustration of the process of data flow in the quantification process.
- When going through the slide on issues to remember in data collection and reporting, it is useful if the participants can also provide some comments or feedback in a buzz session.
- The facilitator should listen to the group discussions so as to provide any required guidance and clarifications to the participants. Participants should come up with additional issues based on their experiences and the trainer can note these for future improvement of the training material.

Lesson Plan Guide:

SESSION	CONTENT	ACTIVITY	TIME
5	Types of data needed and its potential sources, minimum data requirements, data collection for quantification & a practical activity	Lecture/ Discussion/Activity	1½ hours

[5] Buzz sessions are short participatory sessions built into a lecture or larger group exercise to stimulate discussion and provide feedback. Usually small groups spend a few minutes intensively discussing an identified topic and then each reports back on its discussions to the plenary (the whole group of participants). However buzz sessions which involve the whole participant group may also be used.

Data Collection for Forecasting

Session Objectives

At the end of the session, participants should be able to:

- List and describe the various types of data needed and their potential sources
- List the minimum data requirements needed
- Describe data collection for quantification
- Do an exercise focusing on data for consumption and morbidity methods forecasts

Obtaining Required Data

- Data Collection tools
  - Manual
  - Electronic
- Coordination Mechanism
  - Ministry of Health
  - Supply chain technical working group
  - Care and Treatment stakeholders

Sources of Data

- HMIS and LMIS
- Program documents in country
- Policy guidelines or documents
- Reports of previous quantification and procurements
- Central medical stores data

Minimum Data Requirements

- Number of patients/regimen
- Current stock status of all health commodities throughout the system
- Expected shipments
- Estimated recorded and projected rates of loss and wastage

Key points for data collection

- The most difficult of all steps in the quantification process
- In cases where data are not available or are very poor, it may be necessary to make estimates or
- Several different tools can be used to manage the data collection and reporting
- A coordination committee for quantification can be used to share data needs for quantification

Group Activity

Data for both morbidity and consumption based forecasts

- Group 1-HIV/AIDS
- Group 2-RH
- Group 3-Malaria
- Group 4-TB
- Group 5- Lab
- Group 6- Essential Medicines
- Group 7- Medical supplies

Group Activity

For each group, do the following:

- List all the data required for morbidity and consumption methods
- List the possible sources of the data/information
- Validate the data

Validate (give a list of possible questions to ask when validating)

The tables are in the notes following these slides

Example - Split Between 1st Line and 2nd Line Adults

National ADULT ART Regimen Trends

Covers Patients through KEMSA, Kenya Pharma and MSF pipelines

1 Transition to 2nd Line (Treatment Failure)

	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12
1st Line regimens	401,531	393,121	425,475	426,273	440,704	441,712	443,784	456,810	466,944	472,006	488,072	497,984
2nd Line & Others	18,979	17,279	21,566	20,462	21,303	20,186	19,237	19,784	19,457	18,431	18,806	21,625
Total Adults	***420,510***	***410,400***	***447,041***	***446,735***	***462,007***	***461,898***	***463,021***	***476,594***	***486,401***	***490,437***	***506,878***	***519,609***
	4.51%	4.21%	4.82%	4.58%	4.61%	4.37%	4.15%	4.15%	4.00%	3.76%	3.71%	4.16%

Average 4.25%

This data was derived from NASCOP and shows 12 months adult patients data for those on 1st and 2nd line ARV regimens.

Such data can be used to estimate future ARV requirements based on the no. of patients per regimen. This data can be utilized as morbidity data and compared with consumption of specific ARVs to check for the reliability of both data sets.

Activity: Data and Information Needs and Potential Sources

The following tables define data/information needs for the consumption-based and morbidity-based quantification methods. For each table, indicate the source of the data/information in your area of work, e.g. HIV/AIDS, TB, RH etc.

Table 1. Data and Information Needs for Consumption-based Quantification Method

Consumption data element	Sources	
	Document	Location
Stock on hand		
Quantities consumed		
Losses by quantities (expiries, damages, pilferages)		
Days out of stock		
Supplier lead times		
Desired buffer level		
Desired maximum stock level		
Projected commodity costs		
Procurement period		
Pack size		

Table 2. Data and Information Needs for Morbidity-based Quantification Method

Morbidity data element	Sources	
	Document	Location
Population data		
Patient attendance		
Breakdown of patients on treatment regimens		
Proportion of patients by age, gender		
Incidence & prevalence of health problems		
Potential changes in regimens & protocols		
Recommended regimens & protocols		
Supplier lead time		
Procurement period		
Desired buffer levels		
Pack size		
Desired maximum stock level		
Projected commodity costs		

Elements of a Management Information System (MIS)

An MIS is a system used to:

- convert data from internal and external sources into useful information
- communicate that information, in an appropriate form, to managers at all levels in all functions to enable them to make timely and effective decisions for planning, directing and controlling the activities for which they are responsible.

The MIS for commodity management is a set of standards, indicators, tools and procedures that facilitate commodity-related data collection, processing it to generate information, reporting, providing feedback, analysing and using information to make informed decisions.

The elements of an MIS include:

1. Data – the collection of unprocessed raw facts and figures, e.g., quantity of amoxicillin 500mg capsules received
2. Information –data stored, analyzed, compared, calculated and manipulated to produce the form required by the user, e.g., monthly consumption of amoxicillin 500mg capsules
3. Tools – documental and/or electronic formats used to capture data, process data and present information e.g., stock card, tally sheet, monthly report
4. Procedures and standards – the steps and rules of collecting data, generating, sharing and using information, e.g., quantity of drugs issued are to be recorded immediately after dispensing

Steps Needed to Obtain Required Data and Information

Because the data and information needed for quantification come from various sources, it is best to establish a quantification committee, This should include all the relevant stakeholders, e.g. procurement staff from the supply organisation (KEMSA), representatives from Ministry of Health divisions, donor organizations; pharmacy staff and prescribers from a small but representative selection of health facilities. All data/information needs and assumptions should be reviewed by this committee and final procurement figures should also be approved.

The process of obtaining useful data for quantification purposes entails various stages:

- *Determining data and information needs:* performed by the quantification committee as described above.
- *Data collection:* completed through routine recording of product use at the various health facilities. Ideally, data required for quantification are available through routine recording and reporting established at the beginning of the program by a stakeholder committee. Various manual or electronic tools can be used for routine information management. Standard operating procedures (SOPs) should be developed to detail the steps and rules of collecting data.

  Product consumption data is recorded through the use of medicine and other health commodity-centered records (registers, monthly drug tally sheets, bin cards). Morbidity data is captured using various patient-centered records. Updating these records is done at the level at which the data is collected.

The minimum data to collect to support successful quantification should include:

- Product consumption data
  - Orders: date, quantity ordered
  - Receipts: date, quantity received, expiry date
  - Issues: date, quantity issued/removed for destruction, destination
- Patient data
  - Patient profile: adult or child, gender, new or continuing
  - Disease type
  - Regimen prescribed
  - Date, item and quantity dispensed

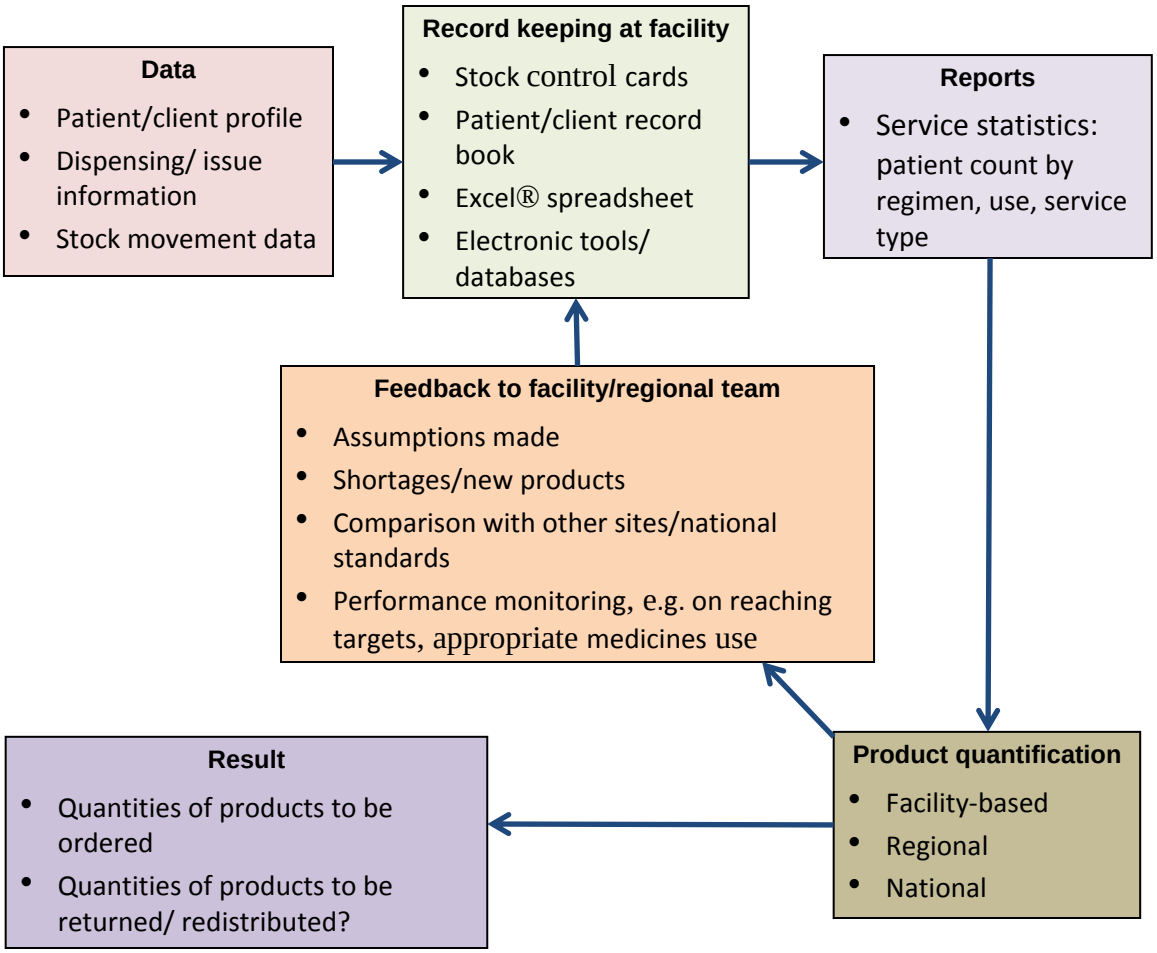
- *Data processing.* Can be at the facility, county, national or multi-national level. Data may either be manually aggregated or summarized using computerized programs. Use of standardized tools for data collection enhances data processing, because errors are minimized during the data entry into aggregated forms.

