



MINISTRY OF HEALTH  
REPUBLIC OF GHANA

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# **NATIONAL QUANTIFICATION GUIDELINES FOR HEALTH COMMODITIES**

1<sup>st</sup> edition, February 2014



# **NATIONAL QUANTIFICATION GUIDELINES FOR HEALTH COMMODITIES**

#### **USAID | DELIVER PROJECT, Task Order 4**

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#### **USAID | DELIVER PROJECT, Task Order 7**

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#### **Abstract**

These guidelines include standard operating procedures (SOPs) for quantifying commodities, including forecasting and supply planning for various health commodity categories. Users, especially officers responsible for quantification, will find practical steps and guidance on how to carry out a national quantification of health commodities. It is also a guide for technical advisors, programme managers, procurement or supply officers, warehouse managers, service providers, implementing partners, donor agencies, and others on how to conduct a quantification exercise. Additionally, these guidelines can also be used for training on quantification methodologies, processes, and tools.

#### **USAID | DELIVER PROJECT**

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# Forward

Quantification is a critical supply chain activity that needs to be carried out, to ensure that clients no matter where they find themselves in-country will be able to access health commodities that they need.

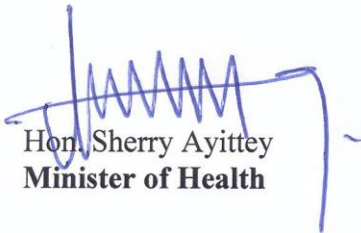
The Ghana National Quantification Guidelines were developed for use by in-country quantification teams in response to two imperatives: First was the need to streamline and standardize quantification procedures and methods in-country across Partners and commodity groups. Second was the need to have a manual for capacity building of in-country quantification teams.

The Quantification Guidelines are the outcome of a synthesis of documented approaches to quantification of various health commodities for different health programmes such as malaria, HIV/AIDS, tuberculosis, nutrition, and family planning amongst others. It crystallizes experiences and lessons learnt from previous Ghana national quantification exercises and best practices from other countries.

The document is the first of its kind in Ghana and provides general guidance on a structured approach to the process of quantification. It provides an overview of the principles on which quantification for health commodities should be based. In the Ghana context, the document defines how, when, how often, and by whom quantifications will be conducted and how results should be disseminated.

It is recommended for use at all levels of the health delivery system especially the national level to ensure availability of commodities for service delivery and eventually help address some of the fundamental challenges and bottlenecks associated with commodity security.

It is my expectation that the continuous use of this document and its regular appraisal will contribute to strengthening and streamlining quantifications in the health sector



Hon. Sherry Ayittey  
**Minister of Health**





# Acronyms

ACT	artemisinin-based combination therapy
AD	auto disable syringe
AIDS	acquired immunodeficiency syndrome
AL	artemether-lumefantrine
ART	antiretroviral therapy
ARV	antiretroviral
AS/AQ	artesunate/amodiaquine
AZT	zidovudine
BCG	bacillus Calmette-Guérin (vaccine)
CBD	community-based distribution
CD4	cluster of differentiation 4
CHAG	Christian Health Association of Ghana
CHAI	Clinton HIV/AIDS Initiative
CMAM	community-based management of acute malnutrition
CMS	Central Medical Store
CMYP	comprehensive multi-year plan
COC	combined oral contraceptive
CPR	contraceptive prevalence rate
CPT	contraceptive procurement table
CT	counselling and testing
CYP	couple-years of protection
DFID	Department for International Development
DHIMS	District Health Information Management System
DHMT	District Health Management Team
DHS	Demographic and Health Survey
DKT	DKT International
DOTS	directly observed therapy short-course
DPT	diphtheria, pertussis, tetanus
DVD-MT	district vaccine data management tool

ECP	emergency contraceptive pill
EFV	efavirenz
EID	early infant diagnosis
EML	National Essential Medicines List
EPI	Expanded Programme on Immunization
EQA	external quality assurance
ESM	EXP Social Marketing
EUV	End-Use verification
FDA	Food and Drug Authority
FDC	fixed-dose combination
FOCUS	Focus Regional Health Project
FP	family planning
FTC	emtricitabine
GAC	Ghana AIDS Commission
GDF	Global Drug Facility
GHS	Ghana Health Services
GHS-SSDM	Ghana Health Services Stores; Supplies, and Drugs Management
GNDP	Ghana National Drug Programme
GOG	Government of Ghana
GSMF	Ghana Social Marketing Foundation
HIV	human immunodeficiency virus
HMIS	health management information system
HPV	human papillomavirus vaccine
HSS	HIV Sentinel Surveillance of Ghana
HTC	HIV testing and counselling
ICD	Institutional Care Division
IP	implementing partners
IPC	inpatient care
IPT	Isoniazid preventive treatment
IPTp	intermittent preventive treatment of malaria in pregnancy
IRS	indoor residual spraying
ITN	insecticide-treated bed net
IUD	intrauterine device

kg	kilogram
LLIN	long-lasting insecticide-treated bed nets
LMIS	logistics management information system
LPVr	lopinavir/ritonavir
MAM	moderate acute malnutrition
MCMG	Malaria Case Management Guidelines
MCR	monthly consumption data
MDG	Millennium Development Goal
MEG	Medical Export Group
mg	milligram
MICS	Multiple Indicator Cluster Survey
MOH	Ministry of Health
MOH-P&S	Ministry of Health Procurement and Supply Division
MOS	months of stock
MR	rubella + measles
MSIG	Marie Stopes International - Ghana
NACS	nutrition assessment, counselling and support
NGO	non-governmental organization
NHIS	National Health Insurance Scheme
NID	National Immunization Days
NMCP	National Malaria Control Programme
NSP	National HIV/AIDS Strategic Plan
NTP	National TB Control Programme
NVP	nevirapine
OI	opportunistic infection
OPC	outpatient care
P&S	Ministry of Health Procurement and Supply
PCV	pneumococcal conjugate vaccine
PFSCM	Partnership for Supply Chain Management
PLHIV	people living with HIV
PMTCT	prevention of mother-to-child transmission
POP	progestin-only oral contraceptive
POW	programme of work

PPAG	Planned Parenthood Association of Ghana
RDT	rapid diagnostic test
RHMT	Regional Health Management Team
RMS	regional medical store
RUTF	ready-to-use therapeutic food
SAM	severe acute malnutrition
SDP	service delivery point
SIA	Supplementary Immunization Activities
SMC	seasonal malaria chemoprevention
SOP	standard operating procedures
SP	sulphadoxine-pyrimethamine
SSDM	Stores, Supply, and Drugs Management Division of Ghana Health Service
STG	standard treatment guideline
STI	sexually transmitted infection
TB	tuberculosis
TC	(HIV drugs)
TD	tetanus + diphtheria
TDF	tenofovir
UNFPA	United Nations Population Fund
USAID	U.S. Agency for International Development
VNRBD	voluntary, non-temunerated blood donation
WHO	World Health Organization

# Acknowledgments

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The Ministry wishes to also acknowledge the support of development partners who provided the funding for the various programmes whose activities have contributed immensely to the development of this document. To personnel who participated in workshops and worked tirelessly to make this a reality, especially the technical working group, the Ministry wishes to acknowledge your selfless service to Ghana.



# Purpose of the Quantification Guidelines

## Who Should Use These Guidelines?

These guidelines include standard operating procedures (SOPs) for quantifying commodities, including forecasting and supply planning for various health commodity categories. Users, especially officers responsible for quantification, will find practical steps and guidance on how to carry out a national quantification of health commodities. It is also a guide for technical advisors, programme managers, procurement or supply officers, warehouse managers, service providers, implementing partners, donor agencies, and others on how to conduct a quantification exercise. Additionally, these guidelines can also be used for training on quantification methodologies, processes, and tools.

## What Is the Purpose of these Guidelines?

The SOPs in these guidelines include various quantification guidelines and strategies that have been used successfully in national level quantification exercises over many years, are adopted from the USAID | DELIVER PROJECT Quantification of Health Commodities: A Guide to Forecasting and Supply Planning for Procurement, and have been customized to fit the Ghanaian context. The guidelines document is intended to guide the application of a systematic, step-by-step approach to quantifying health commodity requirements and costs, and it should be used when conducting a quantification exercise, as well as when disseminating and updating quantification results. This guide includes specific guidance on how to use the results of the quantification to—

- Identify the funding needs and gaps for procurement of the required commodities.
- Coordinate procurements and shipment delivery schedules to ensure a sustained and effective supply of commodities.
- Implement a process for reviewing and updating the results of the quantification to maintain and improve the validity, accuracy, and usefulness of current and future quantifications.
- While several software programmes exist that can be used to complete the forecasting and the supply planning steps in a quantification exercise, currently no one tool does it all. The main purpose of the guidelines is to guide users through the process of conducting a quantification exercise, rather than training them in the use of any specific software tool. It is important to note, however, that the process explained in the guidelines takes into consideration the use of PipeLine, a free software application available for supply planning. Experience over 20 years working with a wide range of commodities has shown PipeLine software as a best practice in preparing supply plans. The step-by-step approach to quantification of health commodities presented in these guidelines will enable users to—Identify the sources and list the specific data required at each step of the quantification.

- Collect, organize, and analyse the available data.
- Choose the appropriate forecasting methodology based on the data available.
- Identify and obtain consensus on the forecasting assumptions needed to account for missing or poor quality data and to estimate the effect of key programmatic and environmental factors expected to influence the demand for commodities.
- Structure the forecasting tree for service-based and/or morbidity-based forecasts to be able to organize forecasting data and assumptions.
- Utilize the forecasting data and assumptions to calculate the quantity of each product expected to be dispensed or consumed during each year of the quantification.
- Identify the key supply chain parameters required to estimate the total commodity requirements and costs for the country or the programme.
- Identify and obtain consensus on the supply planning assumptions needed to account for missing data and to estimate the effect of influential key supply chain factors on the supply of health commodities.
- Calculate the total commodity requirements and costs for each year of the quantification.
- Plan shipment quantities and delivery schedules to ensure continuous supply for each year of the quantification.
- Compare the amounts and timing of funding commitments for procurement with the total commodity costs and required shipment delivery dates as the final step in the quantification.
- Disseminate the results of the quantification exercise to major stakeholders.
- Explain the benefits of using the PipeLine software for obtaining the final outputs of the commodity requirements.

## **How Should These Guidelines Be Used?**

This guidelines document contains various SOPs detailing the general quantification process, as well as SOPs for specific categories of commodities. It describes the overall quantification process from start to finish, provides instructions for each step in the quantification process, and cites challenges and examples from actual quantification exercises. In addition, the guidelines recommend strategies and actions to disseminate quantification results.

National quantification teams must conduct a separate quantification exercise for each category of commodities. The category-specific SOPs detail the types of data required and factors to consider when quantification teams are preparing for and conducting quantification workshops. The category-specific SOPs are necessary to complete a quantification exercise for each commodity category.



# Introduction to Quantification

## Role of Quantification in the Supply Chain

Quantification is the process of estimating the quantities and costs of the products required for a specific health programme (or service) and determining when the products should be delivered to ensure an uninterrupted supply for the programme. Quantification is a critical supply chain activity that links information on services and commodities from the facility level with programme policies and plans at the national level, and is then used to inform higher level decision making on the financing and procurement of commodities. The results of a quantification exercise can be used to help maximize the use of available resources for procurement, advocate for mobilization of additional resources when needed, and inform manufacturer production cycles and supplier shipment schedules.

Quantification is not a one-time, annual exercise that ends when the final quantities and costs of the commodities have been determined. The outputs produced from the exercise should drive an iterative process of reviewing and updating the quantification data and assumptions, and recalculating the total commodity requirements and costs to reflect actual service delivery and consumption; as well as changes in programme policies and plans, over time. The results of a quantification should be reviewed and updated at least every six months, and more frequently for rapidly growing or changing programmes.

Quantification is not a one-time exercise, but an iterative process with reviews and updates required year-round.

## Who Should Conduct a Quantification

For a quantification exercise to be useful and effective, the right people need to be involved in every step of the process—from data collection and analysis to presenting the final results to the Ministry of Health (MOH), Ghana Health Services (GHS), and all other relevant stakeholders. Although the national quantification team leads the process, logistics managers, policymakers, programme managers, technical experts, procurement officers, warehouse managers, and service providers should be involved. This will enrich the information gathering and determine the validity of certain assumptions. The policies that determine the selection and use of the products being quantified are also specific to the health category, type of service, and type of commodity being used. Therefore, throughout the quantification process, it is important to consult with clinical, pharmacy, and laboratory staff that are closely involved in providing these services and managing these commodities. The SOPs in this document, for specific categories of commodities, lists recommendations for organizations and individuals to include in the quantification exercise.

One or more of the quantification team members should have significant software database management skills. These skills are required to structure the quantification databases and then enter the forecasting and supply planning data and assumptions into the database, calculate the final health commodity quantities and costs, and plan the required shipment quantities and schedules to meet the total commodity requirements.

If quantification team members identify the need for additional capacity, external technical assistance may be utilized in planning and implementing a quantification exercise. Detailed information on the level of effort, specific activities, and the staff skills and experience required to conduct, review, and update national quantifications is provided in *Section 3: Reviewing and Updating the Quantification*.

To enhance the skills of team members in areas, such as developing forecasts and supply plans, use of the quantification tools and methodologies, and calculating forecast accuracy, time may be needed, either during or prior to the quantification workshop, for capacity building.

## **Standardization as a Prerequisite to Quantification**

A prerequisite for conducting quantification for any health commodity is the existence of clear, well-defined and disseminated standard treatment guidelines (STGs), protocols, and laboratory testing menus or algorithms for defining how specific commodities should be administered or used for testing. This is especially true when no reliable consumption data is available. A critical assumption when using demographic data, morbidity data, and services data is that service providers are adhering to established standard guidelines. Therefore, standardization should precede quantification, because these guidelines are the basis for the assumptions in the forecasting step of the process. In the case of new, rapidly expanding programmes, the importance of STGs and protocols is magnified, as sufficient quantities of commodities must be procured to allow for expansion.

Adherence to STGs can help ensure that products are used as intended and can also enhance the accuracy in the forecasting step of the quantification. Noncompliance with STGs may compromise the validity of the forecasting results and can lead to procurements that result in overstocking and wastage of some products, and stockouts of others.

## **Ghana's Public Sector Supply Management Context for Quantification**

### **Commodity Flow**

At the national level, health commodities are procured from three sources:

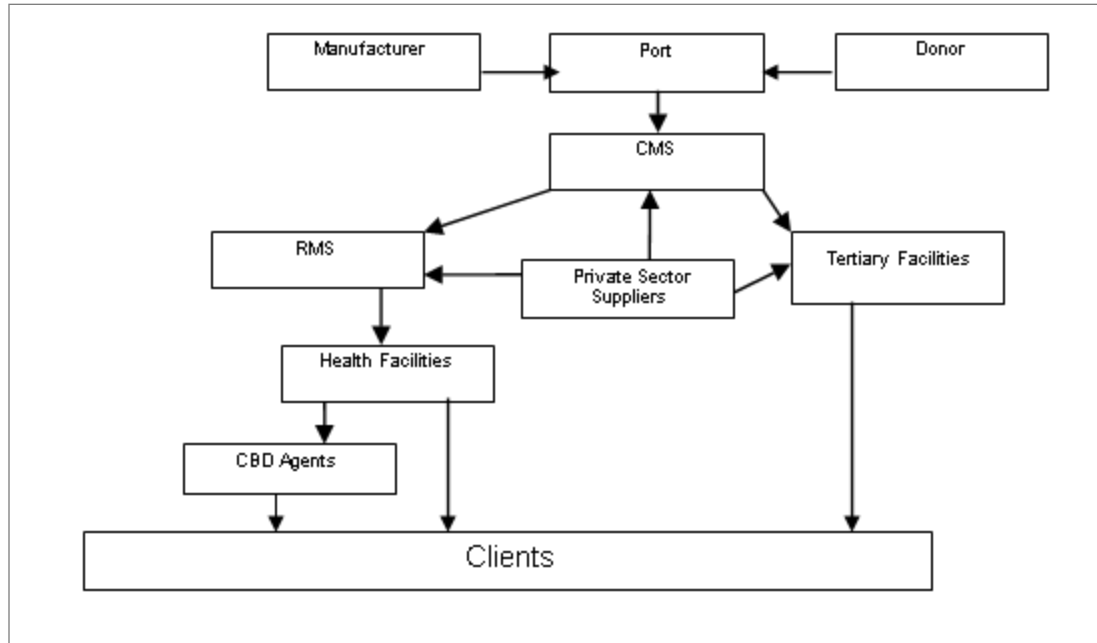
- manufacturers of pharmaceuticals and medical goods in the international market
- private suppliers in the local market
- international organizations.

At the regional level, health commodities are procured from two sources:

- Central Medical Stores
- private suppliers in the local market.

After the commodities are procured, they are transported and stored in a number of intermediate facilities before reaching the health facilities where they are dispensed to clients. Figure 1 illustrates the movement of health commodities in the public sector.