  Manual tools for data aggregation include forms and records for data capture (facility-, county-, and national-based). Alternatively, data may be directly entered into computerized databases that are able to aggregate data and produce reports with ease.

- *Reporting.* This is the transmission of data and information between different levels of a health system. It entails forwarding information collected at the facility level to higher levels in the health system. It may also include feedback reports from the higher levels to the facilities where data were collected. Feedback reports serve to address specific issues highlighted and to analyze how each facility performed compared to others. Providing regular feedback to facilities helps improve data quality and reporting compliance. Reporting is carried out through the use of periodic reports (monthly, quarterly, biannual, etc.). Reporting formats must be standardized to ensure that different facilities provide data on similar parameters.

  A coordination team is required to ensure that facilities are able to provide their reports in a timely manner. This team will oversee the data processing at the central level, and provide feedback to the facilities. The coordination team will also present the processed information to the quantification committee at the national or county level for review.

Forecasting Data Flow Chart



Manual Tools for Data Collection

Various types of forms may be used for data collection. Examples include the following: Standard order forms (SOF), Stock control cards (SCC), DAR, CDRR, and Patient Summary

Electronic Tools for Data Collection

Excel spreadsheet, Access database

Data Collection and Reporting: Lessons Learned

Inaccurate or missing data is universally identified as a major constraint to successful quantification. In addition it can be difficult to extract and aggregate data needed from manual tools. Sites can lose motivation to report data and information if supplier is not responsive or products and quantities supplied are inappropriate to needs.

A concerted and coordinated team effort is needed to:

- Develop and sustain a system for data collection
- Harmonize tools and reporting systems
- Develop, print and disseminate tools to sites
- Provide standard operating procedures for, and advise and train sites on data collection and aggregation
- Support efficient reporting by sites
- Give consistent and responsive feedback to sites
- Consider and plan for computerized tools
- Involve users in system and tool development and provide responsive feedback

SESSION 6: PRESENTATION AND DISCUSSION OF FORECASTING DATA

Duration: 4 hours

Objective: To ensure participants have a good understanding of preparatory process for forecasting and correct management of the relevant data

Content: Data collection, data organization, gaps in the data and challenges encountered

Trainer's notes:
To adequately prepare for this session, various data sets will be required. The following table provides guidance on the type of data required for the forecasting for the various programs.

EMMS Program	Quantity on hand; quantity allocated (kept aside by the supplier after ordering); quantity available in the warehouse; quantity on order; AMC; annual consumption; stock status level; projected AMC; buffer stock, projected annual consumption; projected requirements; quantity to order
HIV Program	Growth/scaling up factor; AMC; number of patients on which treatment regimen; stock status at various SDPs; number of patients on 1st & 2nd line treatment
FP Programs	Stock on hand; consumption; reporting rates
Laboratory Group	Number of tests done; reagents used in which test; AMC; stock levels of reagents etc
TB Program	Number of TB cases reported; scale up factor; no. of regimens; unit of issue; doses per day; treatment duration; pack size, etc
Malaria Program	Number of malaria cases; consumption per weight band; number of uncomplicated & complicated cases

The trainer can guide the participants in identifying critical data for different program quantification and also cover:

1. Data collection – duration of data collection; manual or computerized system - the source of data can be DAR, health facility monthly summary, county summary (aggregated), treatment guidelines, AMC
2. Data organization – monthly aggregated data per district, monthly facility data, number of regimens, number of treatment episodes, number of tablets dispensed per treatment episode, doses per day, treatment duration, pack size
3. Gaps/challenges – include low reporting rates, lack of consumption data, no data on stock outs, poor inventory management, lack of monthly stock status data, lack of morbidity data, no data on new patients enrolled in a program, no data on attrition rates for programs

Lesson Plan Guide:

SESSION	CONTENT	ACTIVITY	TIME
6	Data collection, data organization, gaps in the data and challenges encountered	Discussion	4 hours

Presentation and Discussion of Forecasting Data

Session Objectives

- Divide the participants in groups
- Identify critical data required for different program quantification
- Look at different programs and the data they require for forecasting & quantification
- Discuss the issues presented

Divide the participants into groups (program/commodity based)

Let them list the critical data required to forecast for their commodities and their sources

Let the participants do group work focusing on data elements to be collected, data organization & gaps/challenges they face in the process of quantifying their requirements

Lead a discussion based on the presentations to enrich the content and data we need to utilize for the purposes of forecasting and quantification

SESSION 7: ASSUMPTIONS AND DECISION-MAKING FOR FORECASTING

Duration: 30 minutes

Objective:

To ensure that participants have a good understanding of:

- the necessary assumptions and decisions that are made during forecasting
- how to identify the key assumptions

Content: Rationale for forecasting, Basic Principles for Forecasting, Making Assumptions, Comparing results using consumption and morbidity data, Examples of assumptions

Trainer's Notes:

This session aims to provide participants with an insight into the basic principles and approaches for making assumptions when quantifying for health commodities. As assumption-making is key to the quantification process, the trainer should have a very clear understanding of the topic before presenting the slides.

- In presenting the slides on basic principles when making assumptions, the trainer should clearly explain the major points
- Make the assumptions for new programs as well as continuing programs more interactive by asking participants questions
- The slides on comparing results between morbidity-based and consumption-based methods of quantification also provide a good opportunity for interactive discussions
- After the formal presentation, a general discussion is useful to bring out experiences on how participants have made assumptions in the past. The key message to bring out is that a variety of approaches is used in coming up with assumptions in the forecasting decision-making process.

Lesson Plan Guide:

SESSION	CONTENT	ACTIVITY	TIME
7	Rationale for forecasting, Basic Principles for Forecasting, Making Assumptions, Comparing results using consumption and morbidity data, Examples of assumptions	Lecture/Discussion	30 minutes

Assumptions and Decision Making for Forecasting

Session Objectives

At the end of the session the participants should be able to:

- Describe the basic principles and approaches for making assumptions when quantifying needs
- Identify the key assumptions that need to be made for forecasting exercise

This slide outlines the objectives of this session

Rationale for Assumptions

- Certain decisions and assumptions have to be made to cater for deficiencies e.g.
  - Inaccurate data
  - Incomplete data
  - Missing Data

This slide outlines the challenges that may lead to unsuccessful quantification and necessitate stop-gap measures being put in place to fill any resulting gaps in commodity supply

Making Assumptions: Basic Principles

- Follow-up on inconsistent data
- Ask questions on data issues/challenges
- Communicate with colleagues
- Gather information for future use
- Cross check data calculations and information
- Create "what if" scenarios

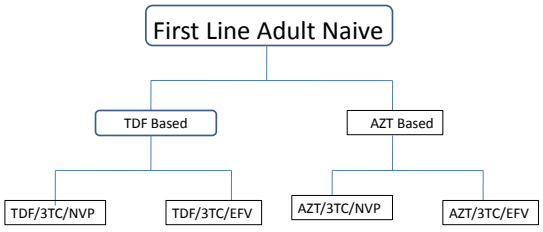
This slide shares the basic principles that need to guide making assumptions as regards data available for decision-making for forecasting

Making Assumptions: Pre-requisites for New Programs

- Look for information from similar programs, facilities or geographic areas
- Gather data from the health information system and use STGs to calculate needs
- Talk to physicians and other providers of care (e.g. multidisciplinary team)
- Use disease incidence or prevalence rates

The slide shares the assumptions that need to be considered when looking at new programs

Making Assumptions: Use Decision Trees



Decision trees can assist one in making assumptions especially when there are several options in a solution or target as illustrated in the diagram.

Treatment may be with Tenofovir or AZT shown in different branches of the tree

Making Assumptions: Quality of the data

- Evaluate the Quality of the Data:
  - Compare data and projected needs with Data from similar programs, facilities or areas

Share with the participants about evaluating the quality of the data they have.

Let them compare the data with data from similar programs, facilities or areas

Making Assumptions: Continuing Programs

- Evaluate the accuracy of the data/assumptions:
  - Compare forecasted demand with:
    - actual usage
    - similar programs, facilities or areas
    - STGs to monitor rational use
- Make adjustments for projected changes

This slide shares the assumptions that need to be considered for existing programs

Comparing Morbidity and Consumption Results

- Confirm the reliability and accuracy of data used
- Consider if the results are comparable and appear reasonable

We need to compare the service statistics giving the morbidity-based and consumption-based results to see whether they relate to each other.

The comparison will guide us as to whether the data is reliable

Comparing Results: Consumption Vs Morbidity (i)

- **Not confident in the quality of data of either method:**
  - Overall health assessment and strengthening HMIS
  - Use Adjusted consumption method. Or adjust results based on reasonable estimates

This slide shows that one may not be confident in the quality of data using either method so you will need to work with the adjusted consumption method to adjust the results

Comparing Results: Consumption Vs Morbidity (ii)

- **Less confidence in morbidity data**:
  - Underestimation of disease?
  - Accurate population figures? Has migration, seasonal workers, and refugees been taken into account?
  - Are Standard guides/protocols followed?
  - Health commodities used in other programs?
  - Low program coverage? Under- diagnosis?

If one has more confidence in the consumption data, consider the reasons why the morbidity data may not be reliable by looking at the parameters outlined

Comparing Results: Consumption Vs Morbidity (iii)

- **Less confidence in consumption data:**
  - Pilferage? Expiration? Leakage?
  - Health commodities used in other programs?
  - Stock-outs of related commodities causing higher consumption of some items?

If there is greater confidence in morbidity data, consider the reasons why consumption data is not reliable to use

Comparing Results: Consumption Vs Morbidity (iv)

- **Greater confidence in morbidity data:**
  - Poor MIS?
  - Adequate budget to meet needs? Population untreated?
  - Low program coverage? Under- diagnosis?
  - Multiple sources for health commodities?

Examples of Assumptions for Calculating Needs of ARVs

- Scaling up
  - Anticipated rate of scale up
    - Resources and capacity to scale-up
    - Availability/capacity of monitoring/diagnosis
  - Adults vs. children
- Treatment and testing guidelines for new patients starting on treatment compared with continuing patients

The slide shows examples of assumptions for calculating needs of ARVs in a scaling up situation

Examples of Assumptions for Calculating Needs of ARVs

- Changes in national / site-level STGs
- Changes in prescribing practice
- Attrition (deaths, transfer out, lost to follow up)
- Conversion to second line therapy

The slide shows examples of assumptions for calculating needs of ARVs and what needs to be considered

Examples of Assumptions for Calculating Needs of ARVs

- Pediatrics
  - Rate of uptake by formulation and recommended dose
  - Formulation switch and increased dosing (growth and increase in surface area) for continuing patients
- FDC or single drug products
- Lead times
- Shortages/stock-outs

Example of Assumptions for Kenya National Quantification Training

- Quantification period will be for a period of 2 years, or 24 months
- The current distribution of patients
- All sites will follow the standard treatment guidelines for ART

The next two slides show assumptions adopted for the Kenya National Quantification Training

Example of Assumptions for Kenya National Quantification Training

- What will the rate of wastage be?
- Percent of pediatrics and adult patient population treated?
- Attrition Rate for the quantification period?
- Migration rates between various patient cohorts?

Summary

The success and accuracy of forecasting can be improved by

- A team approach to making assumptions and decisions
- Cross checking data, information and projected needs
- Using ongoing monitoring of projected versus actual needs to adjust assumptions

The slide shows that the success and accuracy of forecasting
can be improved

Making Assumptions: Introduction

Conducting a successful quantification is a challenge and the process is inherently imprecise. If data are not available, or if the available data are not accurate, complete, or reliable, the accuracy of the quantification results will be affected. How severely accuracy is affected will depend upon the seriousness (both regarding the nature and extent) of the data problems. These limitations do not mean that quantification cannot be performed with less-than-perfect data. They do mean, however, that a closer review of the available data, assumptions, and results and an understanding of the deficiencies, the application limitations, and the risks - financial and otherwise - of using such assumptions, data, and results are crucial.

Difficult decisions often must be made to estimate quantities of medicines and commodities for various health programs. When planning for new or expanding programs, policy-makers, service providers, and the quantification team need to clearly define treatment options, populations to be treated, and scaling-up goals to ensure that the quantification of medicines and other health commodities are appropriate. Scaling up of health programs may go faster or slower than projected; also variable use of health products adds to the complexity of decision-making.

These adjustments may require policy decisions regarding priority age groups, priority facilities, selection of less expensive therapeutic alternatives, and changes to standard treatment guidelines (STGs). This session looks at some basic principles and approaches to be used in making assumptions and outlines some of the key assumptions that participants may have to consider when quantifying health commodity needs at the county, national or multi-national level.

The future is unpredictable, so even the most reliable data may not reflect future consumption. The art of quantification is making the most appropriate assumptions with a given set of data that will best predict the future situation.

Making Assumptions: Basic Principles

- *Follow up on inconsistent data*. If data look inaccurate or inconsistent, they probably are. Although it may be tempting to just move ahead and crunch the numbers, doing so is likely to be a short-term benefit. The consequences of having to deal with over- or undersupply as a result of inaccurate quantification will be considerable.

- *Ask questions*. Visit clinics, meet service providers, data collectors, and data-entry clerks at your site and ask questions. Consider meeting with key informants and clients of the service if uptake is slower than expected or attrition is high to identify causes. Work with key decision-makers at site level including management and clinical teams such as Medicines and Therapeutics Committees in order to identify goals and priorities.

- *Communicate with colleagues.* Use the activities above to develop relationships and channels of communication with colleagues. Consider setting up a "quantification team" to streamline the information-gathering and assumption-making processes. Give feedback to colleagues to improve data quality. Consider the best means to establish communication with other organizations and government departments and ministries to obtain information, for

example, on upcoming STG/CG changes or current and expected medicine/health commodity shortages.

- *Gather information for future use*. Keep records of assumptions made and the decision-making process to assist in future quantifications. Monitor the accuracy of predictions made and refine decision-making as necessary. Set up systems to collect essential data to improve the efficiency of future quantifications.

- *Use different types of information***.** Data are not always numbers (quantitative), but can also come in the form of observations, speculation, or rumors (qualitative). Qualitative data will require further investigation to verify its validity and usefulness in quantification.

- *Cross-check data, information, and calculations.* Use different data records, key informants, and quantification methodologies, and follow up on inconsistencies. Have another person cross-check your calculations. Sometimes we miss our own mistakes no matter how many times we review the calculations.

- *Create "what if" scenarios*. Software programs such as *Quantimed* can be useful to create such scenarios based on different assumptions.

Making Assumptions for New Programs

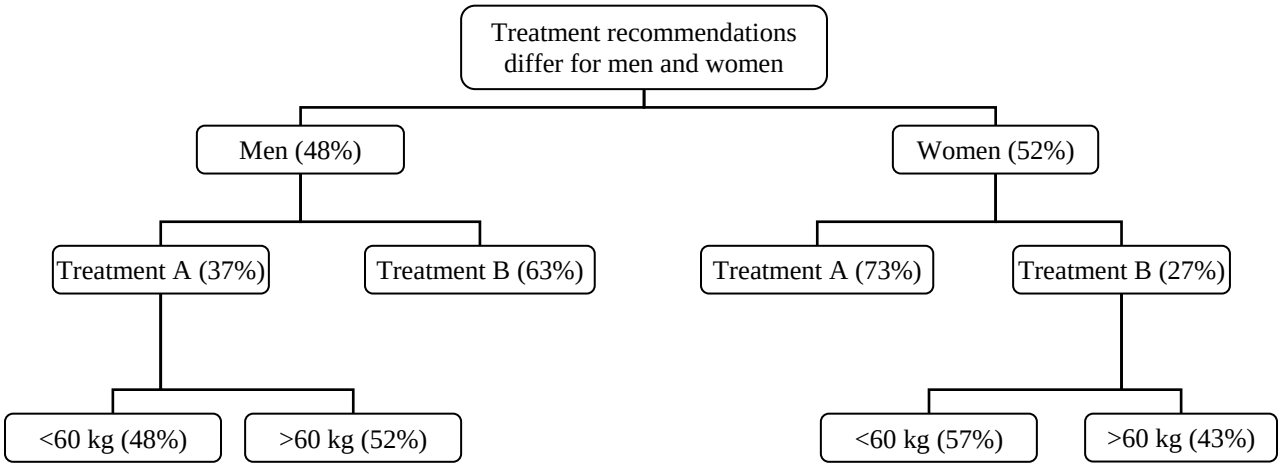
- *Look for information from similar programs, facilities, or geographic areas.* This information can be used to perform an *adjusted consumption method quantification*. If starting a new health program, patterns of demand, prescribing, and transfers in or out at another facility can be used to predict patterns to your facility or can be used for comparison.

- *Gather data from the health information system and use STG/CG to calculate needs.* This information can be used to perform a *morbidity-based quantification.*

- *Talk to physicians and other providers of care*. Compare and contrast results of the two quantification methods, i.e. morbidity-based and consumption-based methods

- *Use weight bands for paediatrics*. If no information on paediatrics is available and no similar programs from which to gather information exist, develop a range of possible weight bands and percentages each representing a specific paediatric population and then work with health providers and decision makers to develop assumptions.

- *Use decision trees.* These provide a visual means of thinking through assumptions and help users identify where decisions need to be made. The decision tree illustrated below is useful for a morbidity-based quantification. It demonstrates a situation where data are available on percentages of *male and female patie*nts to be treated and the percentages of patients who weigh more or less than 60 kg. These percentages are used in the decision tree to derive final percentages of patients on each regimen.



Evaluating and Refining Assumptions in Continuing (Existing) Programs

In continuing programs, periodically evaluating the quality of the data and accuracy of assumptions and making adjustments for changes are important steps. Comparing projected needs based on consumption data with expected needs based on the morbidity-based method to monitor the appropriateness of health commodity use is also recommended. Use the following approach to evaluate and refine your assumptions:

- Evaluate the quality of the data:
    - Compare data and projected needs with:
        - Historical data
        - Data from similar programs, facilities, or geographic areas
        - Clinical records
- Evaluate the accuracy of the assumptions:
    - Compare projected needs with:
        - Historical projected needs and actual usage
        - Projected needs from similar programs, facilities, or geographic areas
        - STGs to monitor the appropriateness of medicines/health commodities use
- Make adjustments for projected changes.

Comparing Morbidity-based and Consumption-based Results: Resolving Inconsistencies

Compare morbidity-based and consumption-based results directly only if you have conducted the studies on the same basis - that is, the commodities being quantified are largely (or entirely) used for the selected morbidities. This scenario is unlikely to occur for a "big picture" quantification, for example, all medicines on the Essential Medicines List, but it could be done if

you are looking at, for example, ART, Malaria or TB where the range of items involved have few or no uses beyond these specific health conditions.

Morbidity- and consumption-based estimates will usually give two different results. Ideally, the estimates would produce very similar results, but in practice this rarely happens. In this situation, the quality of the source data used and the results obtained need to be reviewed to make an informed judgment on the best estimate of quantities required. Calculated quantities may also need to be adjusted to fit available funding.

Comparing morbidity-based and consumption-based results is still quite useful, however, even if the accuracy of the data is questionable and even if the comparison can be done only roughly and with difficulty. The comparison has the potential to reveal large discrepancies and can force a critical reevaluation of preconceived notions about the accuracy of the data. Investigating the reasons for discrepancies often turns up important information that can significantly affect the quantification.

The scenarios that follow explain and suggest actions to take, based on the results of each method and depending on confidence in the data used. For the consumption method, there should be confidence in the pharmaceutical/health commodity management information system (PMIS) accuracy and reliability that maintains data on *consumption* in contrast to stock movement, which in addition to the quantity consumed may include losses due to theft, expired stock, or both. A crucial factor to consider in any analysis is irrational use of health commodities in the system.

Consumption-Based Estimate *Greater* Than Morbidity-Based Estimate

If the consumption-based estimate is more than 50% greater than the morbidity-based estimate, a more detailed investigation of the data should be undertaken before proceeding with the quantification. Some questions to consider include the following:

- Were data entry and transcription done correctly?
- Was the correct population and morbidity information obtained?
- Is there a possibility of large-scale leakage, diversion of supplies, or both?
- Are any special factors at work?