**Figure 1. Ghana Public-Sector Health Commodity Pipeline**

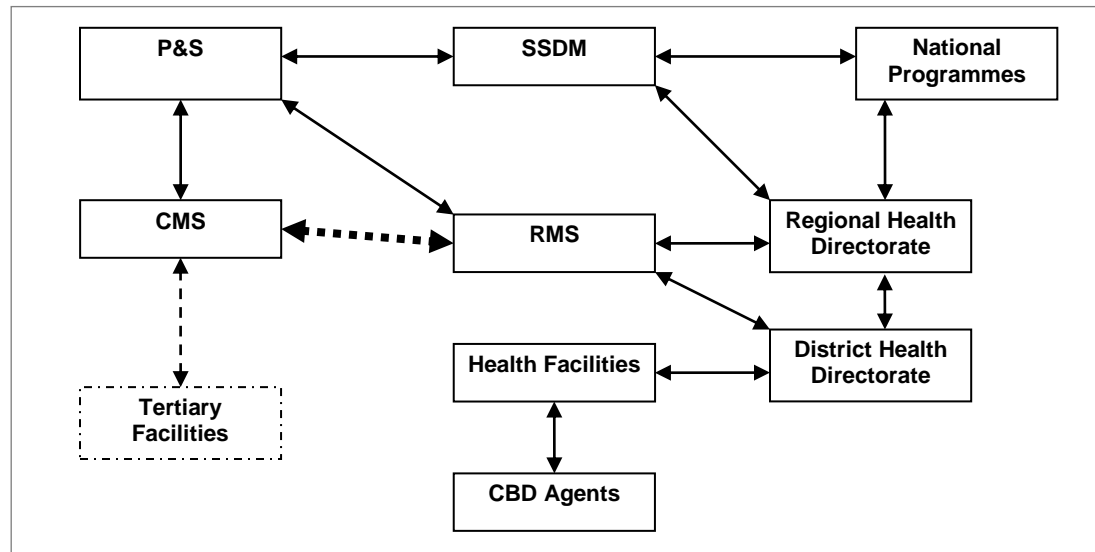


## Information Flow

As health commodities move down through the supply system, logistics information flows up the system. Managers use the logistics information to make decisions about—

- procurement
- distribution
- public health programmes and activities at the national- and local-levels. See figure 2.

**Figure 2. Flow of Information**



## **Governance and Leadership**

### **National Level**

The Chief Director of the MOH, in collaboration with the Procurement and Supply Division of the MOH; and the Stores, Supply, and Drugs Management Division of the GHS, will meet with the quantification teams at scheduled times to ensure that all national quantifications are carried out in accordance with the established procedures in this guideline, and in alignment with the Government of Ghana's (GOG) budgeting cycle, as well as with the annual review of the MOH.

The aforementioned leaders will ensure that roles and responsibilities are assigned for the critical elements of the planning and implementation of quantification exercises, including the following:

- developing of a quantification calendar that aligns with the budgeting cycle of the GoG
- initiating the quantification process
- collecting the necessary data and information
- planning and organizing the assumption-building workshop
- validating and approving the results of the quantification exercise
- submitting the results to ensure inclusion in the appropriate budgets
- preparing and storing the quantification report and associated files.

To ensure an effective quantification exercise, the Policy, Planning, Monitoring, and Evaluation Divisions of the MOH and GHS, and the particular programme or health sect, whose commodities are being quantified; must lead and facilitate the quantification team in gathering, organizing, and analysing the relevant data. All quantification team members are responsible for ensuring that the quantification process and the validation/dissemination of quantification results are completed according to the procedures in this guideline.

The leadership of the quantification team must ensure that the Minister of Health signs off on all completed reports; and copies, including databases, are stored at the secretariats for the following units: P&S, Stores, Supply, and Drugs Management Division of Ghana Health Service (SSDM), records departments of both MOH and GHS, office of the chief pharmacist, and the various programmes.

## **Regional Level**

The regional director, in collaboration with the deputy directors of administration, public health, clinical care, and pharmaceutical services; as well as the head of the regional medical stores, shall ensure that all the necessary data required for a national quantification have been aggregated and copies submitted to the leadership of the national quantification team and copies kept at the regional health directorate.

If it becomes necessary to conduct a regional-level quantification, the regional health director and the regional health management team will convene a quantification team; they will ensure that all regional quantifications are carried out, in accordance with the established procedures in this guideline document, and in alignment with the Government of Ghana's (GoG) budgeting cycle, as well as with the annual health-sector review timelines.

The leaders mentioned earlier will ensure that roles and responsibilities are assigned for critical elements of the planning and implementation of quantification exercises, including the following:

- developing a quantification calendar that aligns with the budget and review
- initiating the quantification process
- collecting the necessary data and information
- planning and organizing the assumption-building workshop
- validating and approving the results of the quantification exercise
- submitting the results to ensure inclusion in the appropriate budgets
- preparing and storing the quantification report and associated files.

The leadership of the quantification team must ensure that the regional director of health services signs off on all completed reports and the reports are submitted to the director general, with copy to the chief director. Copies, including databases, should be stored at the RHMT office and regional medical stores.

## **District Level**

The district director, in collaboration with the District Health Management Team (DHMT), shall ensure that all the necessary data required to support a regional- or national quantification have been aggregated, submitted, and made available for quantifications.

The leaders mentioned earlier will ensure that roles and responsibilities are assigned for critical elements of the planning, collection, and aggregation of required data for onward transmission to the region, in accordance with the quantification calendar.

The leadership of the DHMT must ensure that all aggregated data are signed off by the district director of health services and submitted to the regional director of health services. Copies should be stored at the district health directorate.



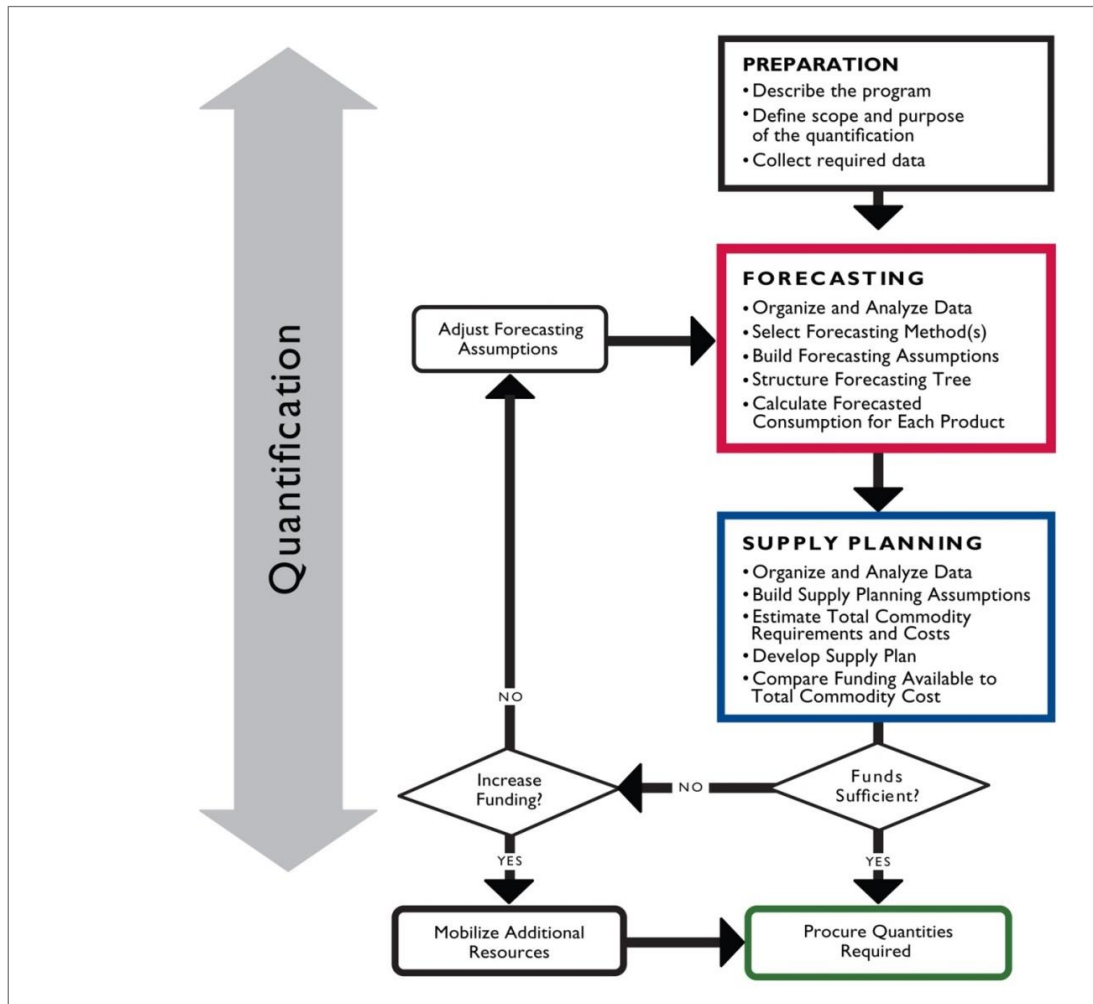
# Part I: General Quantification Process Guidelines

This section explains the general processes and steps in quantification that must be followed to quantify for any health commodity; it also includes a standardized, step-by-step approach to quantification. Many of the terms used in these quantification guidelines have specific meanings for logistics; definitions in a dictionary may not be the same as the definitions used in this guide. See *appendix K* for a glossary of key logistics terms.

## Section I: Steps in the Quantification Process

The three basic steps are preparation, forecasting, and supply planning which are outlined in figure 3.

**Figure 3. Steps in Quantification**



## Step One: Prepare for the Quantification

Prior to collecting data, two initial steps should be taken. The first is to identify and describe the strategic plan of the programme under which each commodity category is being quantified. For example, if quantifying for commodities for a non-communicable health condition—such as hypertension or diabetes—the quantification team should gather information on factors affecting commodity use from the current programme of work (POW) and the National Policy for the Prevention and Control of Chronic Non-Communicable Diseases in Ghana. The second step is to define the scope, purpose, and timeframe of the quantification.

### Describe the Services for Each Commodity Category

Summarize the background, current status, and performance of the services for which the commodities are being quantified. This summary should include a review of objectives, strategies, and priorities established by the Government of Ghana (GoG); and any expansion plans or changes in policies that may significantly influence uptake of services and demand for commodities. It should also include a brief description of the service delivery model, the supply chain, the level of political commitment, and financial support for services and commodities. It should note any challenges encountered in ensuring the supply of commodities and availability at service delivery points (SDPs).

### Define the Scope, Purpose, and Timeframe of the Quantification

#### Scope of the Quantification

It is necessary to define which commodities will be included in the quantification exercise. Quantification of one category of commodities may include commodity requirements for only the public sector programme, or it could include the private sector, as well. A quantification exercise could also be conducted for a particular funding agency, implementing partner, geographical region, or specific population group: e.g., children under 5 years of age or pregnant women. *Best practices in supply chain management have shown that it is most useful to have a national-level quantification of commodity requirements to cover all demand for a particular category of commodities.* A national-level quantification enables key stakeholders to know the full extent of the commodity needs and to coordinate the mobilization of resources for procurement.

When defining the scope of the quantification, the specific list of commodities to be quantified should be agreed-to in and should conform to current standard treatment guidelines, protocols, or policies. This list could include a combination of branded and generic products; products procured by the government and local institutions and donated by different funding agencies; or products procured from multiple suppliers. Please reference the category-specific standard operating procedures (SOPs) for sample commodity lists that are relevant in-country at the time these guidelines were written.

#### Purpose of the Quantification

It is important to identify the purpose of the quantification and how it will address the Government of Ghana's (GoG) objectives, as stated in relevant policy and strategy documents. Examples of the purpose of a quantification exercise include the following:

- Provide data on specific commodity requirements and costs for the government's annual budget allocations.



- Inform donors about funding requirements and advocate for resource mobilization for commodity procurement.
- Estimate commodity needs and assess stock status of the in-country supply pipeline to identify and correct supply imbalances.
- Support an estimate of commodity procurement, storage, and distribution costs.

### ***Time Period of the Quantification***

For maximum effectiveness and usefulness for procurement purposes, it is recommended that the quantification of commodity requirements and costs be done for a rolling two-year period. This should include the actual quantities of each product to be procured and when, and also a shipment delivery schedule based on funding available and established programme stock levels that account for procurement and supplier lead times and maximum and minimum stock levels. Quantifying commodity requirements and costs for a two-year period facilitates timely procurement and identification of funding gaps; it allows time to mobilize needed resources before stockouts occur, or to adjust shipment schedules to avoid overstocking. Although a supply plan should be prepared for two years, in most cases, actual procurement should be done to cover a rolling one-year period. Limiting the actual procurement to one year enables programme managers to adjust future procurement quantities.

### ***Collect Required Data***

The importance of available and quality data cannot be underestimated. These data include services data on the number and type of health services being provided and logistics data on the consumption and stock levels of commodities for informing the quantification. The District Health Information Management System (DHIMS) and logistics management information system (LMIS) are central to improving the accuracy and usefulness of health commodity quantifications. In addition, morbidity data, demographic data, and information on national programme policies, strategies, and expansion plans should be used to inform the assumptions in the forecasting step of the quantification.

Different types of data and information will be required at each step in the quantification. The data and information can be collected through interviews and consultative meetings with key stakeholders, including programme managers, policymakers, donors, implementing partner organizations, procurement managers, supply officers, warehousing managers, clinical and other technical experts, as well as from direct service providers.

Specific data on the number and type of health services provided can be collected through existing DHIMS reports; the consumption and stock levels of individual commodities can be collected from existing LMIS reports. In some cases, it may be necessary to directly collect data at health facilities. In addition, current policy and technical documents and reports, and any epidemiological surveillance data, demographic health surveys, census data, or special survey studies, should be reviewed for morbidity and demographic data that can be used in the quantification.

### ***Data for Forecasting***

- **Consumption data:** Consumption data are historical data on the actual quantities of a product that have been dispensed to patients or consumed at SDPs within a specified period (usually the past

Example: 50,000 tablets of cotrimoxazole were consumed from February to March.

12 months). These data may be reported monthly, bimonthly, or quarterly. Daily consumption data can be found in pharmacy dispensing registers or other point-of-service registers. Where a well-functioning LMIS captures and aggregates these data from service delivery points, aggregated consumption data can be found in monthly facility-level and annual programme-level reports. When consumption data are used, the forecast is based on the quantities of products consumed in the past. Consumption data are most useful in mature, stable programmes that have a full supply of products and reliable data.

- Services data:** Services data are historical programme-level or facility-level data on the number of patient visits to facilities, the number of services provided, the number of disease (or fever) episodes, or the number of people who received a specific service or treatment within a given period (usually the past 12 months). Service statistics data can be found in programme monitoring reports, DHIMS data, facility-level data on service utilization and attendance rates, or patient records.

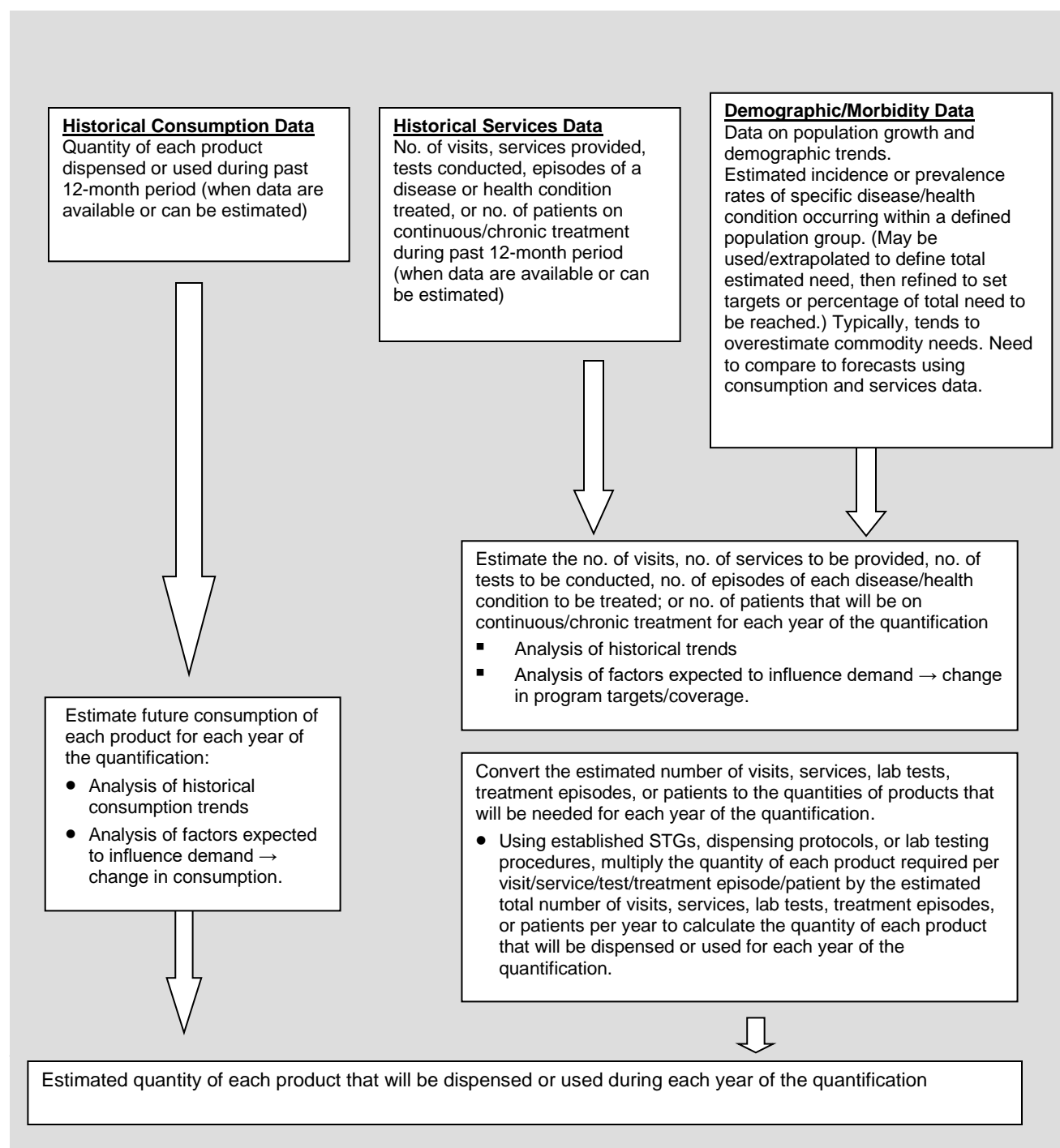
**Example:** In 2005, Ghana's national out-patient hypertension cases totaled 250,000.
- Morbidity and demographic data:** Demographic data include the data on the number and characteristics of the population targeted for services, i.e., age breakdowns. Morbidity data are estimates of the number of episodes of a specific disease or health condition that will occur in a common denominator of the population (e.g., number of episodes per 1,000 or per 100,000 population). Morbidity data may be available through surveillance or research study and extrapolated to estimate national-level incidence and prevalence of specific diseases/health conditions. Demographic and morbidity-based data are often used to estimate the total unmet need for a service or treatment in a programme or country; and, therefore, would represent the uppermost bounds of the potential drug requirements for a programme. See figure 4 for more information on each type of data used for forecasting.