Once the data are verified, for smaller discrepancies you may proceed as follows.

If **you are not confident in the quality of either** the consumption or morbidity data:

- Consider an overall system assessment and strengthening of the health management information system (HMIS) and PMIS.
- Seek comparative facilities, regions, or countries with reliable information systems, and use their data as proxy data.

- Try to judge the percentage of confidence that it is reasonable to have in the accuracy, completeness, or reliability of the data, and adjust the results accordingly.

If **you are more confident in the consumption data** than the morbidity data:

- Examine the morbidity data for underestimation of disease incidence.
- Make sure the population data are current. Check whether any large-scale movement of population into the area has occurred, such as refugees, seasonal workers, or employees of new industries.
- Determine whether STGs are being correctly followed.
- Investigate whether pharmaceuticals or other health commodities are used in other programs or for other purposes.

If **you are more confident in the morbidity data** than the consumption data:

- Consider whether pilferage, expiration, or leakage of stock is high.
- Investigate whether items are used in other programs or for other purposes.
- Check whether stock-outs of other related commodities caused higher consumption of a particular item.

If **you are confident in the quality of both** the consumption and morbidity data, use the consumption-based estimate to avoid the problem of ordering too few health commodities.

Morbidity-Based Estimate *Greater* Than Consumption-Based Estimate

If **you are not confident in the quality of either** the consumption or morbidity data:

- Consider an overall system assessment and a strengthening of HMIS and PMIS.
- Seek comparative facilities, regions, or countries with reliable information systems and use their data as proxy data.
- Try to judge the percentage of confidence that it is reasonable to have in the accuracy, completeness, or reliability of the data, and adjust the results accordingly.

If **you are more confident in the consumption** data than the morbidity data:

- Examine the morbidity data for overestimation of disease incidence.
- Ask whether a change in population has occurred, as a result of exodus due to war, unrest, drought, famine, migration of seasonal workers, departure of refugees, or other causes.
- Determine whether STG/CG are being correctly followed.

- Investigate whether items are used for other programs or for other purposes.

- Consider whether program coverage is low, support services or diagnostics for health conditions is inadequate, or both.

If **you are more confident in the morbidity** data than the consumption data:

- Consider whether the management information system is poor.

- Ask whether the budget has been sufficient to meet the full needs of the population or if a proportion has gone untreated.

- Consider whether program coverage is low, support services or diagnostics for health conditions is inadequate, or both, and whether access to these services has been limited by unrest, strikes, or transportation problems.

- Determine whether commodities are being supplied from other sources not included in the quantification.

If **you are confident in the quality of both** consumption and morbidity data, use the morbidity-based estimate so that you do not order too few drugs and supplies.

Example: Assumptions for Calculating Needs of ARVs

- *Scaling up.* You will need to consider two factors:

    - *Anticipated rate of scale-up.* Goals must be balanced with feasibility. The available resources and capacity to scale up will limit the rate of scale-up. Availability and capacity of laboratory facilities to diagnose HIV infection and then monitor patients on ART, needs to be considered. Reviewing past rates of growth will help determine future rates of growth, especially if there are no changes to human resources; information, education, and communication to the community; or ARV product availability or use.

    - *Uptake of adults versus children.* There may be targets for new children to be started on ART as a number or a % of total population treated. Again, you will need to balance advocacy (ideal) goals against realistic achievable goals.

- *Regimens prescribed for new patients starting on treatment compared with continuing patients.* As ART programs mature, the extent to which the profile of regimens prescribed for existing patients can be used to predict uptake by regimen for new patients will change. New adult patients will weigh less than continuing patients; existing patients are more likely to be placed on alternative 1st or 2nd line treatments; and as ART becomes more widely available, new patients are less likely to be treatment naïve (i.e. patients who have not received treatment before).

- *Changes in national/site-level STG/CG.* Changes to STG/CG may include the addition or deletion of certain ARVs, dosages, or regimens. If STG/CG changes are planned, get as much information on these changes as early as possible to make the most appropriate assumptions and procurements.

- *Changes in prescribing practice.* Prescribers will have their own profile of regimens and may favor certain regimens over others. If prescribers change at a facility, the profile of regimens likely will change as well. This scenario is not as likely if the STG/CG recommendations limit regimen options.

- *Attrition (deaths, transfers out, loss to follow-up).* A new program will have no historical information on rates of attrition. Attrition as a % of total patients treated will decrease as a program grows. Therefore, attrition may need to be considered when quantifying at program start up, but as the program grows, it may be less significant, and the quantification team may choose to ignore losses to simplify calculations.

- *Switching to second-line.* Patients on 1st line or alternative 1st line treatment may eventually need to be switched to a 2nd line regimen, even if adherence to treatment is high because of, for example, co-morbidities or adverse drug reactions.

- *Variable dosing recommendations.* Nelfinavir (NFV), for example, can be prescribed as 1,250mg twice daily or 750mg three times daily, which translates to 300 tablets or 270 tablets required per month, respectively. An assumption will need to be made on how this ARV will be prescribed to patients, if not yet used at facilities. Didanosine (ddI), and indinavir (IDV) also have multiple dosing recommendations that depend on the ARV combinations they are given with.

- *Post-exposure prophylaxis (PEP).* You will need consider the following:

    - Uptake must be varied by type of exposure (i.e. rape or occupational exposure)

    - Campaigns and training to increase awareness can have a dramatic effect on uptake

    - High- versus low-risk exposures figure into the decision. Dual or triple therapy is recommended based on the risk of exposure

- *Paediatric issues.* You must consider the following factors:

    - *Rate of uptake*. The rate of uptake for paediatrics may not be as predictable as for adults, since it will depend on the initiative of parents or caregivers, prescribers, and linkages with the PMTCT program. These may increase recruitment of younger children initially, especially as access to polymerase chain reaction (PCR) testing becomes more available. However, as PMTCT programs become more effective the incidence of HIV in newborns should decrease.

    - *Dosing recommendations used.* A number of different dosing recommendations are in use internationally; it is important that a quantification team and prescribers use the same recommendations to avoid both shortages and overstocking.

    - *Formulation switch and increased dosing (growth and increase in surface area) for continuing patients*. As paediatric patients age, their weights and body surface areas will increase, at times monthly especially at the start of treatment. Dosages will need to be recalculated monthly, and avoiding under-dosing is important as the child will grow in the next month thus increasing the error. As a general rule as age increases, the ability and

willingness of a child to swallow tablets and capsules increases but it cannot be assumed to be a direct correlation.

- *Fixed-dose combination (FDC) or single drug products.* If multiple products are available for use (i.e. double or triple FDC), you will need to make assumptions about which product will be more likely to be dispensed to paediatric patients. Assumptions should also consider which FDC products the manufacturer recommends not be cut or split. The availability of FDCs in a country may be influenced by donor funding and the procurement regulations that govern which products a donor may procure.

- *Lead times*. Lead times may differ by health sector level, product, or both.

- *Shortages.* International shortages will affect the ARV products that a country will be able to procure and use at facilities. The quantification team must be kept informed of such shortages and communicate regularly to in turn inform colleagues and prescribers of upcoming shortages so that alternative drugs can be procured or new patients put on alternative regimens.

Summary

The success of quantification can be improved by:

- A team approach to making assumptions and decisions
- Cross-checking data, information, and projected needs
- Using ongoing monitoring of projected versus actual needs to adjust assumptions

SESSION 8: INTRODUCTION TO SUPPLY PLANNING AND PROCUREMENT PLANNING

Duration: 45 minutes

Objective: To ensure participants have a good understanding of supply planning and procurement planning

Content: Describe supply planning & procurement planning, concepts of supply chain monitoring, identify data necessary for calculating supply requirements and sources of the data

Lesson Plan Guide

SESSION	CONTENT	ACTIVITY	TIME
8	Describe supply planning & procurement planning, concepts of supply chain monitoring, identify data necessary for calculating supply requirements and sources of the data	Lecture/Discussion	45 minutes

Introduction to Supply Planning & Procurement Planning

Session Objectives

- Describe supply planning and procurement planning
- Learn concepts of supply chain monitoring and how to apply these concepts to supply and procurement planning
- Identify the data necessary for calculating supply requirements and the sources of these data

This slide outlines the objectives of this session

Definitions

- Selection answers the question "Which products are needed ?"
- Forecasting answers the question "How much do we need to meet demand and serve our customers?" then
- **Supply Planning** will answer the questions "How much to procure, when will we receive products, and what is the cost? and
- **Procurement Planning** will answer the question "which procurement method will we use and when will we initiate and monitor the purchasing?"

The slide shows the definition of supply and procurement planning.

Let the participants share what they know before displaying the slide

Why Do We Do Supply Planning?

- To ensure continuous availability of commodities
- To prevent expiry and obsolescence
- There may not be enough funding to pay for all requirements at the same time
- There may not be enough warehouse space or infrastructure
- Forecasted consumption figures may not necessarily follow actual uptake

The slide outlines the reasons why we do supply planning

Steps of Developing a Supply Plan (i)

1. Analyze and reconcile results with public health goals and resources expected to be available

This slide and the next two show the steps that should be followed when developing a supply plan

Steps of Developing a Supply Plan (ii)

2. Calculate quantities to procure
- Use current stock levels
- Determine status of expected deliveries

Quantities to procure = forecast – (current stock + expected deliveries)

Steps of Developing a Supply Plan (iii)

3. Finalize supply plan
- Plan/Propose estimated requirements and total costs with delivery dates
- Present proposed supply plan to stakeholders and funders for negotiation, agreement, and implementation

Steps of Developing a Procurement Plan (i)

1. In advance, communicate with relevant partners to develop requirements for forecasting & supply planning
2. Meet with in-country stakeholders & partners to:
   - Update data required to do commodities quantification
   - Determine which assumptions will be included
   - Agree on the products to be included
   - Determine preliminary funding levels from different sources

This slide and the next three cover the steps involved in developing a procurement plan

Steps of Developing a Procurement Plan (ii)

3. Hold meetings with relevant stakeholders to validate assumptions and collected data
4. Conduct a comprehensive 24-month (if possible) national forecast of the commodity requirements
5. Prepare national forecast tables using Quantimed or other forecast tool
6. Develop a 12-month national supply plan using PipeLine & consider SOH, stock in the upstream pipeline & all funding sources for the commodities

Steps of Developing a Procurement Plan (iii)

7. Develop a proposed national funding allocation considering all funding sources
8. Prepare a gap/overlap analysis indicating potential funding inadequacies and/or duplication
9. Consult with relevant stakeholders to determine ways to adjust forecasting assumptions and/or targets to eliminate gaps and overlap of supplies

Steps of Developing a Procurement Plan (iv)

10. Produce a National Procurement Plan taking into account all required products and sources of funding that will ensure adequate commodities without gaps or duplication
11. Submit the draft National Procurement Plan to a group of relevant stakeholders who are empowered to approve the plan

Logistics Management Information Systems

- The purpose of LMIS is to collect, organize, and report data that will be used to make decisions
- Three Essential logistics Data Items
  - –Stock on Hand
  - –Rate of Consumption
  - –Losses and Adjustments
- Three Types of Records and Reports
  - –Stock keeping Records and Reports
  - –Transaction Records and Reports
  - –Consumption Records and Reports

The slide shows what an LMIS does and how useful it is in decision-making.

It also shows three essential logistics data items we need to consider and three types of records and reports that can be captured in an LMIS

Assessing Stock Status

The picture shows a store stocked with drinks. Let the participants share what they can pick out from the photograph

How long will the stock last? You must consider consumption rates to determine this.

Months of Stock on Hand (MOS)

$$\frac{\text{Balance on Hand}}{\text{Average Monthly Consumption (Quantity dispensed to users)}} = \text{MOS}$$

The slide shows how to calculate the months of stock on hand to help a facility determine whether they are overstocked or understocked

Example: Calculating Months of Stock

Over the six months, Unigold tests, 25 per pack, consumed in packs each month was as follows:

- –January 1284
- –February 1310
- –March 1260
- –April 1250
- –May 1261
- –June 1252

- Calculate the *average monthly consumption*

Let the participants calculate the AMC for the 6 months outlined above

Note that total stock available is missing (which will be needed to calculate MOS)

Rounding off

- Average monthly consumption
  –Round up to the nearest whole number using standard practice rounding rules (i.e., if the number after the decimal point is .5 or above you round up, and if the number is .4 or below, you round down to the next whole number)
    E.g. - 1,269.5 ≈ 1,270
- Months of stock
  –Round to one place after the decimal
  –E.g. - 2.39 ≈ 2.4

The slide shows how to round off a number after some calculations so that the result can be translated to a more sensible number to assist in decision-making

Inventory Control Systems

Inventory Control Systems (ICS) inform 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

The slide defines what inventory control systems are and their role in the supply chain

Purpose of an Inventory Control System

- To determine when stock should be ordered/issued
- To determine how much stock should be ordered/issued
- To maintain an appropriate stock level of all products, avoiding shortages and oversupply

The slide shows the value added by an inventory control system

A Maximum-minimum ICS

System to control supplies so that quantities in stock generally fall within an established range

- **Minimum Stock Level/ Quantity:** The level of stock at which actions to replenish inventory should occur under normal circumstances
- **Maximum Stock Level/Quantity:** The level of stock above which inventory levels should not rise under normal conditions

The slide helps to define the maximum and minimum stock levels that should be maintained at the facility at any particular time

Max-Min ICS: Desired Stock

Desired Stock – The amount of stock the Program should appropriately have upon delivery of procured supplies. Its calculated as below:

$$\frac{\text{(Maximum +minimum) stocks + shipment interval in months}}{2}$$

- Shipment interval ≤ (Max stock– Min stock)

The slide shows the amount of stock that should be maintained at the facility

Estimating Supply Requirements

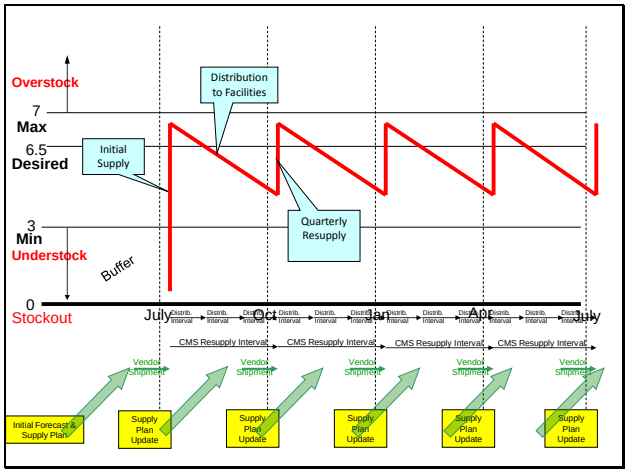
- You have just completed your forecast for 2011/12 for DMPA. Before you make your procurement plans, you need to take into consideration desired end of year stock levels, stock on hand, and quantities on order. Here are the parameters for your program:
  - Your forecast for consumption for the next twelve months is 7,800,000 injections
  - Your average monthly consumption is 650,000 injections
  - Desired end of RP stock level = 9 months stocks
  - Stock on hand = 2,000,000 injections
  - Quantity on order = 1,500,000 injections
- Given these factors, how many vials of DMPA do you need to procure for 2011/12?

Total annual requirement:
12 x 650,000 = 7,850,000

Add 9 months buffer:
9 x 650,000 = 5,850,000

Less pipeline stocks (SoH plus Qty on order)

Qty to procure:
13,650,000 – (2,000,000 +1,500,000)
= 10,150,000



The initial supply is to fill the pipeline to desired level. This is followed by replenishments to maintain stocks within desired levels after distribution to facilities.

Stocks below Min mean you are under-stocked. Above Max means overstocked.

Re-supply to facilities is done quarterly and the supply plan for the central medical store (CMS) is done quarterly based on supply plan updates.

SESSION 9: INTRODUCTION TO *PipeLine*®

Duration: 1½ hours

Goal: To enable participants to correctly use PipeLine to assist in commodity supply management

Objective: To ensure that participants have a good understanding of the use of PipeLine while quantifying, forecasting and supply planning

Content: PipeLine features; inputs and outputs

Lesson Plan Guide

SESSION	CONTENT	ACTIVITY	TIME
9	PipeLine features; inputs and outputs	Exercise	1½ hours

Introduction to PipeLine

Session Objectives

- To introduce PipeLine as a tool for the supply planning of health commodities
- To explain the purposes of PipeLine
- To describe supply chain concepts applied in PipeLine
- To demonstrate PipeLine

This slide outlines the objectives of this session

Purpose of PipeLine

- A simple Microsoft Access based logistics tool that can:
  - Link donor information systems and service provider information systems
  - Ensure appropriate supply and procurement plans
  - Help supply chain partners share best information
  - Make "data" useful

The trainer needs to be conversant with the PipeLine program and manual to be able to tackle the session effectively, assist the participants to navigate through the program and provide any clarifications which may be needed.

PipeLine was used in the past for family planning commodities but is now applicable for use with any health commodities.

What PipeLine Can Do for You

- PipeLine helps you achieve the *right* quantities at the *right* time
  - **For each product, PipeLine monitors—**
    1. **Total quantities *consumed* (i.e., amounts dispensed to users or sold to clients)**
    2. ***Shipments* of new products (planned, ordered, shipped, or received) into your program and the values of your products**
    3. ***Inventory levels* for each product in your program's logistics system (desired and actual)**
    4. ***Inventory level changes* (e.g., product losses or transfers out of or into your program)**

What PipeLine Can Do for You

- Show what actions you need to take for procurement planning and management, and when these actions should be taken
- Identify impending problems (i.e., surpluses, shortfalls, or stockouts) *before* they occur
- Calculate procurement quantities needed to keep your pipeline in balance
- Calculate the estimated value of shipments or maintain the actual value (if known)

What PipeLine Can Do for You

- It helps monitor the *aggregate* quantity of each product entering and leaving your program
  - Preferably using data from a logistics management information system [LMIS]
- However…
  - PipeLine is *not* the answer to every logistics question

This and the next two slides outline the capabilities of PipeLine and what it can do for us.

How does PipeLine work?

For each medicine or health product in a program, PipeLine helps track—

- the rate at which commodities are used
- what has been ordered but not yet received
- total quantity available at all storage facilities and health care facilities
- total amount of losses (due to expiry and damage) or transfers
- time required for the product to arrive after it is ordered

This slide and the next one illustrate how PipeLine helps to track consumption, commodities on order, stock on hand at all levels of the supply chain, wastages and losses, lead time, expected delivery time, any supply pipeline problems & forecasting future commodity requirements.

How does PipeLine work?

- With this data, PipeLine can be used to—
  - identify when to receive new products and what actions are needed to do so and when
  - identify shortfalls, surpluses, stockouts, and other pipeline problems
  - forecast future needs

Why use PipeLine?

- Multiple suppliers of many products (local and private suppliers, bilateral and multilateral donors, etc.), each with its own products, lead times, costs, information needs, and bureaucratic constraints
- Proliferation of service delivery points, in many cases in an integrated service delivery setting and/or with multiple service delivery organizations served by a single logistics system

The next two slides outline the advantages of using PipeLine in supply & procurement planning

Why use PipeLine?

- Increasing volume (and costs) of commodities, which must be managed and moved through complex distribution channels
- Increasing emphasis on accountability, cost-effectiveness, and sustainability from donors who fund product procurement and from policymakers

Who Should Use PipeLine?

- Managers and decision makers will be the primary users of PipeLine, the system can also provide information to –
  - **Suppliers of commodities**
    - PipeLine provides reports on the current status and the cost of pending shipments from a specific supplier, which that supplier can use to monitor product flow

These next two slides highlight that the greatest beneficiaries of using PipeLine are managers and decision-makers who deal with health commodities in addition to other stakeholders, e.g. commodity suppliers, commodity purchasers/ donors, policy-makers

Who Should Use PipeLine?