**Example:** 2008 estimated prevalence rates for metabolic risk factors included:  
 Raised blood pressure 36.4% and  
 Raised blood glucose 8.8%

**Example:** The population of Ghana in 2010: 24,391,823
- Information on current programme performance, plans, strategies, and priorities, including specific programme targets for each year of the quantification.** The quantification team may be able to use target data. In some situations, programme targets are also *political targets* that do not relate to the actual number of patients being served, or who can be served by a programme. Broad programme targets of this type are best used for advocacy and resource mobilization, and should not be used for quantification of products for procurement. Sources of programme target data include programme planning documents, national policy and strategy documents, and materials published for dissemination and advocacy.

**Example:** 100,000 IUDs will be inserted in the next programme year.

Figure 4. Types of Data for Forecasting Consumption of Health Commodities



- national- or programme-level stock on hand (SOH)—preferably from physical inventory—of each product to be quantified (should include losses and adjustments)
- expiration dates of products in stock, to assess whether they will be used before expiration
- quantity on order: any shipment quantities of product(s) already on order, not yet received
- established shipment intervals and current shipment delivery schedule

- established national- or programme-level maximum and minimum stock levels
- product information
  - patent status, registration status, prequalification status (if applicable)
  - status of products on the National Essential Medicines List (NEML) and in the standard treatment guidelines and protocols
  - specific product characteristics (formulations, dosages, number of units per pack size, unit cost, and others).
- supplier information (supplier in this context is the entity to whom the purchase order is being issued and who supplies directly to customers; e.g., Medical Export Group (MEG) or Partnership for Supply Chain Management (PFSCM))
  - supplier prices
  - supplier packaging information
  - supplier lead times
  - shipping and handling costs.
- funding information: where the funding source is the entity that provides the funds for procurement—such as GOG or the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM)
  - all funding sources for procurement of commodities
  - amount and timing of funding commitments, by funder
  - funding disbursement schedules to determine when funding will be available for procurement from each source.
- procurement information
  - all procurement mechanisms (e.g., competitive international bidding/tendering, donor procurement, or local procurement) for all products to be quantified
  - procurement lead time for each procurement mechanism.
- distribution information
  - customs clearance fees
  - in-country storage and distribution costs, if applicable
  - in-country sampling/quality testing costs.

### ***Information on Factors Expected to Influence Demand for Services and Commodities***

The following are examples of factors that may affect demand for services and commodities and may need to be considered in the forecasting assumptions:

- changes in policies and STGs mandating product selection and how products are to be prescribed, dispensed, and used

- emergence of new products and formulations on the market
- changes in amounts and timing of financing available for commodity procurement
- changes in programme priorities, strategies, and goals, particularly targets for coverage: e.g., HIV testing and counselling (HTC), emphasis on early infant diagnosis (EID), paediatric antiretroviral therapy (ART), laboratory diagnostics and monitoring, increased focus on home-based care, nutritional support and long-term family planning methods, introduction of new vaccines) that result in demand for new commodities or may create variation in consumption of existing commodities
- epidemiological variations: e.g., seasonal and geographical variations of specific diseases and health conditions
- changes in political, legal, technological, economic, or regulatory environment
- societal and behavioural factors: e.g., stigma affects demand for antiretroviral (ARVs), wider use of long-lasting insecticide-treated bed nets (LLINs) reduces incidence of malaria.

## Step Two: Forecasting

### Organize, Analyse, and Adjust the Data

Multiple types of data from multiple data sources may have been collected—from LMIS reports to number of patients treated or clients served, to incidence and prevalence rates of disease. After the forecasting data have been collected, they should be organized by type of data, either consumption, services, morbidity, or demographic. Programme targets for the quantification period should also be included, if available.

*One of the most critical steps for the quantification team is to assess the quality of the data to determine if they can be used for the quantification.* Some considerations for data quality include the following:

- What is the facility reporting rate? How many of the facilities that should be reporting consumption and/or services data have reported? Of the facilities that reported, how representative are they of the non-reporting facilities? Reported data must be adjusted to accommodate for non-reporting facilities. The lower the reporting rate, the lower the quality of the data. With very low reporting rates, it is not likely that data can be extrapolated to represent a national picture.
- For consumption data, did the facilities experience stockouts at any time? If the programme has experienced stockouts of products, past consumption data will underestimate what the consumption would have been if products had been continuously available at all facilities. Adjustments will be required to cover the stockout periods.
- How recent are the data? This is critical for all types of data, whether consumption, services, morbidity, or demographic. The older the data, the less likely it would reflect the current reality or predict future needs.

#### Forecasting

- Organize and analyse data
- Select forecasting method(s)
- Build forecasting assumptions
- Structure forecasting tree
- Calculate forecasted consumption for each product

- Are historical data predictive of future need? Is current programme performance an accurate reflection of the demand for services that will be provided or quantities of health commodities that will be dispensed in the future? For new or expanding programmes, the rate of increase in services to be provided, or products to be dispensed, should consider past performance and historical growth rates.

It is helpful to organize the data that you have collected and analysed into a table. As an example, table 1 illustrates the organization of data for the commodity of mebendazole that was collected, organized, and analysed during a quantification exercise for essential drugs. Please note that this is only an example and not necessarily the standard.

**Table 1. Organized Data for an Essential Drugs Quantification (commodity: mebendazole)**

Type of Data	Data	Quality of Data	Other Notes
Consumption data	Aggregated regional-level issues data  Aggregated regional-level SOH	Complete monthly issues data for the past 12 months	No stock on hand (SOH) data available at health centres  Site-level consumption data not available
Services data	Number of patients treated for worm infestations	55% reporting rate for the past 3 months	No data available on deworming campaigns  No data available on school-based deworming programmes
Morbidity data	Number of treatment episodes for worm infestations	Incomplete	
Demographic	Total population	Outdated (data is 4 years old)	No population growth rate available

*Table is for illustrative purposes only*

The quantification team will need to formulate assumptions on current programme performance if data are missing or of questionable quality—unreliable, outdated, or incomplete data. Using the example from table 1, the team will need to make assumptions on the current population figures, because the demographic data available is four years old and there is no data on the population growth rate. After all the historical data have been evaluated and adjusted, to forecast quantities of each product that will be needed during each year of the quantification, the quantification team will need to formulate and agree on all assumptions about future programme growth and any increase or decrease in demand for services and products.

When using consumption data, the quantification is based on quantities of products historically consumed. These historical consumption trends need to be analysed and assumptions made about factors expected to influence the demand for individual products during the quantification period.

When using services data, the number of patients or clients served, or number of treatment episodes, is used as the starting point. Similar to consumption data, these historical trends need to be

analysed and assumptions made about future number of patients or clients served, or number of treatment episodes. These must be converted into quantities of products.

When using morbidity or demographic data, the starting point is population-based figures. As with services data, these data on people must also be converted into quantities of products expected to be consumed.

No matter which type of data is utilized, the final outcome will be the quantity of each product expected to be dispensed or consumed during the quantification period.

After organizing and analysing the historical data, the quantification team may need to use various adjustment techniques to address incomplete or incorrect consumption, services, or demographic data.

When using morbidity, demographic, or services data, the estimated number of people or episodes of a disease that are expected to be treated must be used to determine the number of products expected to be consumed.

### **Adjust Historical Data for Incomplete Reporting**

Reports are often either missing or incomplete; reporting rates are rarely 100 percent. For example, in table 1, the reporting rate was 55 percent. To adjust for missing reports, therefore, you need to know which facilities' reports are missing and if those facilities are significantly different from the facilities whose reports you already have.

You may assume that clients at all the missing facilities consume products at the same rate as at other facilities, but using this assumption can result in significant errors. For example, if the missing facilities are in a densely populated area, you could underestimate consumption by using consumption rates from facilities located in sparsely populated areas.

If geographic location, population, seasonality, or another factor may affect consumption at the missing facilities, you can make an additional adjustment up or down to reflect the unique characteristics of the missing facilities.

To adjust the data, if the consumption rates are approximately the same as the rates for the SDPs that have reported, use the following formula:

$$\frac{\text{Sum of all consumption reported}}{\text{Percentage of reports received}} = \text{Estimated total consumption}$$

If you use this technique to estimate consumption, remember to document how you made your adjustment. Substitute issues data for consumption data if reporting rates are very low. Remember that issues data may also be affected by less-than-perfect reporting; therefore, it is also important to verify reporting rates if you choose to use issues data. Issues data can overestimate consumption if excessive quantities of product are being sent from one level of the system to another. Similarly, issues data can also underestimate consumption if products are being rationed. To minimize over- or under-estimates of consumption, if issues data must be substituted for consumption data, it is best to collect issues data from the lowest level of the supply system possible.

If the SDPs that have not reported have significantly different consumption patterns from those SDPs that have reported—e.g., they are known to dispense much larger or much smaller quantities

to users—you can either substitute issues data for consumption data, or you can use the following formula:

$$\frac{\text{Sum of all consumption reported}}{\text{Percentage of consumption represented by those reporting}} = \text{Estimated consumption during period}$$

## Adjust for Aggregated Data

Depending on the LMIS or available tools for data collection, consumption data may be aggregated into annual quantities; therefore, you may not be able to divide them into smaller units of time for analysis. Remember that two assumptions are implicit in data organized this way:

- All facilities consume products at the same rate.
- Consumption is the same for all the time periods covered: e.g., it does not show an increasing or decreasing trend.

You can make adjustments to correct for data aggregation if you have information that indicates that facilities consume products at different rates (see the earlier discussion of incomplete reporting), or information that indicates that the consumption trend during the year was not flat.

Reports can also consolidate groupings of products—such as various brands of oral contraceptives grouped under *pills*—to create a forecast and a supply plan, you will need to sort them by brand. This can happen with any type of data (consumption, services, or demographic), but it occurs most often with demographic data.

If any available surveys indicate the breakdown percentage of brands among users, to estimate each brand's use, you can apply those percentages to the total quantities consumed. You can also use issues data, taking the percentage of each brand issued over a period of time, and applying it to the consumption data to estimate the consumption, by brand.

## Adjust for Stockouts

Even when logistics records accurately reflect true consumption, they may not reflect true demand. This can happen when some products are out of stock for extended periods. Your task, as a forecaster, is to estimate what consumption would have been if the stockout(s) had not occurred. If you know that, for certain commodities, a stockout, hoarding, and rationing, or incorrect data reporting occurred in a particular month, disregard the data for that month and include data from earlier months when these events did not occur, until there are three months of data without these problems.

You can use the following formula to determine an average of the (n) other periods and use that as the data for the stocked out period:

$$\frac{\text{Sum of consumption in other } n \text{ periods}}{\text{Number of periods (n) in which stockout occurs}} = \text{Estimated consumption during period}$$



For commodities without established consumption trends, or with seasonal variations in consumption, you may need to adjust the consumption data for *what would have been* if the stock had been available and dispensed normally. In these cases, you may not have a sufficient number of months of historical data or, due to programmatic changes, data from past months may not be reflective of current or future consumption. Therefore, supervisors could analyse trends, targets, and data from facilities that are not stocked out to develop assumptions about the missing rates of consumption. These adjustments and calculations should not be done at the facility level. Facility-level staff time should be focused on providing services and serving patients, not doing sophisticated calculations, like the ones described here. These adjustments are made primarily for two reasons:

- if the resupply quantities should account for days out of stock
- when estimating consumption for an entire programme or country, to determine the average monthly consumption and to assess national stock status.

Regardless of which approach is used, document how the data was adjusted and keep detailed notes on how the calculations were made. It is important to be able to repeat stock status assessment and to calculate the same answers if the decision making process needs to be explained.

### **Adjust for Outdated Data**

Adjusting for outdated data often occurs when demographic data is used to forecast, especially to obtain current population estimates. Assumptions about trends may be needed in many variables, not just population growth. No single demographic data source will provide all the data points needed; demographic data are often bundled together from multiple data sources that represent different time periods, some or all of which may need to be adjusted so they reflect the same period of time. These additional assumptions may cause significant errors in the forecast. To minimize the number of adjustments, for the base or starting year of the forecast, select the date of the survey as the major data source.

Sub-populations usually grow at different rates than national populations. However, given the inherent imprecision introduced by other assumptions that must be made in preparing the forecast, and the relatively short timeframe of projections made for procurement purposes, this adjustment can be used if Ghana Statistical Service or United Nations estimates are available.

See *appendix A* for an alternative approach to adjusting data for forecasting purposes. Its sources include Management Sciences for Health's *Managing Drug Supply* and the *Manual for Quantification of Malaria Commodities* (2011).

### **How to Forecast Without Historical Data**

If historical consumption or services data is not available—for example, when a new programme or new services are to be implemented, or when a new product will be introduced—forecasting of supplies becomes an assumptions-driven exercise that requires inputs from a broad range of key stakeholders. Informed assumptions can be drawn from research data; from experiences from other countries; and from the knowledge and experience of programme managers, implementing partners, service providers, and technical experts. The forecasting assumptions and results should be formulated, agreed-on, and vetted by key decision makers, implementers, and service providers; they will be responsible for managing and providing the specific healthcare services and products.

## Build Forecasting Assumptions

Two kinds of assumptions need to be made during the forecasting step:

1. assumptions on adjustments made to historical programme data when data are missing, unreliable, outdated, or incomplete
2. assumptions on future programme performance, based on factors influencing demand for services and commodities.

### Sample assumptions for a national quantification of essential drugs

- Number of episodes for the health conditions being quantified that were reported from health centers will be the same as for the non-reporting health centers.
- Essential drugs being quantified will be supplied at a rate to satisfy 80 percent of the forecasted need.
- Health centers will be applying the standard treatment guidelines (STGs) and treating patients accordingly.
- Population growth rate is 2 percent.
- Demographics data will be utilized to identify the percentage of the population that is in each age group.

Most often, complete data are not available for a particular quantification. *The most critical point in making assumptions is to document clearly and specifically which assumptions were made, and on what basis.* If there are few or no data, the forecast will rely heavily on assumptions. Assumptions may include issues such as a changes in standard treatment guidelines (STGs); products; programme strategies; priorities; expansion plans (and when these changes will be implemented), or service capacity (infrastructure, human resources availability, and capacity); client awareness of and access to services; timing and amount of funding commitments for procurement; seasonality; or geographical differences in disease incidence and prevalence.

It is critical for the quantification team to reach consensus on the forecasting assumptions. A quantification workshop is often an effective forum to achieve consensus; and it should include dedicated time for clarifying, agreeing upon, and documenting assumptions. This should be a consultative process with a wide range of programme implementers: programme managers, procurement specialists, clinical experts, pharmacists, and warehouse managers. It is important to document the source of information and input from key informants used in making the forecasting assumptions. The quantification should be revised if any of the forecasting assumptions change.

For forecasts based on services, morbidity, or demographic data, after the data have been collected, analysed, evaluated, and adjusted, and the forecasting assumptions have been determined, a *forecasting tree* can be a helpful tool to organize and utilize the data and assumptions to help estimate future consumption. A forecasting tree does not need to be constructed for a consumption-based forecast, because the starting point is already quantities of products.