- Purchasers or donors of commodities
  - Staff who finance the purchase of commodities can use PipeLine reports and graphs to understand the current pipeline status and future requirements
- Host-country policymakers
  - PipeLine reports and graphs can be used to help policymakers understand issues with the levels of particular commodities and the implications of different decisions on the availability of the product

Pipeline Monitoring

- Monitoring stock balances, in terms of quantities and months of stock on hand in the entire program (aggregate of stock at all levels)
- Comparing stock balances to maximum and minimum stock policies
- Automating the identification of pipeline problems (quantities needed, stock-outs, balances below minimum or above maximum)

Procurement Planning

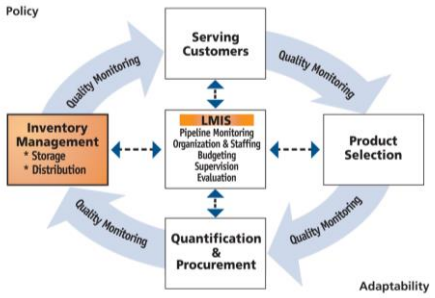
- Calculation of shortfalls/surpluses and quantities needed to maintain the program's desired stock levels
- Automated calculation and tracking of pending pipeline actions, based on lead times (shipments to plan, order, ship, and receive)
- Calculation of estimated costs of shipments and freight and other costs

Procurement Planning

- Comparison of alternative procurement scenarios and analysis
- Alternative unit of measure calculation displays products in Basic Units. Basic Units are used to quantify patient or consumer needs and usually refers to tablets, capsules, or mls, rather than packs or bottles

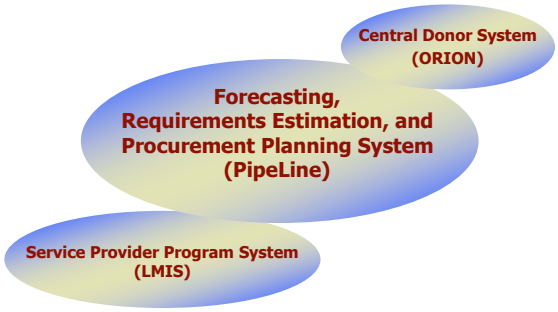
Procurement planning will answer the question "which procurement method will we use and when will we initiate and monitor the purchasing?"

How PipeLine Fits Into Logistics Systems



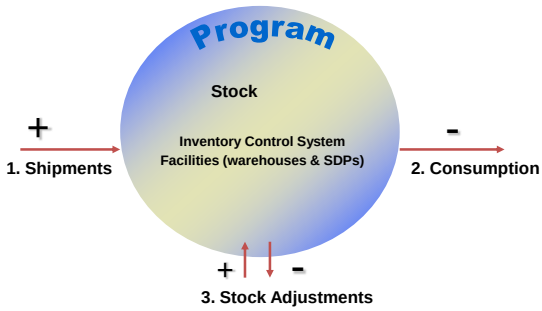
The slide shows how PipeLine links logistics systems with serving customers, product selection, quantification, procurement & inventory management

Role In Supply Chain Management



PipeLine is used in forecasting, requirements estimation and procurement planning and provides information to the LMIS & funding mechanisms

PipeLine: Flow of Information



Shipments add commodities to the supply chain.

Consumption reduces commodity quantities from the inventory system.

Stock adjustments add or reduce commodities from the inventory system

PipeLine: Flow of Information

Inputs		Outputs
Profiling: Program Products (costs, cases, min, max) Categories Suppliers (lead times) Transactions: Stock Shipments Consumption Adjustments		Graphs: Stock Status Forecasting Impact Reports: Stock Status Shipments Annual costs Procurement Tickler (procurement monitoring & planning)

How does Pipeline make "data" useful

The inputs required with PipeLine include – commodities (cost, max & min stocks), commodity categories, suppliers & their lead times, shipments expected, adjustments, consumption data.

The outputs are graphs and reports that can be used in decision making and include – stock status, shipments, annual costs, procurements done

PipeLine Concepts

- Minimum Stock - Least amount of stock desirable for the Program to ever have expressed in months of consumption
- Maximum Stock - Greatest amount of stock desirable for the Program to ever have, expressed in months of consumption
- Average Monthly Consumption

$$AMC = \frac{\text{The previous 3 months consumption}}{3}$$

This slide defines the key terms used in inventory management

PipeLine Concepts

- Desired Stock
  - The amount of stock the Program should appropriately have upon delivery of procured supplies
  - Defined to calculate future requirements

$$\text{Desired stock} = \frac{(\text{maximum stock} + \text{minimum stock} + \text{shipment interval})}{2}$$

- Shipment interval ≤ (CMS Max – CMS Min)

This is the amount of stock that is required to run a commodity inventory system and provide timely and quality health services.

Inputs: Months of Stock - SZ

	Min MOS	Max MOS
Central Medical Store	4	7
Health Facilities	2	3
Program	**6**	**10**
Shipment Interval	3	
Program Desired Stock level	**10**	

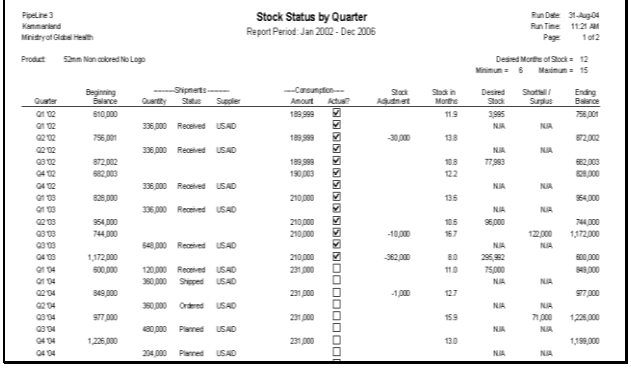
This slide shows the min-max months of stock at different levels.

The higher the level, the more MOS are required.

The lead time is 3 months.

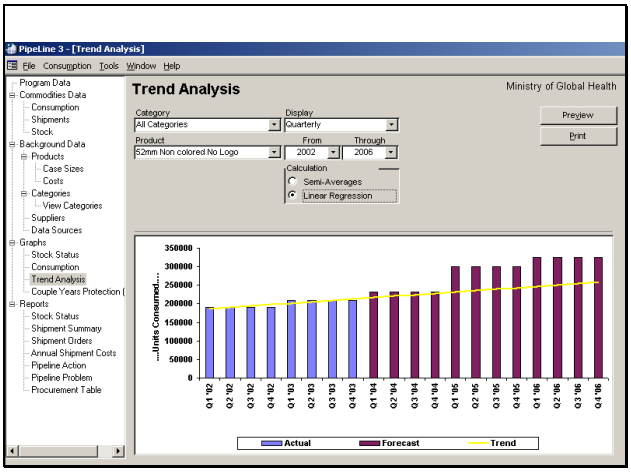
The desired stock level is 10 MOS

Outputs: Stock Status



This is a stock status report and outlines the following:

- Beginning balance per quarter
- Shipments – quantity, status & supplier
- Consumption – quantity & whether it's actual or not
- Stock adjustment – can be positive or negative
- Stock in months
- Desired months of stocks
- Shortfall/surplus
- Ending balance



The slide shows how PipeLine can do a trend analysis using actual and forecasted consumption. This can be used in decision making

Successes

- PipeLine is being used by more than 40 countries
- Is used to monitor supply plans of wide range of health commodities: ARVs, FH Products, Laboratory reagents, TB drugs, Malaria drugs and supplies,..
- PipeLine helps ensure programs are able to reliably calculate their requirements to meet demand and efficiently supply their pipelines
- Provides health program managers with access to advanced proven technology for improving procurement planning processes

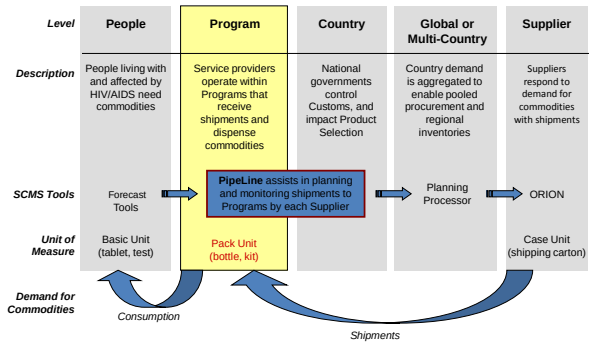
The slide outlines the successes of PipeLine based on its capabilities. It can be used for a wide range of health commodities.

Features

- Works with Microsoft technology
- User may choose to work entirely in either English, Spanish, or French
- Complete On-Line help available with “F1”
- Context-based Help available in the Status Bar
- Tree View menu for ready navigation

The slide shares some basic features of PipeLine

Role In Demand Planning



The slide shows the role PipeLine plays in demand planning. It assists in planning and monitoring shipments to programs by each supplier

Summary

- Accurately determining procurement quantities is an important element of ensuring product security
- Scheduling the arrival of commodities to arrive at the right time keeps the in-country supply chain adequately stocked, without overloading the capacity of the storage and distribution systems
- PipeLine is a proven and easy to use tool used for supply planning and procurement planning

Additional notes on PipeLine

Applying Trend Analysis

The Trend Analysis Graph generates a trend line from the last actual consumption data for any particular product or type of product. The trend line shows what future consumption would look like if it were linear. This enhancement makes it possible to automatically input the points on that line as monthly forecast figures in the consumption screen. Applying Trend Analysis can be a first step to forecasting, enabling faster populating of the consumption table. The trend data can then be adjusted to reflect program realities and produce a more accurate forecast.

With the Consumption screen displayed:

1. Select a product from the drop-down menu.

2. Click on the Trend button. The Trend Analysis Graph will appear, and a trend line will be produced based on the most recent two years' actual data. If no actual consumption exists for the product selected, the "Trend" button will appear in grey.

NB: Actual consumption must exist to produce a trend line. PipeLine does not calculate trends based on forecast consumption.

3. Adjust the parameters of the Trend Analysis Graph (if desired).

4. Click Apply Trend.
The Apply Trend window is displayed, as shown in Figure 1 below.

The first month and year for which no actual data are entered will be displayed as the starting month and year. You can change these parameters if you wish to add data further into the future, but existing actual consumption will not be overwritten. A trend line forecast may be entered for time periods *already past*.
The number of months to forecast can be any number up to 36, a three-year period. Enter the number of desired months of forecast data.

5. Click OK to apply the trend analysis.
If you are applying the trend to a past time period, a warning message appears:

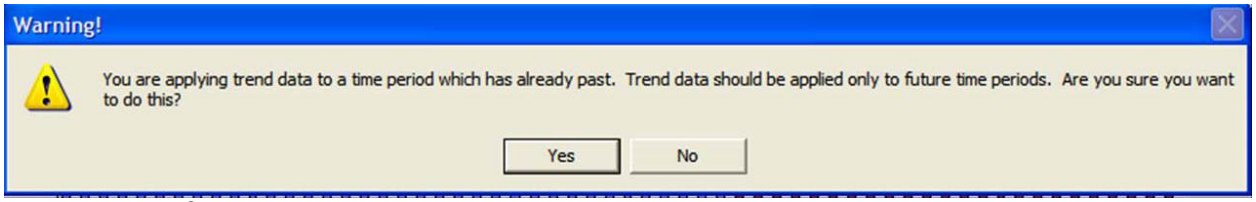


Figure 2—Past Time Period Warning Message

PipeLine verifies the extrapolation method and time period before applying the trend analysis.

6. Click Yes to continue applying the trend analysis or No to cancel the operation and return to the Trend Analysis Graph screen.

If a forecast exists for the selected time period, PipeLine will verify that you want to overwrite the existing forecast.

7. Click Yes to overwrite the existing forecast.

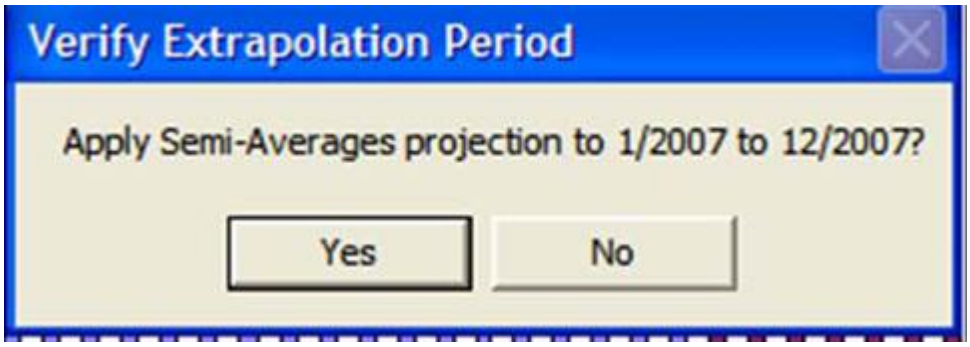


Figure 3—Verifying the Extrapolation Period

Click No only to overwrite any portion of the time period for which no forecast exists. Click Cancel to cancel the Apply Trend operation and return to the Trend Analysis Graph screen.

A message confirms the number of new records added (for time periods with no data input) and the number of records replaced (for time periods with existing data overwritten).

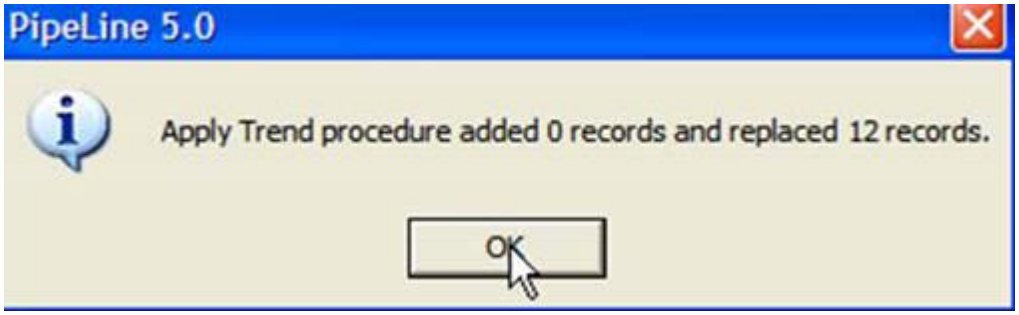


Figure 4 – Apply Trend Confirmation Message

NB: Consumption generated by a trend analysis is always marked as *forecast*. Trend data are entered monthly; the data source of applied trend data is automatically entered as *projected trend*.

Some common PipeLine issues and how to resolve them:

The following issues continue to occur in PipeLine 5.1, but fixes and workarounds for these exist. These issues and ways to resolve them are described below.

1. Inability to import or export XML files

PipeLine 5.1 can import and export files in extensible markup language (XML) format. These files may be:

☐ Product lists from programs/departments
☐ Forecasts from Quantimed
☐ Consumption data from Supply Chain Manager
☐ Shipment changes from other PipeLine databases

If you experience difficulty importing and exporting XML files, update your computer with Microsoft XML Core Services 6.0 (MSXML 6.0), which is included in the PipeLine installation CD (Figure 5) and the PipeLine web-based installer. Installing MSXML 6.0 should resolve difficulty importing and exporting XML files.

Figure 5 – CD installation screen, including MSXML 6.0

When to update your computer to MSXML 6.0

Even if you have MSXML 6.0 installed, during installation of PipeLine 5.1, you may receive the following message:

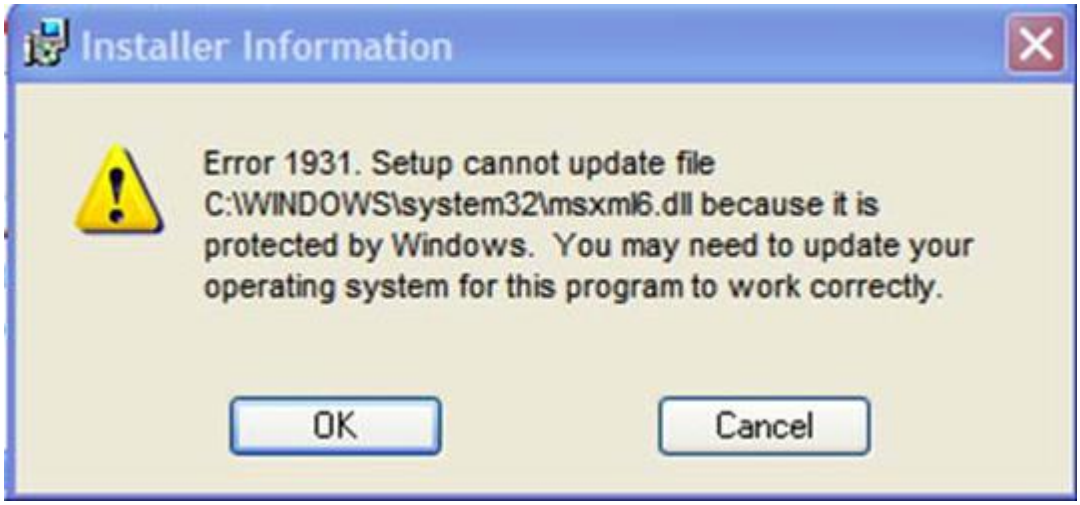


Figure 6 – Protected File Error Message

This message simply indicates that the computer's system files are protected and cannot be updated by programs other than Windows. It does not indicate a problem using the xml import and export features in PipeLine.

If you receive this message during installation:

1. Allow the installation to finish
2. Open PipeLine and attempt an xml import or export.
3. If the import or export works correctly, do nothing further. Your machine is up to date.

If the message refers to a version predating MSXML 6.0 (version 4.0, for example) or if an attempt to import or export xml fails, you must update your computer with MSXML 6.0.

To update your computer:
1. Close PipeLine.
2. Return to your PipeLine installation CD and install MSXML 6.0 on your machine.

If you are prompted to reboot your machine during installation, allow the reboot to occur and continue with installation.

3. Reopen PipeLine and attempt the xml import or export again.

Installing MSXML 6.0 should resolve the problem.

2. Graphs Do Not Refresh

If you are using a newer version of Microsoft Office (2007 or 2010) or running a newer operating system such as Windows Vista or Windows 7, you may not automatically see graphs on-screen in PipeLine after changing screens or parameters. This is caused by changes between Microsoft Office 2003 and Microsoft's Windows XP operating system, and newer versions of

Office and Windows. As of this writing, there is no fix for this issue, but clicking the "Preview" button will display the graphs.

If graphs do not appear:

1. On the graph screen, click the Preview button.
2. The graph will appear in the Preview window in printable report form.
3. Print the graph in report form or return to the main graph screen.

The graph will subsequently appear after you close the print preview and return to the graph screen in PipeLine.

3. Export to MS Excel Does Not Work

If your computer is running Microsoft Windows 7 and Microsoft Office 2007, you may experience difficulties exporting reports into Microsoft Excel. This is caused by changes between Microsoft Office 2003 and Office 2007. To restore the ability to export to Excel, install Microsoft Office 2003 Service Pack 3 (SP3), which is included on the PipeLine installation CD. Installing SP3 will not cause newer versions of Microsoft Office to revert to 2003. It will install a component of Microsoft Access runtime needed for the export to Excel to work properly.

SESSION 10: SUPPLY PLANNING EXERCISE - PipeLine

Duration: 3 hours 45 minutes

Objective: To ensure participants have a good understanding of how to use PipeLine for supply and procurement planning

Content: Exercise on supply and procurement planning

Trainers Notes: For this exercise, use program specific data and forecast results for the demonstration

Lesson Plan Guide:

SESSION	CONTENT	ACTIVITY	TIME
10	PipeLine exercise to demonstrate how to do supply & procurement planning	Exercise	3 hours 45 minutes

SESSION 11: WAY FORWARD AND ACTION PLANNING

Duration: 1½ hours

Goal: To take participants through developing an action plan for their work place as regards forecasting & quantification

Objective: To ensure participants understand how to identify and prioritize activities to be implemented to improve forecasting and supply planning

Content: Development of an action plan as the next step after the training

Lesson Plan Guide:

SESSION	CONTENT	ACTIVITY	TIME
11	Development of an action plan as the next step after the training	Discussion/ Group work	1½ hours

Way Forward & Action Planning

Way Forward

- Feedback to staff back in our facilities on what we have learnt
- The participants need to practice more on how to use PipeLine

Action Planning

- Participants to be grouped according to the commodities they handle
- Work on an action plan (template available in the manual)
- Participants to present what they have developed for extra input from other participants

The participants need to develop a way forward after achieving a good understanding of the concepts they have been taught.

Let them draft it so that they are able to undertake forecasting & quantification in a better manner than they have done in the past.