The forecasting tree is a diagram of patient groups—or health conditions—and the products required to treat one patient or one episode (see figure 5). It can be completed with a pencil and paper—no software is needed. Data required for a forecasting tree are—

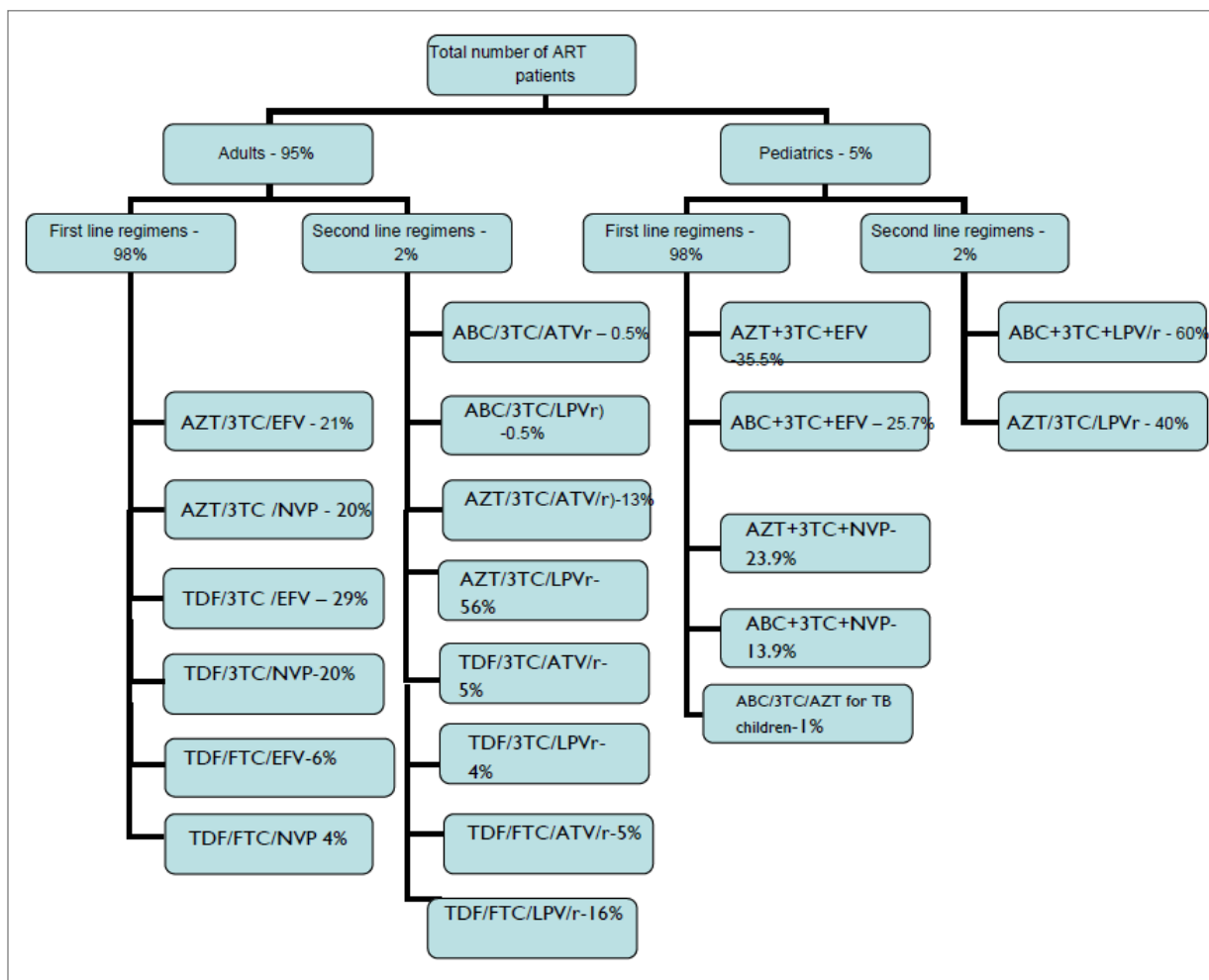
- STGs, treatment regimens, testing protocols, or lab testing procedures, including the list of products and specific product characteristics: e.g., formulations, dosages, and pack sizes

- specific patient groups or health conditions.

Steps for constructing a forecasting tree are as follows:

- Identify the specific disease or health condition: e.g., HIV, malaria, diarrhoea, hypertension, diabetes mellitus, pneumonia, or tuberculosis (TB).
- Separate the logical patient groups or health conditions to be treated:
  - For malaria, the patient groups could be adults versus children, further separated into simple vs. severe malaria.
  - For HIV, the patient groups could be adults versus children, further separated into first line versus second line patients.
  - For TB, the patient groups could be adults versus children, further separated into new or retreatment cases.
  - For anaemia, the patient groups could be adults, including pregnant women; versus children, further separated by age group.
  - For each of the patient and age groups, list all the possible treatment regimens.
- Assign the specific drugs required for each of the possible treatment regimens within each patient and age group.

**Figure 5. Sample Forecasting Tree for an ARV Drug Quantification**



## Calculate Forecasted Consumption for Each Product

Forecasts prepared using services, morbidity, demographic, or programme target data must be converted from number of patients, visits, or episodes treated into estimates of quantities of products consumed. This conversion requires assumptions about the application of and adherence to current STGs, dispensing protocols, testing algorithms, or lab testing procedures. These assumptions should include information on product characteristics and how products should be prescribed and dispensed. The following example demonstrates how this can be presented and calculated:

$$A \times B = C$$

Where—

A = the number of basic units of product (tablet, capsule, ampoule, bottle, test strip, ml of liquid, etc.) that should be dispensed or consumed per visit, per service, per treatment episode, or per patient; and the quantities of each product required per day or per year if forecasting for a chronic health condition

B = the total estimated number of visits, services, lab tests, treatment episodes, or patients expected to be treated/receive services for each year

AND

C = the quantity of each product expected to be dispensed or consumed: e.g., the forecasted consumption.

The forecasted quantity of each product to be dispensed or consumed should be estimated monthly, for each year of the quantification, for programmes that are new, scaling up services, or planning to implement significant changes in policies or strategies that will affect the demand for products; this also applies to new products that will be introduced, or products that will be substituted or replaced with others during the year, for which there are no historical data. Table 2 shows the conversion factors that should be applied for the different types of forecasting data.

**Table 2. Conversion Factors for Forecasting Data**

Type of Data	Conversion Factor			Forecasted Consumption	
Consumption	Estimated quantity of product to be dispensed/used			=	Quantities of Product
Services	Estimated no. patients, no. episodes of disease or health condition, no. lab tests	X	STGs, testing algorithm, lab procedure	=	

### Example of calculating anti- malaria drugs for adult malaria cases requiring artemether/lumefantrine regimens:

- Each adult case that requires artemether/lumefantrine regimen requires 1 treatment (artemether/lumefantrine 4 x 6).
- There are an anticipated 4,692,240 adult malaria cases requiring this regimen in a particular year.
- This will give a yearly total of 4,692,240 (4,692,240 x 1) treatments.
- The annual number of treatments can be divided by 12 for a monthly estimation of consumption.
- This means 391,020 treatments (artemether/lumefantrine 4 x 6) will be needed each month.

Type of Data	Conversion Factor			Forecasted Consumption	
Demographic/ Morbidity	Estimated no. patients, no. episodes of disease or health condition, no. lab tests	X	STGs, testing algorithm, lab procedure	=	
Programme targets	Targeted no. users, no. patients, no. episodes of disease or health condition, no. lab tests	X	STGs, testing algorithm, lab procedure	=	

At this point in the quantification process, software can be used to calculate the total estimated quantity of each product to be dispensed, or consumed, for each year of the quantification.

For forecasts using consumption data, the PipeLine software is recommended. Forecasting consumption using the services, demographic, or morbidity data can be done using Excel spreadsheets or a number of other software programmes. A software tool commonly used for forecasting drug requirements with these data types is Quantimed. See *appendix B* for a summary of available software programmes.

### **Reconcile Forecasts to Produce Final Estimate**

Ideally, multiple types of data should be used to calculate one or more forecasts. These results should be compared to arrive at the final forecast consumption figures. For example, a quantification team could prepare one forecast with morbidity data, another with services data, and yet another with consumption data. The results from these different forecasts should be compared, a final forecast selected, and the reasons documented. If data of one type are of very poor quality, the team may decide not to base a forecast on those data. For example, if no consumption data exist, the quantification team may choose to use morbidity data instead.

This forecast reconciliation process includes—

- evaluating the strengths and weaknesses of the forecasting data and assumptions to determine the validity or limitations of each forecast
- comparing and contrasting the acceptable forecasts
- using good judgment and consensus to select a final forecast.

By definition, the forecast will always be an approximation of future demand and will never be completely accurate. Comparing multiple forecasts from independent data sources will highlight the strengths and weaknesses of each data source and mathematical assumptions; and it will demonstrate the consistency (or inconsistency) of the forecasts; thus, programme managers will be able to make an informed judgment when selecting the best projection.

To evaluate the quality of forecasts, assess the number and reliability of the forecasting assumptions, and assess the methodology followed, and the accuracy of the calculations. When data limitations do not allow multiple forecasts, take more care to evaluate the quality of the single forecast.

At this stage in the quantification, the monthly forecasted consumption for each product should have been calculated; the team will then move to supply planning. Output from the forecasting step

is a major input to the supply planning step. See *appendix C* for a diagram of the flow of data throughout the quantification process.

## Step Three: Supply Planning

To identify funding sources and mobilize additional resources to meet funding gaps, if needed; typically, national quantification exercises include a commodity *forecast for a three-year period*. Although the forecast should be done for three years, an actual procurement plan should be done for two years, where orders have been placed with suppliers and shipment dates negotiated. Developing the supply plan entails coordinating the timing of funding disbursements from multiple funding sources with procurement lead times and supplier delivery schedules to ensure a continuous supply of products and to maintain stock levels between the established maximum and minimum levels.

### Supply Planning

- Organize and analyze data
- Build supply planning assumptions
- Estimate total commodity requirements and costs
- Develop supply plan
- Compare funding available to total commodity cost

### Organize and Analyse the Data

At this stage in the quantification, monthly forecasted consumption of each product, for each year of the quantification, has been calculated. To determine the total quantities to procure, other data must be utilized. During the preparation stage, data should be collected for the supply planning step. These data, which should now be organized and analysed, include—

- national/programme-level SOH (physical inventory) of each product to be quantified
- expiration dates of products in stock to ensure they will be used before expiration
- quantity on order: any shipment quantities of product(s) already on order, but not yet received
- established programme-level maximum and minimum stock levels
- supplier information
  - supplier prices
  - supplier packaging information
  - supplier lead times
  - shipping and handling costs.
- funding information
  - all funding sources for procuring commodities
  - amount and timing of funding commitments by funder
  - funding disbursement schedules to determine when funding will be available for procurement from each source.
- procurement information

- All procurement mechanisms (e.g., government or international bidding/tendering, donor procurement, or local procurement) for all products to be quantified.
- Procurement lead time for each procurement mechanism.
- distribution information
  - in-country storage and distribution costs (if applicable)
  - in-country sampling/quality testing costs
  - customs clearance fees.

As with the forecasting step, where data are unavailable, incomplete, unreliable, or outdated, assumptions must be made.

### ***Establish Maximum, Minimum, and Desired End of Period Stock Levels***

Included in the list of data types required to formulate a supply plan were the established programme-level maximum and minimum inventory levels for each commodity included in the quantification exercise. If these maximum and minimum levels were not determined earlier, they must be developed now. And, if they were established earlier, they should now be reviewed and updated, as required. Maximum and minimum levels are needed for every level in the in-country supply chain where inventory is to be received and stored—such as the central, regional, and SDP levels. The max-min inventory control system is used to inform commodity managers when to order/issue and how much to order/issue; it also provides a guide for requisition approval and for how to maintain an appropriate stock level of products to avoid shortages and oversupply.

### ***Factors to Consider in Determining Desired Inventory Levels—Maximum, Minimum, Desired End of Period Stock***

The desired stock at the end of period should be set high enough to ensure continuous availability of products at all programme levels, but not so high that they regularly expire. In setting this policy, programme managers should consider the length of the pipeline to and within the country, storage capacity at all levels of the distribution system, normal and maximum lead times for ordering and receiving supplies, and volatility of consumption. Most health commodity logistics systems operate on variations of the max-min inventory control system, in which each storage facility is supposed to maintain stock balances between pre-set maximum and minimum levels, expressed in terms of number of months of supply on hand. The minimum stock levels include not only quantities sufficient to cover demand during the time it takes to replenish supplies, but also a safety/buffer stock. The purpose of safety/buffer stock is to avoid stockouts when shipments are late, when consumption or losses are higher than anticipated, or when breakdowns occur in the distribution system. In setting these levels, managers must judge the reliability of the—

- distribution system
- forecast of consumption and losses
- suppliers.

The less reliable any of these components is, the higher the safety stock—and maximum and minimum stock levels—needed.



Selecting the level of safety stock should not be a subjective decision. Data should be available on timing and reliability of both in-country and international shipments. Comparisons of past forecasts to actual performance can provide a quantitative measure of forecast reliability. Generally, safety stock and minimum and maximum policies are set initially at relatively high levels, and then increased or decreased as experience dictates.

Because stock balances are intended to fluctuate between the maximum and minimum, desired stock at the end of the period ideally is calculated by adding the maximum and minimum months' supply at each level of the distribution system and dividing by two. This calculation yields a desired stock at end of period—measured in months of stock—equal to the average of maximum and minimum, which is appropriate for stable, mature distribution systems. In a less reliable system, managers should adopt the more conservative approach of setting desired stock at end of period equal to the maximum stock level, so that all facilities are topped up completely at the end of the period.

## Requirements Estimation

The country's total stock pipeline, again, measured in months, is equal to the sum of the maximum months of stock at each level of the distribution system. The desired stock level at the end of the period is either an average of the maximum and minimum stock levels or, more conservatively, the maximum stock level. See table 3 for the desired stock level calculations.

**Table 3. Calculating Desired Stock at End of Period (in months of stock)**

Programme Level	Maximum Stock Level (months)	Minimum Stock Level (months)
Central	12	6
Region	6	3
SDP	3	2
Total	21	11

**Normal Calculation:**

$$\begin{aligned} \text{Desired stock at end of period} &= \frac{\text{Total max stock level}}{2} + \frac{\text{Total min stock level}}{2} = \frac{21}{2} + \frac{11}{2} \\ &= 16 \text{ months of stock} \end{aligned}$$

### Conservative Calculation:

Desired stock at end of period = Total max stock level = 21 months of stock

In either case, the desired stock at end of period (in months) is converted to an actual quantity of product for use in the requirements estimation formula by multiplying by the projected average monthly consumption for the following time period. The following time period's forecasted consumption is used instead of the current time period's projection because the end of period balance for each period should be sufficient to cover demand during the subsequent time period. Where usage of a commodity is growing or shrinking rapidly, it is especially important to use the following period's forecast in this calculation.

In distribution systems with multiple levels or long lead times for procurement, the quantification team must also be concerned about the total length of the pipeline implied by these calculations. Most health commodities have limited shelf lives and are susceptible to deterioration in storage. A programme should never run short of commodities, but neither should it want to destroy

commodities because of expiration or quality problems. For these reasons, every effort should be made to limit the length of the in-country pipeline and, therefore, the desired level of stock at end of period to no more than 12 months. A longer pipeline increases the risk that commodities will expire before they can be distributed.

These equations and definitions were adapted from *The Contraceptive Forecasting Handbook for Family Planning and HIV/AIDS Prevention Programmes* (2008).

## Build the Supply Planning Assumptions

As previously mentioned, the most critical point in the assumptions building process is to document clearly and specifically the sources of information and the key informant inputs on the assumptions. And, as in the forecasting step, consensus must be reached among the quantification team on the supply planning assumptions. For the supply planning step, assumptions may need to be reached on the timing of available funds, lead times for each supplier, exact amounts of funding available, and estimates on arrival dates for supplies.

If a maximum-minimum inventory control system has not been formally established, the quantification team will need to make assumptions about the minimum and maximum stock levels at each level of the logistics system—facility and central levels, for example.

## Estimate the Total Commodity Requirements and Costs

Estimating the total commodity requirements consists of determining the quantity of each product needed to—

1. Meet the forecasted consumption.
2. Ensure that the in-country supply pipeline has adequate stock levels to maintain continuous supply to service delivery points.

### Example of assumptions from essential drug quantification:

- MOH will have \$7,000,000 available for essential drugs procurement.
- DFID has committed \$30,000,000 for the procurement of essential drugs.
- Order quantities will arrive as scheduled.
- A three-month stock level will be maintained at the regional medical stores at all times.

To estimate the total commodity requirements for the forecast period, the following steps are taken: (1) calculate the additional quantities of product needed to cover procurement and supplier lead times and buffer stocks; and (2) subtract the quantity of each product already in the country (SOH), any quantities that have been ordered but not yet received (quantity on order), and any products that will expire before they are used.

In some cases, shipment delivery schedules need to be adjusted to accommodate constraints in the storage and distribution capacity of the logistics system—e.g., scheduling more frequent shipments of reduced quantities rather than larger shipments.

At this point in the quantification, regardless of the forecast method used, PipeLine software should be used. This software was specifically developed to address the unique considerations of supply planning and pipeline monitoring for public health programmes in resource-poor and limited settings; its use is recommended as a best practice. If creating a database for the first time, the quantification team should enter programme, product information (including pack sizes and prices), and supplier data. Please see the *PipeLine User's Manual* for specific guidance on how to use the software.

If a PipeLine database already exists, the quantification team should update all data inputs, including the timing and quantities of any shipments received and entered into inventory, the actual consumption of each product, and any losses and adjustments to inventory that have occurred since the last update.

Whether a new PipeLine database is being created, or an existing PipeLine database is being updated, the following data should be entered:

- national SOH of each product at the time of the quantification, whether from a physical count, routine LMIS data, or review of stock card entries
- all shipments currently on order, by supplier, with the expected arrival date
- all planned shipments by supplier, with the expected arrival date
- monthly forecast consumption for each product (If Quantimed was used in the forecasting step, the forecast consumption can be directly imported into PipeLine. See *appendix D* for information on how to export data from Quantimed and import it into PipeLine.)

At this step in the quantification, an assessment of the in-country stock status is needed to calculate the quantities of each product to be ordered and that can reasonably be expected to be stored, distributed, and used before expiration. Assessment of the in-country stock status (months of stock) for each product should include an estimate of how long the existing stocks of each product are going to last.

## **Develop the Supply Plan**

A shipment should be scheduled to arrive when the national months of stock reaches the established minimum stock level. The quantity of product to order should bring the national months of stock back up to the established maximum stock level. The quantity to order will need to be rounded up to the nearest whole unit of supplier packaging.

The next step is to estimate the cost of the total commodity requirements.