As the trainer, guide them so that the targets set are SMART- specific, measurable, achievable, realistic, time-bound

Action Plan

Problem Statement	Probable Root Causes	Objectives	Strategies/ Interventions	Who?	Resources Needed	Time Line	Indicators and Targets

APPENDIX 1: COURSE TIMETABLE

Time	Session	Facilitators
Day 1		
8:45 – 9:15 am	Registration	
9:15 – 9:30 am	Introduction and expectations	
9:30 – 9:40 am	Welcoming Remarks	
9:40 – 10:00 am	Session 1: Course Overview: Workshop Goal, Objectives & Schedules	
10:00 -10:30 am	Session 2: Introduction to Quantification	
10:30 – 10:45am	**Coffee/Tea Break**	
10:45 – 11:30 am	Session 3: Introduction to Forecasting Methodologies	
11:30 – 1:00 pm	Session 4: Practical Applications of Forecasting methodologies	
1:00 – 2:00 pm	**Lunch**	
2:00 – 3:30 pm	Session 5: Data Collection for Forecasting	
3:30 – 4:30 pm	Session 6: Presentation of and Discussion on Forecasting Data (Part 1)	
4:30 – 4:45 pm	Summary of the Day	
4.45 – 5:00pm	**Coffee/Tea Break**	
Day 2		
8:30 – 9:00 am	Recap from Day 1	
9:00 – 10:30 am	Session 6: Presentation of and discussion on Forecasting Data (Part 2)	
10:30 – 10:45 am	**Coffee/Tea Break**	
10:45 – 1:00 pm	Session 6: Presentation of and discussion on Forecasting Data (Part 3)	
1:00 – 2:00 pm	**Lunch**	
2:00 – 3:15 pm	Session 6: Presentation of and discussion on Forecasting Data (Part 4)	
3:15 – 3:45 pm	Session 7: Assumptions and Decision Making for Forecasting	
3:45 – 4:00 pm	Summary of the Day	
4:00 – 4:30 pm	**Coffee/Tea Break**	
Day 3		
8:30 – 9:00 am	Recap from Day 2	
9:00 – 10:30 am	Session 8: Introduction to Supply Planning and Procurement Planning	
10:30 – 10:45 am	**Coffee/Tea Break**	
10:45 – 11:30 am	Session 9: Introduction to PipeLine	

Time	Session	Facilitators
11:30– 1:00 pm	Session 10: Supply Planning Exercise – PipeLine (Part1)	
1:00 – 2:00 pm	**Lunch**	
2:00 – 4:00 pm	Session 10: Supply Planning Exercise – PipeLine (Part 2)	
4:00 – 4:15 pm	Summary of the Day	
4:15 – 4:45 pm	**Coffee/Tea Break**	

Time	Session	Facilitators
Day 4		
8:30 – 9:30 am	Recap from day 3	
9:30 – 10:30 am	Session 10: Supply Planning Exercise - PipeLine (Part 3)	
10:30 – 10:45 am	**Coffee/Tea Break**	
10:45 – 1:00 pm	Session 11: The Way Forward & Action Planning	
1:00 – 2:00 pm	**Lunch**	
2:00 – 3:00 pm	Workshop Evaluation, presentation of Certificates and closing remarks	
3:00 – 4:30 pm	Coffee/Tea Break	

APPENDIX 2: SAMPLE TEST QUESTIONS

1. Quantification involves:
    a) estimation of needed quantities of an item only
    b) estimation of financial requirements to purchase an item only
    c) consideration of several contextual factors, e.g. human resource, storage
    d) all the above

2. Poor quantification can result in all of the following except:
    a) inequity of supply
    b) suppression or distortion of demand
    c) inadequate cost- effectiveness
    d) rational adjustment to budgetary constraints

3. List two areas where quantification of health commodities is applicable and useful
    a)

    b)

4. Effective and accurate quantification of national health commodity needs is the responsibility of
    a) Donors
    b) Logistics
    c) Ministry of Health
    d) KEMSA
    e) Logisticians
    f) All of the above

5. List three methods of quantification
    a)

    b)

    c)

6. The Consumption-based method of quantification forecasts the quantity of medicines needed for prevention or treatment of specific diseases based on projections of the incidence of those diseases. TRUE / FALSE

7. Which of the following factors does NOT affect the supply of health commodities:
    a) Prequalification of products
    b) Lengthy public sector procurement process
    c) Variable use and response to medicines
    d) Donations and special pricing

8. When quantifying medicine needs for children, special considerations should be taken into account including:
    a) Existing dosing recommendations

b) Stability of products
c) Product availability and suitability
d) All the above
e) None of the above

9. Name two strategies that can be applied to reduce a health commodity budget without compromising service delivery
   a)

   b)

10. The following factors negatively influence a manufacturers capacity to meet demand for health commodities:
    a) Lack of incentives to manufacture at no profit
    b) Flexibility to increase production in the short term
    c) Inadequate supply of active ingredients
    d) Inaccurate forecasting

11. All of the following are effects of irrational prescribing on quantification EXCEPT:
    a) complicated quantification
    b) resistance / treatment failure leading to increased use of alternative regimens
    c) stock outs/ overstocking
    d) None of the above

12. Inaccurate or missing data is a major constraint to successful quantification of health commodity needs. TRUE / FALSE

13. The following data sets are required for quantification. Please tick the data type for which each data element is applicable.

Data Element	Consumption-based Method	Morbidity-based Method
Number of days out of stock		
Treatment Regimen		
Incidence & prevalence of health problem		
Consumption period		

14. The following are the steps involved in obtaining the required quantification data. Please arrange them in the order in which they are undertaken with the first step as number one (1) and the last step as number six (6).

Step	Number
Data reporting	
Determine data sources	
Feedback to improve data management	
Collect Data	
Process data	
Define data elements required	

15. All of the following issues have no effect on quantification of health commodities EXCEPT:

A. Prequalification of suppliers
B. Changes in patient weights
C. Scaling up of programs
D. Teamwork
E. None of the above

Answers:

1. D

2. D

3. Forecasting, justification of budgets, estimation of storage needs, planning for new or expanding programs, calculating emergency needs for epidemics and disaster relief, resupply an existing supply network that has become depleted of products, comparison of current medicine consumption with public health priorities and usage in other health systems, for procurement

4. F

5. consumption, morbidity, adjusted consumption, service level

6. False

7. C

8. D

9. Increasing the procurement period, purchase of FDCs over single innovator products, reduction of safety stock levels, purchase of generic products over branded products, purchase of oral products over injectables, purchase of tablets over syrups

10. B

11. D

12. TRUE

13.

Data Element	Consumption-based Method	Morbidity-based Method
Number of days out of stock	✓	
Treatment Regimen		✓
Incidence & prevalence of health problem		✓
Consumption period	✓	

14.

Step	Number
Data reporting	5
Determine data sources	2
Feedback to improve data management	6
Collect Data	3
Process data	4
Define data elements required	1

15. E

APPENDIX 3: SESSION AND COURSE EVALUATIONS

1: Introduction to Quantification

1. Did this session meet its stated objectives? If not, explain in what way:

2. What were the most useful features of this session?

3. What were the least useful features of this session?

4. Please comment on the speaker's presentation style:

2: Forecasting Methodologies

1. Did this session meet its stated objectives? If not, explain in what way:

2. What were the most useful features of this session?

3. What were the least useful features of this session?

4. Please comment on the speaker's presentation style:

Any other comments?

3: Practical Applications of Forecasting Methodologies

1. Did this session meet its stated objectives? If not, explain in what way:

2. What were the most useful features of this session?

3. What were the least useful features of this session?

4. Please comment on the speaker's presentation style:

4: Data Collection for Forecasting

1. Did this session meet its stated objectives? If not, explain in what way:

2. What were the most useful features of this session?

3. What were the least useful features of this session?

4. Please comment on the speaker's presentation style:

Any other comments?

5: Presentation of and discussion on Forecasting Data

1. Did this session meet its stated objectives? If not, explain in what way:

2. What were the most useful features of this session?

3. What were the least useful features of this session?

4. Please comment on the speaker's presentation style:

6: Assumptions and Decision Making

1. Did this session meet its stated objectives? If not, explain in what way:

2. What were the most useful features of this session?

3. What were the least useful features of this session?

4. Please comment on the speaker's presentation style:

Any other comments?

7: Introduction to Supply Planning and Procurement Planning

1. Did this session meet its stated objectives? If not, explain in what way:

2. What were the most useful features of this session?

3. What were the least useful features of this session?

4. Please comment on the speaker's presentation style:

8: Introduction to PipeLine

1. Did this session meet its stated objectives? If not, explain in what way:

2. What were the most useful features of this session?

3. What were the least useful features of this session?

4. Please comment on the speaker's presentation style:

Any other comments?

9: Supply Planning Exercise

1. Did this session meet its stated objectives? If not, explain in what way:

2. What were the most useful features of this session?

3. What were the least useful features of this session?

4. Please comment on the speaker's presentation style:

10: Way Forward and Action Planning

1. Did this session meet its stated objectives? If not, explain in what way:

2. What were the most useful features of this session?

3. What were the least useful features of this session?

4. Please comment on the speaker's presentation style:

Any other comments?

Question	Rating	Comments
A. Overall rating of the course *(please circle the selected rating: 1 = Poor, 5 = Excellent)*		
1. How would you rate your overall satisfaction with the course?	1 2 3 4 5	
2. How effective was the overall format of issues-based sessions, case studies, exercises and discussions? Please elaborate on your response:	1 2 3 4 5	
3. How would you rate the materials for this course (handouts, slides, supplementary references)? Please elaborate on your response:	1 2 3 4 5	
B. Rating of individual sessions		
Session 1: Course Overview	1 2 3 4 5	
Session 2: Introduction to Quantification	1 2 3 4 5	
Session 3: Forecasting Methodologies: Introduction	1 2 3 4 5	
Session 4: Forecasting Methodologies: Practical Applications	1 2 3 4 5	
Session 5: Data Collection for Forecasting	1 2 3 4 5	
Session 6: Presentation of and discussion on Forecasting Data	1 2 3 4 5	
Session 7: Assumptions and Decision Making for Forecasting	1 2 3 4 5	
Session 8: Introduction to Supply Planning and Procurement Planning	1 2 3 4 5	
Session 9: Introduction to PipeLine	1 2 3 4 5	
Session 10: Supply Planning Exercise – PipeLine	1 2 3 4 5	
Session 11: Way Forward & Action Planning	1 2 3 4 5	
C. Comments		
1. How much has the course added to your knowledge of the need to improve the accuracy of commodity		
2. How well has this course demonstrated the general approach to quantifying health commodities?		

3. How well has this course demonstrated the process of quantifying health commodities?		
4. What, if anything, would you change about this course? Are there any additional topics you would like to see		
5. List three aspects of this course that you might address in your professional capacity:		
6. Would you recommend this course to your professional colleagues? Please elaborate on your response:	Yes No	
Any other comments:		