Updated sources of information on product prices and supplier rates are needed to estimate the cost of the quantities of products to be ordered. In addition, information on the cost of insurance and freight, customs clearance and duties, and in-country storage and distribution costs may need to be added to the cost of the quantities of products to be procured if they are not included in supplier rates or budgeted for through other mechanisms or waiver agreements.

If price data have already been entered into PipeLine, the costs associated with a shipment will be automatically calculated.

Flexible procurement contracts with suppliers are recommended so that shipment quantities can be adjusted to respond to uptake in services, fluctuations in patient demand, existing stock levels, and rates of consumption of products. Agreements with suppliers may also need to include flexibility to delay shipments into the year following the year of the forecast, if uptake of services does not meet expected demand; or to bring forward delivery dates if uptake is higher than previously estimated.

## Compare Funding Available to Total Commodity Costs

The final decision on the quantities to procure will be determined by the amount of funding available for procuring products. Where sufficient funding is available, the final quantity to procure of each product will be the same as the quantity to order as a result of the quantification.

If funding is insufficient, the quantification team will need to determine whether additional resources can be mobilized. An effective venue for this can be presenting the quantification results to stakeholders and funding partners, illustrating what the funding gap is in order to mobilize additional funds to ensure timely procurement and delivery of the required quantities of commodities.

If resources are insufficient and a funding gap exists, it is critical that the reduction in quantities required come from revisiting and adjusting the forecasted quantities, rather than eliminating quantities required to fill the in-country supply pipeline. Short-changing quantities to fill the pipeline will result in stockouts and will undermine program goals.

With non-full supply, if it is impossible to mobilize additional resources to procure the full quantities of products required, the forecasted quantities of products expected to be dispensed will need to be reduced. This is done by returning to the forecasting step in the quantification and engaging in further consultation and consensus building to adjust the forecasting assumptions.

After adjusting the forecasting assumptions, to reconcile the results of the quantification with the funding constraints, the quantification team will need to repeat the steps in the quantification process—from the calculation of the forecasted monthly consumption of each product to the final calculation of the actual quantities of each product to procure.

## Section 2: Using the Results of the Quantification

### Prepare Report Summarizing the Quantification Exercise

After a quantification exercise is complete, the quantification team will document and share the quantification results with all major stakeholders. This dissemination process includes preparing a comprehensive quantification report and organizing and conducting dissemination meetings. When preparing the quantification report, the quantification team should use the Quantification Report Preparation Checklist—see *appendix E*. Each checklist item should be considered and appropriately addressed.

Additionally, the quantification team should prepare the following materials and, as appropriate, include them with the quantification report.

- all PipeLine databases for the health programmes included in the quantification
- electronic Adobe (PDF) version of Stock Status Reports and Procurement Tables for each product forecasted, in every health programme included in the quantification exercise (produced in PipeLine), covering each year of the quantification
- electronic Adobe (PDF) version of Shipment Summary by Supplier Report from each PipeLine database, covering each year of the quantification.

### Share Results with Stakeholders

The quantification team should formally present the results of the quantification to stakeholders:

- Within two weeks of the quantification exercise, a debriefing meeting, with initial results, should typically be scheduled.
- Within six weeks after the quantification workshop, the team should ensure that the report summarizing the quantification workshop process and outcomes is completed.
- Within six weeks of the quantification exercise, a dissemination meeting should be held with all major organizational stakeholders.

The specific timing will depend on stakeholder availability and on the completion of the summary report. Individual meetings may be required with certain stakeholders to inform them of the quantification results if they are not able to attend larger dissemination meetings. This dissemination process enables the team to receive feedback about the assumptions that were made during the forecasting step, as well as the data sources used. Presenting the results of the quantification is an opportunity for the team to present on national stock status levels for commodities to all stakeholders and to outline the actions required to maintain adequate stock levels.

By presenting the quantification results to stakeholders, the following decisions and actions can be accomplished:

- programme planning and budgeting decisions
- mobilization and allocation of funding for commodity procurement
- coordination of multiple sources of funding for procurement
- informing procurement actions on which products to procure, how much to procure, and when to procure
- adjusting timing of procurements and shipment delivery schedules to ensure continuous supply, while avoiding stockouts and overstocking.

When conducting a presentation, the quantification team should prepare slides (e.g., PowerPoint) that review each step of the quantification exercise, including—

- review of implementation of the previous quantification during the last six months
- scope, purpose, and timeframe of the current quantification
- review of all data sources used, and challenges in data collection
- summary of the major forecasting assumptions and description of what data sources were used to make those assumptions
- summary of supply planning assumptions—especially if assumptions about amounts and timing of funding commitments will affect procurement and delivery
- total quantities of each product required for each year of the quantification
- national stock status (months of SOH) for each product (PipeLine Stock Status Graphs are very useful to convey this information)
- highlight products on verge of expiry, stocked out, or overstocked, based on stock status analysis (months of SOH)

- summary of shipments, by supplier
- total funding gaps for the next 24 months
- specific actions required to address any critical stock imbalances and to maintain stocks at the required levels.

## **Section 3: Reviewing and Updating the Quantification**

Quantification does not end when the final quantities and costs have been determined; it is an ongoing process of monitoring, reviewing, and updating the forecasting data and assumptions; which, in turn, may require a recalculation of the total commodity requirements and costs. For the quantification exercise to be useful and effective, the forecasting assumptions and the supply plan should be reviewed and updated at least every six months, and more frequently for rapidly growing or changing programmes. Ongoing monitoring and updating of the quantification is critical to keeping programme managers, funders, and other stakeholders informed on the availability of health commodities; it is a vital precondition for timely decision making on product selection, financing, and delivery of commodities.

Reviewing and updating the quantification involves the following steps:

- To determine the degree of error, update the actual consumption for each product and comparing the actual consumption against the forecast consumption.
- Review and updating the forecasting data and assumptions.
- Calculate or recalculate the forecasted consumption using Quantimed, Excel spreadsheets, or other software.
- Update the SOH for each product.
- Assess the national stock status for each product—based on product consumption and stock levels.
- Review and update shipment delivery schedules to ensure continuous supply and to maintain desired stock levels.
- Update the amounts and timing of funding commitments.
- Recalculate the commodity requirements and costs over time.
- Estimate and update funding needs and gaps for procurement.

### **Knowledge and Skills Required**

Ideally, the same core team of people who conducted the initial quantification should conduct routine updates. The knowledge and skills required to complete a quantification for health commodities include the following:

- for each commodity category, expertise in the specific programme area and knowledge about the commodities and how they are used
- computer literate and proficient in Microsoft Excel spreadsheets, or other software programmes, to create and manage databases: e.g., PipeLine, Quantimed

- to update the PipeLine database, monitor, collect data, and update the forecasting data and assumptions and supply planning data
- prepare and present quantification data and methodology and final quantification results to key stakeholders, including implementers.

See *appendix F* for a sample timeline of the activities needed to develop and routinely update a national quantification.





# Part 2: Quantification Process

## Guidelines for Specific Programmes

This section of the document guides users through the quantification of some selected programme commodities that the national quantification teams have quantified over the years for Ghana.

### Section 4: Malaria Commodity Category

#### Context

Malaria continues to be a serious health risk for Ghana, contributing significantly to the overall burden of disease in the country. All the country's population of 25 million is at risk for malaria, and malaria is hyper-endemic in all parts of the country. Transmission occurs year-round; seasonal variation is only slight for most of Ghana, but more pronounced in the northern parts of the country. As cited in Ghana's 2012 PMI Malaria Operational Plan, malaria is the country's leading cause of morbidity, accounting for approximately 38 percent of all outpatient illnesses and 33 percent of all deaths in children under 5 years of age.

The National Malaria Control Programme (NMCP) is implementing a multi-year strategic plan. The broad objective of the strategic plan is to reduce the malaria burden to a point where it is no longer a disease of public health importance and, eventually, it is eliminated from Ghana. The key interventions being implemented are malaria case management and integrated vector control. Coverage of these interventions is national and universal. It is the policy of the Ministry of Health (MOH) to provide universal access to parasite-based diagnosis, and effective and prompt treatment for all confirmed malaria cases, based on the Malaria Case Management Guidelines.

#### Scope of Quantification

- *Timeframe:* National quantification of malaria commodities must be conducted annually and reviewed semi-annually. At each quantification, a three-year forecast of commodity requirements is generated; and a two-year supply plan is developed, which is updated once a quarter.
- *Sector:* The quantification team will conduct the quantification exercise for all facilities—public and private, nationwide—that receive products from the public sector. This includes medicines that are distributed in community-based programmes.
- *Medicines:* Medicines to be quantified will be based on current standard treatment guidelines (STGs), Malaria Case Management Guidelines (MCMG), and the National Essential Medicines List (NEML). STGs, Malaria Case Management Guidelines, and protocols may be revised over time; recommended regimens and protocols should, therefore, be verified prior to each quantification exercise. Following are some examples of malaria commodities that are currently in use and may be included in the quantification exercise:

- artesunate/amodiaquine 25mg/67.5mg (2–11 months) (1x3)
- artesunate/amodiaquine 50mg/135mg (1–5 years) (1x3)
- artesunate/amodiaquine 100mg/270mg (6–13 years) (1x3)
- artesunate/amodiaquine 100mg/270mg (+14 years) (2x3)
- artemether/lumefantrine 20mg/120mg (0–3 years) (1 x 6 )
- artemether/lumefantrine 20mg/120mg (3–8 years) (2 x 6)
- artemether/lumefantrine 20mg/120mg (9–14 years) (3 x 6)
- artemether/lumefantrine 20mg/120mg (+14 years) (4 x 6)
- dihydroartemisinin piperaquine
- quinine sulphate 300mg tablets
- quinine injection 600mg
- artesunate injection 30mg
- artesunate injection 60mg
- artesunate injection 120mg
- artemether injection 40mg
- artemether injection 80mg
- artesunate suppository 50mg
- artesunate suppository 200mg
- clindamycin 150mg capsules
- sulphadoxine-pyrimethamine (SP) tablets
- amodiaquine 153mg
- long-lasting insecticide-treated bed nets (LLINs)
- rapid diagnostic tests (RDTs).

### **Quantification Workshop—Participation and Schedule**

Participants for the workshop should include representatives from the National Malaria Control Programme (NMCP), including the Programme Manager, Ghana Health Service—Stores, Supply, and Drugs Management (GHS-SSDM), Institutional Care Division (ICD), Ministry of Health—Procurement and Supply Division (MOH-P&S), Office of the Chief Pharmacist, Ghana National Drug Programme (GNDP), national quantification team, Central Medical Stores (CMS), several regional medical stores (RMSs), National Public Health Reference Laboratory, implementing or development partners—e.g., USAID, United Nations Children’s Fund (UNICEF), and World Health Organization (WHO), and any organization that may be providing technical assistance for the quantification, as well as clinical practitioners experienced in malaria case management.

The quantification workshop should occur over five working days; the first three days should be dedicated to analysing data and building forecasting assumptions. All participants should, therefore,

attend the first three days of the workshop; during this time they will analyse data, and discuss and reach consensus on forecast assumptions. During the final two days, the forecasts and supply plans will be developed, using the assumptions agreed-to earlier in the week. Participation for this final period is required from at least the representatives from the GHS-SSDM, MOH-P&S, and the quantification team. If an external organization is providing technical assistance for quantification, their representatives should also be present for the final period. *See appendix G* for a sample workshop schedule for the first three days.

The objectives of the quantification workshop may include the following:

- Organize and analyse data needed to prepare forecasts and supply plans for the malaria programme.
- Develop, by consensus, key assumptions for building consumption-based, services-based, and demographic-based forecasts, and for building the supply plan.
- Develop three-year commodity forecasts and two-year supply plans.

### **Data Sources for Forecast Development**

To be prepared to develop forecasts during the quantification exercise, the quantification team will collect the following data prior to the date of the quantification exercise:

- Consumption-based forecast: Service delivery point (SDP)-level consumption data for the most recent full two years, monthly issues data from all 10 RMSs for the prior full two years and the year-to-date issues data for the current year.
- Services-based forecast: The District Health Information Management System (DHIMS) data on malaria cases for the most recent full four years and the year-to-date data for the current year, including breakdowns of simple and severe malaria, clinical and confirmed cases, and malaria in pregnancy; and age breakdowns of cases under 1 year, under 5 years, and over 5 years of age.
- Demographic-based forecast: The most recent Ghana National Census data for total population estimates and population growth rates, most recent Demographic and Health Survey (DHS) or Multiple Indicator Cluster Survey (MICS) data on reported fever episodes and for those patients seeking treatment in the public and private sectors. It should also include data on LLIN coverage on ownership, and DHIMS and/or sentinel sites data on the rate of change in malaria cases and on the average slide positivity rate. Because many of the assumptions used to develop the services-based forecast will also be used to develop the demographic-based forecast, the data sources for the services-based forecast will be useful for both forecasting types.

High-quality data may not be available for some data categories listed in the previous section. In this case, the quantification team will collect and analyse the data that is available for completeness and quality, highlighting any gaps in data for the participants of the quantification exercise to consider when developing assumptions. Prior to the quantification exercise, the quantification team will also develop handouts for each forecasting type that describe the proposed approach, data available, and assumptions required for each type of forecast.

### **Key Considerations in Consumption-Based Forecast Development**

Although several initiatives are being implemented to strengthen the logistics management information system (LMIS) in Ghana, national-level consumption data on malaria products may not

be available. In this case, prior to the quantification exercise, an Excel spreadsheet should be developed and provided to all RMSs; to request monthly issues data for the last full two years and for the current year-to-date, with the unit of tablets to be used. The RMSs should be asked to include total number of days out of stock for each product, for each month, including the issues data. This data can be used as a proxy for consumption data, if required. The quantification team should ask the RMSs to submit data for all products they issued out to facilities, whether the CMS had received the products or had been procured directly from the private sector. The quantification team will use this data to develop a consumption-based forecast. See *Section 1, Step 2: Forecasting* for an explanation of the forecast development process for public health commodities.

### **Key Considerations in Services-Based Forecast Development**

The starting point for the services-based forecast is the total number of malaria cases. Data may be obtained from the DHIMS on the number of malaria cases for the preceding full four years and year-to-date data for the current year; including divisions of simple and severe malaria, clinical and confirmed cases, and malaria in pregnancy, as well as age breakdowns of cases under 1 year, under 5 years, and over 5 years of age.

*Increase in access and decrease due to interventions:* After obtaining this data, the quantification team may apply an increase in the number of cases, based on historical rates of increase. Interventions to consider when estimating the rate of increase in cases include the expansion of community-based service provision and the increase in the number of individuals enrolled in NHIS. Also, because access cannot indefinitely increase and due to vector control interventions, such as LLIN and indoor residual spraying (IRS) coverage and intermittent preventive treatment of malaria in pregnancy (IPTp), assumptions can also be made concerning a rate of decrease.

*Types of malaria cases:* The quantification team will then divide the number of cases into the cases requiring artemisinin-based combination therapy (ACTs) (simple and severe malaria), cases requiring severe malaria medicines (severe malaria), and the cases requiring quinine (malaria in pregnancy—first trimester).

*Breakdowns of ACT presentations:* The cases that require ACTs can be divided into the various categories of ACTs currently in use, including their related age or weight bands.

Artesunate/amodiaquine (AS/AQ) is currently preferred to treat children in Ghana, while artemether/lumefantrine (AL) is more common for treating adults who may be defined as those older than 14. Using data from the most recent census, the quantification team will be able to estimate the percentages of adults (>14 years) and of children (<14 years). After this general breakdown, the team will need to make assumptions about the percentage of each age group that will be on each type of ACT.

*Dividing severe malaria medicines:* The cases that require severe malaria medicines can be divided into those requiring any of the STG prescribed injectables—currently, artesunate injection, artemether injection, or quinine injection—for severe malaria and the related weight bands. For severe malaria medicines, assumptions need to be made on the number of days that patients can be prescribed injections before they are given tablets. For instance, in the Ghana 2013 quantification exercise, it was assumed that severe malaria cases will need injections for three days, and then they could take ACTs. Ghana is currently expanding the use of artesunate injection, while phasing out artemether injections and quinine injections. Implementation status of this, and any other changes in regimen, should be reviewed, and appropriate assumptions should be made to reflect the current status and the status in the near future.

*For quinine injection*, the only product currently approved for use in Ghana is the 600mg vial (2ml of 300mg quinine). After a vial of quinine is opened, it must be used or the contents must be thrown away; therefore, the quantification team may assume that one vial will be needed for each dose. This will mean that every patient taking quinine injection will need the same number of vials—nine—regardless of their weight or age.

The team can apply the same weight bands (and percentages on each weight band) for artesunate and artemether injections. These weight bands will be based on the number of vials required, according to dosage guidelines. The team can assume that the majority of severe malaria cases will be in the 11–25 kg weight band. Also, the DHIMS data will show the percentage of malaria admissions in under-5s. This percentage can be assumed to be approximately the percentage of severe malaria cases in the lowest two weight bands.

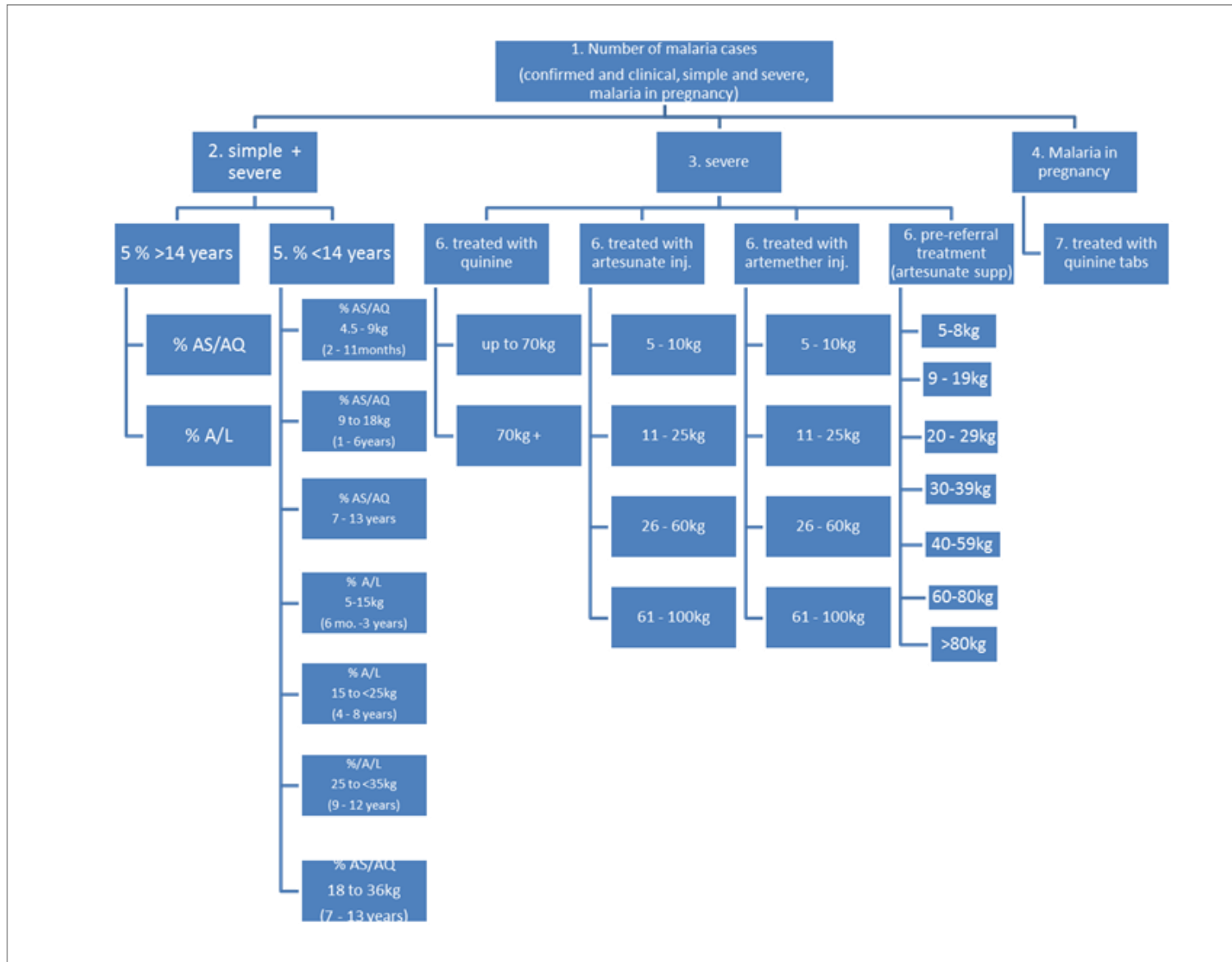
The quantification team will define the specific products required. An arthemether injection is available in 40mg and 80mg vials, while artesunate injection has, historically, only been available in a 60mg vial. The WHO has also prequalified a 30mg vial and a 120mg vial of artesunate injection. The size range of vials is important because, after a vial is opened, its contents must be either used or thrown away. The quantification must be limited to commodities specified in the National Essential Medicines List and the STGs.

*Pre-referral treatment for severe malaria:* National guidelines state that severe malaria cases that are initially detected at the community level or at lower-level health facilities should receive pre-referral treatment. Patients should be given rectal artesunate (suppositories) and then referred to higher level facilities for treatment with severe malaria medicines. The quantification team must, therefore, make assumptions on the percentage of severe malaria cases that will receive pre-referral treatment with rectal artesunate.

*Malaria in pregnancy:* Currently, approximately 2 percent of all malaria cases in Ghana are reported as malaria in pregnancy cases. This can be confirmed by reviewing the DHIMS data. The quantification team may then need to make assumptions on the percentage of the malaria in pregnancy cases that are likely to occur during the first trimester (e.g., in the 2013 Ghana quantification exercise, it was assumed that one-third of these cases will occur during the first trimester of pregnancy). For those cases, quinine tablets alone or quinine plus clindamycin are used instead of ACTs for treatment. The quantification team will have to assume the percentages for quinine only treatment and quinine plus clindamycin treatment. In the past, the use of clindamycin has been limited. The NMCP, however, plans to expand the use of clindamycin for such cases; therefore, the current status of the roll out may need to be considered when making assumptions.

Figure 6 illustrates a sample services-based forecasting tree. This forecasting tree was used during the 2013 quantification exercise for the Ghana malaria programme.

**Figure 6. Sample Services-Based Forecasting Tree for Antimalarial Medicines**



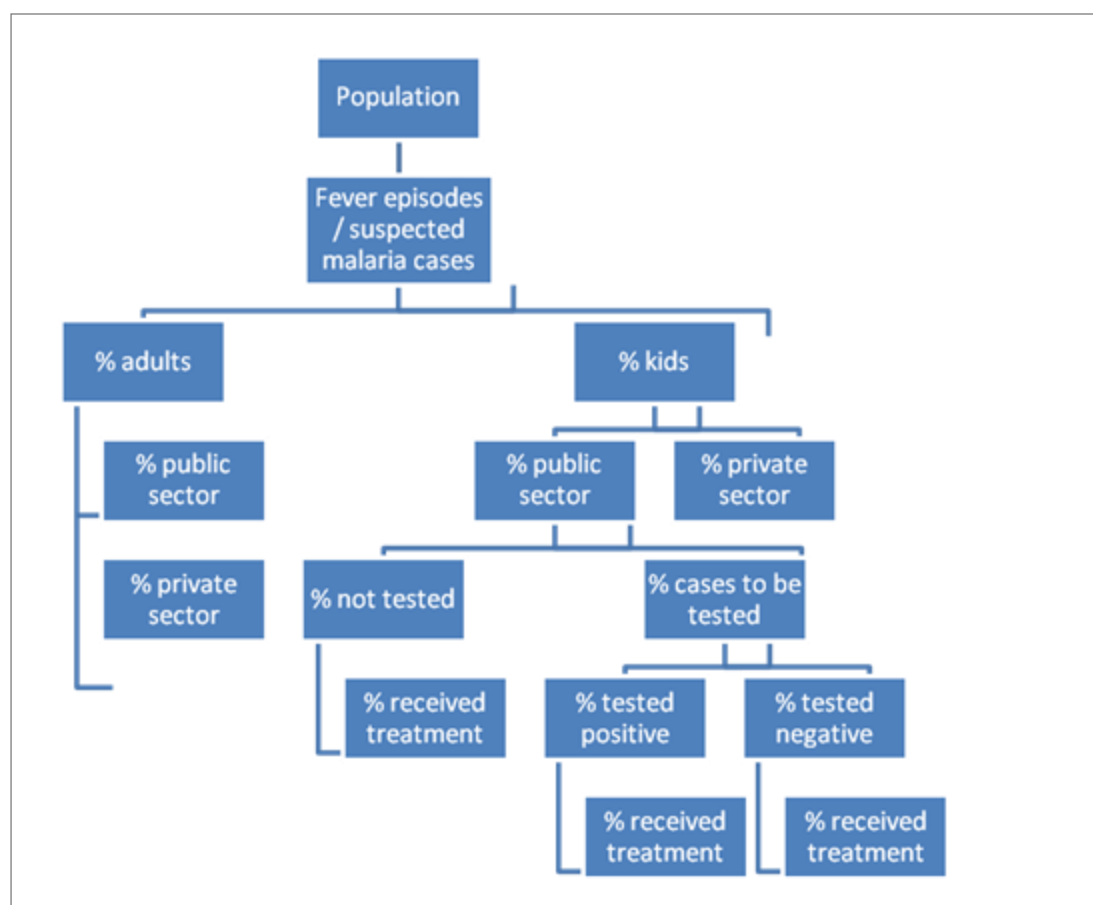
### **Key Considerations in Demographic-Based Forecast Development**

All the assumptions made in developing the services-based forecast can also be applied to the demographic-based forecast. The difference between the two forecasts is the starting point. For the services-based forecast, the starting point is the total number of cases reported in the DHIMS. For the demographic-based forecast, the starting point is the total population of Ghana.

*Estimating total number of cases:* The quantification team can apply a growth rate to this starting point of total population, and they can estimate the percentage of fever episodes. The team will divide this percentage into adults and children, because the percentage of adults seeking treatment in the public sector is different than the percentage of children. A division between the public sector and private sector will also be applied. After that, the team will estimate the percentages of fever episodes that are tested and not tested (e.g., clinically diagnosed). An assumption will be made about the percentage of those who are not tested, but receive treatment. Of those tested, the team will make assumptions on the percentage of those that test positive and receive treatment, and the percentage of those that test negative and receive treatment. The total number of expected malaria cases to receive treatment in the public sector, therefore comprises cases that are not tested (e.g., clinically diagnosed); cases that test positive and are treated; and cases that test negative and are treated.

After determining the total number of cases, to determine the specific quantities of individual products that would be needed, the quantification team can apply the same assumptions that were developed for the services-based forecast. Figure 7 depicts a sample demographic-based forecasting tree. This forecasting tree was used during the 2013 quantification exercise for the Ghana malaria programme.

**Figure 7. Sample Demographic-Based Forecasting Tree for Antimalarial Medicines**



*Estimating total fever episodes:* The quantification team can use the most recent census figures for the total population estimates and for the reported population growth rates. To estimate the percentages of children reported to have fever in the two weeks preceding the survey and who sought treatment for that fever, they can also review the most recent MICS data. By applying these percentages to the population figures from the census, the team can estimate the total number of fevers in the year for those 1–5 years of age. To determine the average number of fever episodes in those 1–5 years of age per year, this figure can then be divided by the population 1–5 years of age.

The team will apply reductions to the total estimated number of fever episodes per year, considering the effect of increasing access and prevention interventions. The same assumptions that were used in the services-based forecast can be applied to the demographic-based forecast.

*Public- and private-sector treatment:* The team can assume that the percentage of adults seeking treatment in the private sector is significantly higher than the percentage of children seeking private-sector treatment. MICS data can be used to identify the percentage of children under 5 years of age who had fever in the two weeks before the survey and sought treatment in the public sector, and the percentage that sought treatment in the private sector. The team can assume that this same percentage can be applied to all those under age 14—not just those under 5. For adults, the quantification team can assume that, for instance, 40 percent seek treatment in the public sector, and 60 percent seek treatment in the private sector.



Before applying these percentages, the team must make assumptions about the general division between adults and children, using the relevant assumptions from the services-based quantification.

*Testing malaria cases:* The current NMCP policy recommends that all suspected malaria cases should have parasitological confirmation—with RDTs or microscopy—prior to treatment; currently, the NMCP is continuing to expand access to RDTs. The quantification team can make assumptions based on the recent percentage of malaria cases that was confirmed prior to treatment—potentially using information from DHIMS—to estimate the percentage of cases to be confirmed using RDTs.

*Cases receiving treatment:* The three types of cases that would receive treatment include cases that test positive, cases that test negative, and cases that are not tested. For the cases that are not tested, the quantification team may assume that all these cases are clinically diagnosed; therefore, all cases would receive treatment. In estimating the cases that test positive, the team must develop assumptions about whether there would be an annual decrease during each year of the quantification in terms of the positivity rate. DHIMS data will provide the current average positivity rate. The team will develop assumptions about whether this can be held constant or revised for any year of the quantification. The team can probably assume that 100 percent of those who test positive will receive treatment. Additionally, due to a lack of available data, the team may need to make an assumption about the percentage of cases that test negative, but still receive treatment.

### **Seasonal Malaria Chemoprevention**

Seasonal malaria chemoprevention (SMC) is an intervention that seeks to reduce clinical episodes of malaria in children aged 3–59 months by administering full therapeutic doses of sulfadoxine-pyrimethamine (SP) plus amodiaquine 153mg during the period of highest malarial risk. The intervention is applicable in geographic areas where malaria transmission is seasonal and the period of highest risk is relatively short, 3–4 months. The antimalarial intervention is administered once a month, for a maximum of four months per year.

Ghana plans to implement SMC soon in the northern parts of the country, which covers the Upper West, Upper East, and Northern regions. To provide coverage for the target population in the selected geographic regions, it will be necessary to quantify SP plus amodiaquine 153mg. A demographic-based forecasting methodology can be used; the total population of the selected geographic region can be its starting point. Assumptions will be applied about the percentage of population that is 3–11 months of age and the percentage that is 12–59 months of age. The SMC regimens recommended in the STGs will be applied to these targeted populations.

*Forecasting for LLINs:* The LLIN forecasting process may require the use of an additional tool—NetCALC. This tool can assist in managing a comprehensive LLIN strategy by facilitating the following tasks:

- estimating the achieved LLIN coverage between household surveys, based on the last survey result and the number of bed nets distributed per year through various channels since then
- estimating the number of LLINs initially needed and as replacements to achieve and maintain established coverage targets
- projecting the capacity of various continuous distribution channels to sustain high coverage levels and, thereby, assist in decisions regarding the best overall LLI strategy.

NetCALC allows a variation in the value of the expected useful life of bed nets. Through this feature, the tool facilitates estimates of expected savings using products with improved durability.

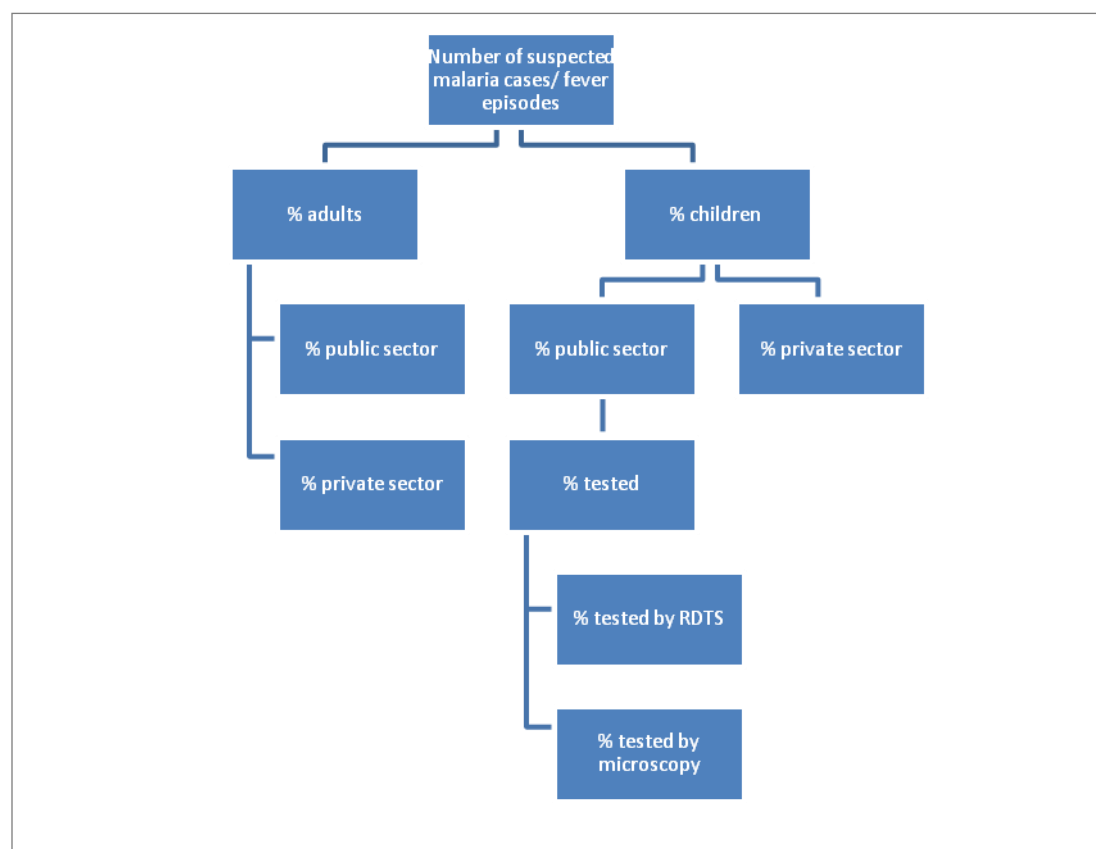
Prolonged useful life of LLINs can be achieved through behavioural change communication in terms of better care and repair.

NetCALC calculations have two major components. The first is called the bed net crop, which is the number of bed nets available in a given system, at a given time. The bed net crop is the sum of every bed net cohort of annual distributions carried forward and reduced by an annual loss rate, as defined by the loss function. The second component of NetCALC translates the net crop into a coverage rate. Assumptions are based on empirical data for how bed nets accumulate within households as their availability increases, as well as their distribution within households. This component uses these assumptions to calculate the percentage of households with at least one LLIN. After incorporating all these assumptions into the NetCALC tool, an LLIN forecast for the quantification period will then be generated.

*RDT forecast:* As with antimalarial medicines, the quantification team will develop consumption-based, services-based, and/or demographic-based forecasts for RDTs. Before a consumption-based forecast is developed, an Excel spreadsheet should be developed and provided to all RMSs before the quantification exercise—it should include a request for monthly issues data for RDTs for the last full two years and for the current year-to-date. With the issues data, the RMSs should be asked to include the total number of days out of stock, for each product, for each month. The quantification team should ask the RMSs to submit data for all RDTs that they issued out to facilities, whether the products the CMS has received the products or has procured them directly from the private sector.

The RDT demographic-based forecast can be based on the same initial numbers and assumptions used in the demographic-based forecast for medicines. The overall approach is shown in figure 8.

**Figure 8. Sample Demographic-Based Forecasting Tree for RDTs**



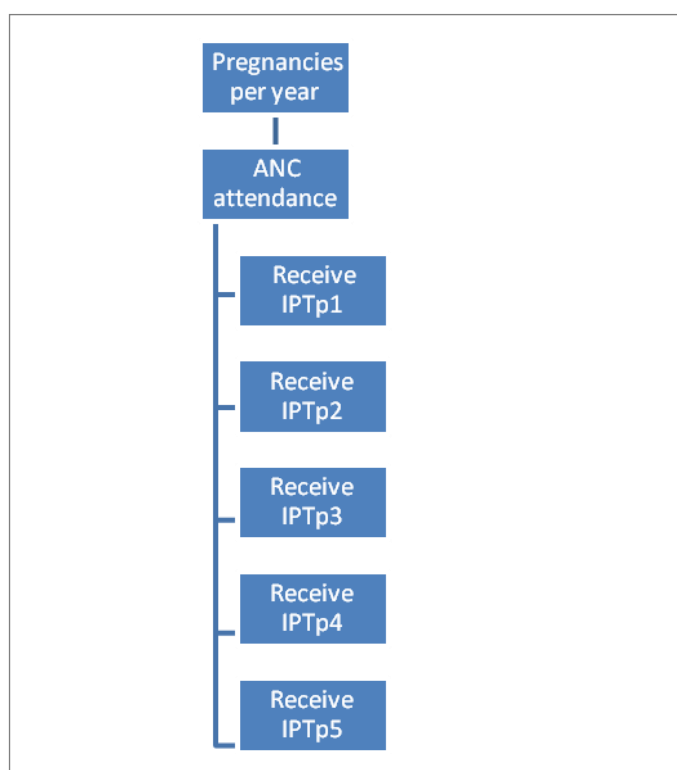
Historically, RDTs have not been consistently available for use, therefore to ensure the availability of sufficient quantities of RDTs, the quantification team may choose to be more optimistic about the percentage of cases that would be tested, compared to what was used in the demographic-based forecast.

Moreover, the NMCP's policies related to training and equipping private-sector pharmacies for the use of RDTs should be considered when making assumptions about the percentage of cases to be tested in the public- and private-sectors.

The next step will be to determine, for all the cases to be tested, what percentage would be tested with RDTs and what percentage would be tested by microscopy. To determine the percentage of cases to be tested by microscopy, the quantification team may analyse available results data from an End-Use verification (EUV) activity, which is a quarterly facility-based data collection exercise that is used to collect data on malaria case management and product availability.

Intermittent preventive treatment (of malaria) in pregnancy (*IPTp*) forecast: The NMCP is continuing to roll out and promote the use of SP for IPTp. The quantification team may only utilize a demographic forecast for SP needs, if insufficient DHIMS data is available. The overall SP forecasting approach is depicted in figure 9.

**Figure 9. Sample Demographic-Based Forecasting Tree for SP for IPTp**



The quantification team can obtain the total number of expected pregnancies per year from the MOH's prevention of mother-to-child transmission (PMTCT) scale-up plans. Also, to determine the percentage of women receiving IPTp, they can review the most recent DHS and MICS data.

## Data Sources for Building the Supply Plan

To produce the supply plan, the quantification team should obtain the following data prior to the workshop activity:

- Quantities of SOH: the quantification team will obtain data from all 10 RMSs and CMS at the end of the last month that precedes the quantification exercise. These will be added together to calculate an aggregate SOH for each commodity. If stock on hand at the facility level is available, they can also be included.
- Quantities on order: The procurement unit—GHS-SSDM or NMCP—will provide information on quantities of all products currently on order, regardless of the funding source.
- Programme minimum and maximum stock levels: The quantification team will identify the maximum and minimum inventory levels currently being used, for each product. Refer to *Section 1, Step 3: Supply Planning* for the methodology for developing new maximum and minimum levels and to confirm the appropriateness of the maximum and minimum levels now in use.

## Supply Plan Development

Using the assumptions agreed-to by workshop participants, and the methodology described in these guidelines, the forecast quantities will be calculated on the third day of the workshop using Excel spreadsheets, Quantimed, or any other appropriate software. In the final workshop activity, the supply plan will be developed using PipeLine software. The supply plan will include calculated forecast consumption; stock on hand (SOH) at the Central Medical Store (CMS) and at each RMS; quantities on order with expected shipment dates; and maximum, minimum, and desired stock levels.

## Dissemination

As stated in *Section 2: Using the Results of the Quantification*, the quantification team should ensure that the report summarizing the quantification results is prepared within six weeks after the quantification exercise. A debriefing meeting with initial results should be scheduled within two weeks of the quantification exercise. A dissemination meeting with all major organizational stakeholders should be held within six weeks of the quantification exercise. The specific timing will depend on stakeholder availability and on the completion of the summary report. Individual meetings may be required with certain stakeholders to inform them of the quantification results, if they are not able to attend the larger dissemination meetings. Major stakeholders include the NMCP; MOH; GHS; and implementing, development, and donor partners—e.g., USAID and GFATM. Please see *Section 2: Using the Results of the Quantification* for a description of the content to be included in the dissemination meetings.

During the dissemination process, partners should be consulted regarding procurement quantities, desired arrival dates, and available funding for commodities. Supply plans should then be revised, as needed, following these meetings.

## Section 5: HIV and AIDS Commodity Category

### Context

The country established the National AIDS/STI Control Programme (NACP) as the lead agency for implementing the health sector's response to HIV and AIDS. Its core mandate is to reduce the incidence of HIV among the general population, as well as to reverse the rising trend of AIDS cases.

The NACP supports antiretroviral therapy (ART) services in almost all districts, manages a PMTCT programme, has an HIV testing and counselling strategy to improve knowledge about HIV status in the public, and provides nutritional supplements to treat malnourished HIV-positive patients. They also provide other services—such as post-exposure prophylaxis (PEP), blood safety monitoring, sentinel surveillance, treatment monitoring, palliative care, and laboratory testing. This range of programmes and services offered by the NACP, as part of the national HIV response, requires a variety of commodities; including antiretrovirals (ARVs), drugs to treat opportunistic infections (OIs), HIV test kits, therapeutic foods, laboratory reagents, and non-drug consumables.

### Scope of Quantification

- *Timeframe:* National quantification of HIV commodities must be conducted annually and reviewed semi-annually. At each quantification, a three-year forecast of commodity requirements is generated, and a two-year supply plan is produced: it is updated once a quarter.
- *Sector:* The quantification team can conduct the quantification exercise for ARVs, test kits, OI medicines, and laboratory commodities primarily for the public sector and accredited private institutions.
- *HIV commodities:* Commodities to be included in the quantification are based on the standard treatment guidelines and the national essential medicines list for ARVs and OIs, as well as algorithms and testing protocols for laboratory commodities. STGs and protocols may be revised over time; therefore, recommended regimens and protocols should be verified prior to each quantification exercise. Following are examples of commodities that are currently in use and can be included in the quantification exercise. Quantification for HIV therapeutic foods is addressed in *Section 8: Nutrition Commodity Category*.

#### ARV—Adult Formulations

- abacavir 300mg
- atazanavir-ritonavir 300+100mg
- efavirenz 600mg
- nevirapine 200mg
- efavirenz+lamivudine+tenofovir 600+300+300mg
- lamivudine+zidovudine 150+300mg
- lamivudine+zidovudine+nevirapine 150+300+200mg
- lopinavir+ritonavir 200+50mg
- tenofovir disoproxil fumarate+emtricitabine 300+200mg
- tenofovir disoproxil fumarate+lamivudine 300+300mg

**ARV—Paediatric Formulations**

- abacavir syrup 240ml
- nevirapine 50mg
- nevirapine syrup 240ml
- lamivudine+zidovudine+nevirapine 30+60+50mg
- lopinavir+ritonavir 100+25 mg
- lamivudine+zidovudine 30+60mg
- zidovudine 100mg
- lamivudine syrup 240ml
- efavirenz 50mg
- abacavir+lamivudine 60+30mg.

**Test Kits**

- First Response
- OraQuick
- GenScreen.

**OI Medicines**

- cotrimoxazole 480mg
- cotrimoxazole suspension 100ml
- fluconazole 200mg.

**Laboratory Commodities**

- CD4 reagents and accessories
- hematology reagents and accessories
- chemistry reagents and accessories.

**Quantification Workshop—Participation and Schedule**

Participants for the workshop should include representatives from the NACP, including the programme manager; Stores, Supply, and Drugs Management Division of Ghana Health Service (GHS-SSDM); Ghana AIDS Commission; MOH–P&S; Office of the Chief Pharmacist; teaching hospitals; CMS; RMSs; National Public Health Reference Laboratory; clinical laboratory unit of the GHS local representatives for manufacturers/suppliers of laboratory commodities; implementing, development and donor partners (e.g., USAID, WHO); and any organization providing technical assistance in quantification, as well as clinical practitioners with experience in HIV and AIDS treatment and testing.

Depending on the scope of the quantification exercise, workshop participants can be divided into two groups. One group will agree on forecast building assumptions for medicines and test kits (e.g., ARVs, RDTs, and OI commodities), while the second group discusses forecast building

assumptions for laboratory commodities. At the close of the workshop, the participants will meet in a plenary to present and discuss results. During this period, participants will discuss and reach consensus on the following:

- patient numbers on ARVs and OI commodities
- percentage of patients on the various regimens and key assumptions
- testing menu and number of patients expected to be tested.

Following this four-day period, a smaller group of participants—including the quantification team and any organization providing technical assistance in quantification—will work for three days to calculate the forecast consumption and supply plans, based on the agreed-to assumptions.

The objectives of the quantification workshop may include the following:

- To organize and analyse data needed to prepare forecasts and supply plans for the ARVs, RDTs, OI medicines, and laboratory commodities.
- To develop, by consensus, key assumptions for building consumption-based, services-based, and demographic-based forecasts; and for building the supply plan.
- To develop commodity forecasts and two-year supply plans.

### **Data Sources for Forecast Development**

To be ready to develop forecasts during the quantification exercise, the quantification team will collect the following data, prior to the date of the quantification exercise:

- consumption-based forecast: SDP consumption data for the most-recent, full two years
- services-based forecast: service statistics data (DHIMS) on HIV and AIDS cases for the most-recent, full four years and the year-to-date data for the current year; and the number of PMTCT clients enrolled, per month, for the last three years
- demographic-based forecast: population-level data from surveys, such as DHS, MICS, HIV Sentinel Surveillance of Ghana (HSS), and the most recent Ghana National Census
- laboratory commodity data: list of laboratory tests to be included in the quantification; specific equipment (brand and model) used per test; list of all reagents (including controls and calibrators) needed per test; reagent volume needed per test; type and size of specimen containers used; HIV testing algorithms and testing protocol; and number of HIV tests done by category—PMTCT, counselling and testing (CT), blood screening, etc.—during the last two years
- regional-level SOH information, as collected through the monthly LMIS report for HIV test kits and consumable laboratory supplies.

High-quality data may not be available for some data categories listed above. In this case, staff will collect the data that is available and highlight gaps in data for the participants of the quantification exercise to consider when developing assumptions. Challenges encountered could include a lack of standardized laboratory equipment, tests, and techniques; and a lack of reliable consumption data.

Prior to the quantification exercise, the team will analyse all data for completeness and quality, noting any significant quality concerns. Team members will also develop handouts for each of the forecasting types, describing the proposed approach, data available, and assumptions required for each type of forecast. These handouts will be used throughout the assumption-building portion of the quantification workshop.

### **Key Considerations in Forecast Development for Patient Treatment and Testing**

During the first four days of the workshop, participants will discuss any significant issues with data quality and quantity as well as discussing the assumptions which would be required to develop consumption-based, services-based, and demographic-based forecasts. The participants will reach consensus on which of the three forecast types should be developed.

*Adults and children on treatment and regimen use:* The team will develop assumptions for patients eligible for treatment (adults and children), patients on current treatment (adults and children), adults on first line regimen, adults on second line regimen, children on first line regimen, and children on second line regimen. These assumptions can be based on national HIV estimates, which are obtained from the current NACP annual reports or from the National HIV/AIDS Strategic Plan (NSP).

The team can consider and develop assumptions on the expected rates of change in the use of certain ARVs, where necessary. For instance, for the Ghana 2013 HIV quantification, assumptions were made to decrease nevirapine-based regimens, while increasing efavirenz-based regimens for adult first line cases. This was due to the NACP's plans to replace adult first line nevirapine-based treatment regimens with efavirenz.

*PMTCT targets and regimens:* The quantification team will develop PMTCT target assumptions for ARVs, based on estimates from the national strategic plan (NSP). The total number of PMTCT patients expected for each year will be estimated, as well as the percentage expected to receive each of the recommended PMTCT regimens.

*Testing targets:* Assumptions will be developed for testing targets for HIV testing and counselling (HTC), PMTCT, blood donation (VNRBD), and HSS. These will be based on NSP targets and will probably include tuberculosis patients to be tested. The blood transfusion targets may be based on historical data of blood transfusion services. HSS estimates may be based on sample testing from sentinel sites, as well as on external quality assurance testing conducted during the survey.

*Testing algorithm:* The team should confirm the current testing protocol and algorithms used for screening, confirmatory, and tie-breaker testing procedures.

*Positivity and indeterminate rates:* Assumptions will be generated for the positivity and indeterminate rates for HTC, PMTCT, blood donation, and HSS testing.

*Additional use of test kits:* The quantification team will also develop assumptions for additional quantities of test kits to be required for training and quality control, and to account for wastage in the system. For example, the team can assume that an additional 10 percent may be added to the total test kit quantities for each category to address the 2 percent use for training, 7 percent use for quality control, and 1 percent for wastage. The quality control estimate may include facility-initiated and national-level testing, as directed by the External Quality Assurance (EQA) scheme. And, training estimates should include an allocation for research purposes.



*OI commodity targets:* The NSP can be used as a data source to develop assumptions on achievable numbers of adult and children to be treated during each year of the quantification period. Assumptions will be required for the percentage of clients not on treatment but who will receive OI commodities. These assumptions can be divided into adults and children.

*Health facility expectations:* The team should analyse the number of health facilities in the country providing related services and estimate the number of additional facilities, if any, that will need to provide services in order to achieve these targets and be aligned with the NSP.

### **Key Considerations in Forecast Development for Laboratory Commodities**

The quantification team must consider and make assumptions based on the types of laboratory tests conducted for HIV-positive clients at every stage of their case management, the types of instruments needed, and the specific reagents and consumables required for the specific tests to be performed for each identified testing protocol. Some of these tests currently include CD4 count, viral load, drug resistance test, full blood count, blood chemistry test, fasting lipid profile, syphilis screening for PMTCT, and hepatitis B test.

*Forecasting challenges:* Limited data may be available on the use of laboratory testing systems and on stock levels of laboratory commodities. Available data may be either incomplete or not very reliable. Without reasonably complete, reliable consumption data, either service statistics data or demographic and morbidity data can be used for forecasting laboratory commodities. Because laboratory services are not programme-specific, developing the forecasts can be challenging. If service statistics data is used, the quantification team can use the number of tests conducted during a particular past period of time to estimate future requirements.

*Forecasting using demographic and morbidity data:* The team will need to make assumptions for the percentage of patients who present themselves for testing and those who are actually tested. And, the quantification team will establish numerical assumptions for the following patient categories: PMTCT, HIV-exposed infants, HTC patients, new adults to receive ART, total adults to receive ART, new children to receive ART, total children to receive ART, total adults and children not on treatment, PMTCT mothers not on treatment, new positives, new HIV-positive infants, and total pregnant women.

*Testing schedule, menu, and platform equipment:* Based on the national standard guidelines, the quantification team will identify an HIV and AIDS testing schedule, a test menu, and test equipment per platform to use in their forecast development. Refer to *appendix H* for examples of a testing schedule, test menu, and test platform and equipment that were used in the 2013 Ghana HIV commodity quantification exercise.

*Additional assumptions:* The quantification team may need to make further assumptions in the absence of use of standardized laboratory testing techniques and test menu by all levels in the health system. For instance, in the 2013 Ghana HIV commodity quantification, due to the lack of standardization of laboratory equipment, tests, and techniques, by levels, only HIV laboratory commodities that the NACP procured and distributed was forecasted. Assumptions were, therefore, required and made on the percentage of clients that will be tested using only NACP-supplied equipment. Assumptions were also made on the percentage of this equipment that was in good condition.

### **Data Sources for Building the Supply Plan**

To develop the supply plan for HIV and AIDS commodities, the quantification team will obtain the following data prior to the workshop:

- Quantities of SOH: Staff will obtain data from all 10 RMSs and CMS as of the end of the last month preceding the quantification exercise. These will be added together to calculate an aggregate SOH for each commodity. If stocks on hand at the facility level are available, they can also be included.
- Quantities on order: The NACP and other stakeholders will provide information on quantities of all products currently on order, regardless of the funding source.
- Programme maximum and minimum stock levels: The quantification team will develop assumptions regarding the desired stock levels to be maintained nationally, in terms of months of stock (MOS). Consensus will need to be reached among major organizational stakeholders during the workshop on the desired minimum and MOS for the central, regional, and facility levels. If the maximum and minimum stock requirements are already established, the team will review and update them, as necessary. Refer to *Section 1, Step 3: Supply Planning* for the methodology for developing new maximum and minimum levels and for confirming the appropriateness of the maximum and minimum levels now in use.

## Supply Plan Development

Using the assumptions agreed-to by workshop participants during the first four days of the workshop and the methodology described in these guidelines, the forecast quantities can be calculated. MS Excel can be used for laboratory reagents; Quantimed can be used for ARVs, rapid test kits (RTKs), and OI commodities. To generate the forecast consumption, the quantification team can enter data on HIV testing targets, projected positivity rates, indeterminate rates, numbers of clients receiving treatment, and OI commodity targets into Quantimed. If Quantimed is to be used, participants may need a brief capacity-building session earlier during the workshop. Following the calculation of the forecast consumption, PipeLine software will be used to develop the supply plan. The team will input the following information into PipeLine: calculated forecast consumption; SOH at CMS and at each RMS; quantities on order with expected shipment dates; and maximum, minimum, and desired stock levels.

## Dissemination

As stated in *Section 2: Using the Results of the Quantification*, the quantification team should ensure that the report summarizing the quantification results is prepared within six weeks after completing the quantification exercise. A debriefing meeting with initial results should be scheduled within two weeks of the quantification exercise. A dissemination meeting with all major organizational stakeholders should be held within six weeks of the quantification exercise. The specific timing will depend on stakeholder availability and on the completion of the summary report. Individual meetings may be required with certain stakeholders to inform them of the quantification results if they are unable to attend the larger dissemination meetings. Major stakeholders include the National AIDS Control Programme; Ghana AIDS Commission; MOH; GHS; and implementing, development, and donor partners: e.g., USAID, GFATM, and WHO. Please reference *Section 2: Using the Results of the Quantification* for a description of the content to be included in the dissemination meetings.

During the dissemination process, partners should be consulted regarding procurement quantities, desired arrival dates, and available funding for commodities. Supply plans should then be revised, as needed, following these meetings.

## Section 6: Contraceptive and Condom Commodity Category

### Context

Recognizing the link between rapid population growth and social and economic development, the Government of Ghana continues to work to produce a positive environment in the area of family planning, in terms of policy, service delivery, and commodity availability. The *HIV and AIDS National Strategic Plan* for Ghana AIDS Commission (GAC) has targeted a 50 percent reduction in new HIV infections by 2015. Consistent condom use is considered as one of the key strategic interventions for prevention and for achieving this goal. Again, The *National Population Policy* includes a targeted contraceptive prevalence rate (CPR) for 2020 of 50 percent. *A Road Map for Repositioning Family Planning in Ghana* also calls for an increase in political commitment, public awareness, and acceptance of family planning as important to national health and socio-economic development, and funding for family planning commodities and services. While Ghana's total fertility rate has been steadily decreasing, there has not always been a corresponding increase in the CPR. Also, fertility rates vary widely by geographic region. Accelerated progress is needed to achieve the government's ambitious targets and to support Ghana's continued social and economic development.

Family planning services include methods and practices to space births, limit family size, and prevent unwanted pregnancies. Pregnancy by choice, and not by chance, is a basic requirement for women's health. family planning improves the quality of life for everyone in the family, including all adults, but particularly the children. Again, family planning services are a link to other reproductive health services, such as prevention and management of sexually transmitted infection (STI), including HIV and AIDS.

Condoms have a dual protection purpose. When consistently used, condoms provide significant protection against pregnancy, HIV, and sexually transmitted infections, better than any other preventive method. Bearing this in mind, it is important that all persons in Ghana have the right to choose, obtain, and use contraceptives for family planning and condoms for its dual purpose. Contraceptive security is achieved when every woman, man, and youth can choose, obtain, and use the contraceptives and condoms they need for family planning and prevention of sexually transmitted infections. Quantification of condoms should therefore not be limited to only family planning, but to prevention of HIV and other sexually transmitted diseases as well.

*Partnerships:* Contraceptive and condom services are provided by implementing partners (IP) in the public, social marketing, and nongovernmental organization (NGO) sector. Collaborative partners with MOH/GHS in these sectors come together for the quantification exercise and contribute to a more accurate national picture for contraceptive use and estimations. For some IPs, their direct source of commodities is the MOH/GHS. It is, therefore, important that these programmes can prepare their individual programme forecasts and supply plans, which can then feed into MOH/GHS supply planning. Therefore, during the quantification exercise, the MOH/GHS supply plan takes into consideration shipments that must be delivered to individual IPs.

### Scope of Quantification

- *Timeframe:* The quantification team is required to conduct a comprehensive annual quantification exercise for a three-year forecast period. During this process, a two-year supply plan will be developed. Staff will review and update the results of the quantification every six months and update supply plans once a quarter.

- *Sector:* Staff will conduct the quantification exercise for all family planning and condom programmes in the country—e.g., for both the private and public sectors. This includes the MOH/GHS, private sector and nongovernmental organizations (NGOs), which currently include USAID-funded social marketing organizations, Planned Parenthood Association of Ghana (PPAG), Marie Stopes International-Ghana (MSIG), Ghana Social Marketing Foundation( GSMF), and DKT International programmes.
- *Commodities:* Commodities to be included in the quantification will be based on the national family planning protocol and the NEML. Guidelines and protocols may be revised over time, therefore recommended regimens and protocols currently in use should be verified prior to each quantification exercise. Following are some examples of commodities that are currently in use and may be included in the quantification exercise:
  - combined oral contraceptive (COC) pills
  - implants
  - emergency contraceptives
  - standard days methods—cycle beads
  - male condoms
  - female condoms
  - intrauterine devices (IUDs)
  - progestin-only pills
  - injectables.

### **Quantification Workshop—Participation and Schedule**

Participants for the workshop should include representatives from the family planning programme in the Family Health Division of the Ghana Health Services(GHS-FHD); MOH–P&S; Office of the Chief Pharmacist; Ghana AIDS Commission (GAC); National Population Council (NPC); quantification team members; any organization providing technical assistance for the quantification; and implementing, development, or funding partners—current examples include UNFPA, PPAG, USAID-funded social marketing organization, MSIG, DKT International, Focus Region Health Project (FOCUS), EXP Social Marketing (ESM), and Ghana Social Marketing Foundation (GSMF).

The objectives of the quantification workshop may include the following:

- Organize and analyse data needed to prepare forecasts and supply plans for each of the family planning programmes.
- Review the previous six months’ forecasts for each of the programmes—assumptions and forecast accuracy.
- Revise and agree-to key assumptions for contraceptive quantification, for each of the family planning programmes.
- Develop forecasts and two-year supply plans.

Usually, the quantification workshop takes place during five working days. The first two days are dedicated to building forecast assumptions for each of the family planning and condom implementing programmes. All participants should be present for these first two days of the workshop when participants will discuss and reach consensus on forecast assumptions. On the third day, using the assumptions agreed-to earlier in the week, forecasts and supply plans will be developed by all implementing partners.

Forecasts and supply plans, determined by all implementing partners or programmes, are required to be completed at this time; they are fed into the national supply plan, which is developed on the fourth day. The Contraceptive Procurement Tables (CPT) report is subsequently drafted on the fifth day. Participation during the third, fourth, and fifth days is required from at least the representatives from the GHS, MOH–P&S, quantification team members, procurement and supply chain professionals, and any organization providing technical assistance for quantification. See *appendix I* for a sample workshop schedule.

## Data Sources for Forecast Development

To be prepared to develop forecasts during the quantification exercise, members of the national quantification team will collect the following data prior to the date of the quantification exercise:

- consumption-based forecast: SDP-level consumption data for the most recent full two years, monthly issues data from all 10 RMSs for the prior full two years, and the year-to-date issues data for the current year
- services-based forecast: DHIMS data for the most recent full four years and the year-to-date data for the current year
- demographic-based forecast: Population-level data from surveys, including DHS, MICS, and the most recent Ghana National Census.

High-quality data may not be available for some data categories listed above. In this case, gaps in the available data are highlighted for the participants of the quantification exercise to consider when developing assumptions.

## Key Considerations in Forecast Development

The following table lists the forecasting considerations that are often relevant for particular contraceptive methods.

**Table 4. Forecasting Considerations for Contraceptive Methods**

Method	Product Characteristics	Additional Products Required	Forecasting Considerations
Oral contraceptive	<ul style="list-style-type: none"> <li>• Either a COC (levonorgestrel+progestin) or progestin-only oral contraceptive (POP)</li> <li>• Dispensed in blister packs (called cycles) of 28–35 pills, depending on brand</li> </ul>	None	<ul style="list-style-type: none"> <li>• When forecasting for oral contraceptives, always forecast for the number of cycles, not for individual pills</li> <li>• If using services data, what are the dispensing guidelines and how closely are they followed?</li> <li>• Demographic data (and often services data) may not distinguish between</li> </ul>

Method	Product Characteristics	Additional Products Required	Forecasting Considerations
			types of pills (e.g., COC vs. POP)
Injectable	<ul style="list-style-type: none"> <li>Available in one-month, two-month, and three-month varieties (three-month injectables are the most popular)</li> </ul>	<ul style="list-style-type: none"> <li>May need to forecast and procure syringes with the correct size needles separately if not included with the ampoule or vial for injection</li> <li>Safety boxes for sharps disposal</li> </ul>	<ul style="list-style-type: none"> <li>Which injectables will be included in the forecast?</li> <li>Will the supplying organization include syringes with needles as part of the order?</li> <li>Demographic data may not distinguish between different types of injectables</li> </ul>
Male condom	<ul style="list-style-type: none"> <li>Waterproof, elastic, durable sheath with a reservoir tip; made of natural rubber latex and coated with a lubricant; one time use</li> </ul>	None	<ul style="list-style-type: none"> <li>Some programmes and donors may distinguish between condoms for family planning vs. HIV and STI prevention, although this is neither necessary nor the best practice for forecasting purposes. If forecasting for programmes separately cannot be avoided, determine if forecast is exclusively for family planning or the HIV and STI prevention programme; adjust assumptions accordingly</li> </ul>
Female condom	<ul style="list-style-type: none"> <li>Thin, soft, loose-fitting sheath made of polyurethane with flexible ring at each end; inserted at intercourse</li> </ul>	None	<ul style="list-style-type: none"> <li>Does the programme distinguish between use of the female condom for family planning vs. HIV and STI prevention?</li> <li>Female condom typically used much less than male condom</li> <li>Programmes tend to overestimate demand for female condoms</li> </ul>
Emergency contraceptive pill (ECP)	<ul style="list-style-type: none"> <li>One- or two-pill pack of high dose oral contraceptives</li> <li>Calculated by doses</li> </ul>	None	<ul style="list-style-type: none"> <li>Are ECPs targeted to specific population groups (e.g., adolescents)?</li> <li>Will all SDPs provide ECP or only some?</li> </ul>
Cycle beads	<ul style="list-style-type: none"> <li>Standard days methods color-coded beads</li> </ul>	None	<ul style="list-style-type: none"> <li>If the method is new, will providers receive any training?</li> <li>Are there particular groups (e.g., faith-based hospitals) primarily providing the method?</li> <li>Does the dispensing protocol include dispensing a backup method (e.g., condoms) for unsafe days?</li> </ul>
Hormonal implants	<ul style="list-style-type: none"> <li>Long-acting, reversible contraceptive method</li> <li>Small, thin, flexible plastic rods, about the size of a matchstick, inserted under the skin; releases a progestin hormone</li> </ul>	<ul style="list-style-type: none"> <li>Medical instruments, including – <ul style="list-style-type: none"> <li>reusable instruments (e.g., trocar with handle, scalpel handle, straight forceps, curved forceps)</li> <li>disposable instruments</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>If using demographic data, use CYP factor based on average duration of use that considers discontinuation rate</li> <li>If using services data, forecast separately for number of implant insertions and removals per year</li> <li>Include quantities of medical</li> </ul>

Method	Product Characteristics	Additional Products Required	Forecasting Considerations
	<ul style="list-style-type: none"> <li>Different types have different use life—from 3 to 5 years</li> </ul>	<ul style="list-style-type: none"> <li>if not included in kit (e.g., cup/bowl/gallipot, forceps)</li> <li>Expendable medical supplies, including—               <ul style="list-style-type: none"> <li>products for infection prevention, administering local anaesthesia, and bandaging</li> </ul> </li> </ul>	instruments and expendable medical supplies required per procedure
IUD, hormonal IUD	<ul style="list-style-type: none"> <li>Small, flexible, plastic frame inserted into woman's uterus</li> <li>Long-acting, quickly reversible contraceptive method</li> <li>Different types have different use life</li> </ul> <p>Copper bearing IUD; use life=12 years</p> <p>Hormonal IUD; use life=5 years</p>	<ul style="list-style-type: none"> <li>Medical instruments including –               <ul style="list-style-type: none"> <li>reusable instruments (e.g., speculum, straight forceps, IUD removal forceps, IUD string retriever)</li> <li>disposable instruments if not included in kit (e.g., cup/bowl/gallipot, forceps, scissors)</li> </ul> </li> <li>Expendable medical supplies, including—               <ul style="list-style-type: none"> <li>products for infection prevention, decontamination, packing instruments, and patient post-procedure use.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>If using demographic data, use CYP factor based on average duration of use that considers discontinuation rate</li> <li>If using services data, need to forecast separately for number of IUD insertions and removals per year</li> <li>Include quantities of medical instruments and expendable medical supplies required per procedure</li> </ul>

Additionally, the quantification team should assess the forecast accuracy by comparing the consumption data for the last six months to the forecasted consumption for the same period, calculating the percentage error for each commodity and each family planning programme. The acceptable industry standard is 25 percent margin of error and the results should be compared to this value. In order for key factors to be taken into account when developing the new forecast consumption, the team should discuss and understand the reasons for significant deviations, if any.

Similarly, the planned shipments for the last year should be compared to the actual shipment quantities received, reviewing dates and quantities. To enhance the quality of the new forecasts and supply plans, the team should discuss and understand the reasons for significant deviations.

### **Data Sources and Key Considerations in Consumption-Based Forecast Development**

The team can develop a forecast based on consumption and sales data for the last six months. Potential sources for consumption data include LMIS records, DHIMS, SDP-level family planning daily activity registers, family planning form B—captures aggregated consumption data from facilities that offer family planning services within the various regions—stock cards, sales and

distribution records, records of physical inventories, financial records, and supplier shipping records. These data sources provide dispensed-to-user, distribution, and/or sales data. Ideally, dispensed-to-user data is used to develop the consumption-based forecast. If this data is not available, distribution and/or sales data can be used. The table in *appendix J* lists the data sources that were used in the Ghana 2013 contraceptive quantification workshop to develop a consumption-based forecast.

### **Data Sources and Key Considerations in Services-Based Forecast Development**

Data sources can potentially include SDP-level family planning daily activity registers and DHIMS programme reports. Challenges encountered in developing a services-based forecast may include the following: low DHIMS reporting rates, lack of standardization on definitions of new visit and revisit, or inconsistent provider compliance with dispensing protocols. When facing these types of challenges, refer to *Section 1, Step 2: Forecasting* for specific techniques to use to adjust data.

### **Data Sources and Key Considerations in Demographic-Based Forecast Development**

Data sources can include the most recent Ghana National Census, MICS, and DHIMS data. This forecasting method will require the quantification team to use available demographic data to estimate the population of current users, by method (segmented further by brand and source of supply, if possible), from which to project the total number of users (new and continuing) for each year of the quantification. The total number of users is then converted into the forecasted quantity of each product that will be needed for each year of the quantification. Refer to *Section 1, Step 2: Forecasting* for the methodology to perform this conversion.

### **Data Sources for Building the Supply Plan**

To produce the supply plan for family planning commodities, the quantification team will obtain the following data prior to the workshop:

- Quantities of SOH: Team members will obtain data from all 10 RMSs and CMS, as of the end of the last month preceding the quantification exercise. These will be added together to calculate an aggregate SOH for each commodity. If SOH at the facility level are available, they can also be included.
- Quantities on order: Stakeholders will provide information on quantities of all products currently on order, regardless of the funding source.
- Programme maximum and minimum stock levels: The quantification team will develop assumptions regarding the desired stock levels to be maintained nationally, in terms of months of stock (MOS). During the workshop, the major organizational stakeholders will need to agree on the desired maximum and minimum stock levels for the central, regional, and facility levels. Inventory requirements for implementing partners will also be established. If the maximum and minimum stock requirements are already established, the team will review all of them and update, as necessary. Refer to *Section 1, Step 3: Supply Planning* for the methodology for developing new maximum and minimum levels and for confirming the appropriateness of the maximum and minimum levels now in use.

### **Supply Plan Development**

Using the assumptions agreed-to by workshop participants during the first two days of the workshop, and the methodology described in these guidelines, the forecast quantities will be calculated utilizing Excel and/or Quantimed. If Quantimed is to be used, a brief capacity-building



session may be required for participants earlier during the workshop. Following the calculation of the forecast consumption, the supply plan will be developed using the PipeLine software. The team will input the following information into PipeLine: calculated forecast consumption; SOH at the CMS and at each RMS; quantities on order with expected shipment dates; and maximum, minimum, and desired stock levels.

## **Dissemination**

As stated in *Section 2: Using the Results of the Quantification*, the quantification team should ensure that the report summarizing the quantification results is prepared within six weeks of the quantification exercise. A debriefing meeting, with initial results, should be scheduled within two weeks of the quantification exercise. A dissemination meeting with all major organizational stakeholders should be held within six weeks of completing the quantification exercise. The specific timing will depend on stakeholder availability and on the completion of the summary report. Individual meetings may be required with certain stakeholders to inform them of the quantification results if they are not able to attend the larger dissemination meetings. Major stakeholders include the MOH; GHS; and implementing, development, and funding partners—e.g., USAID, Department for International Development (DFID), and UNFPA. Please reference *Section 2: Using the Results of the Quantification* for a description of the content to be included in the dissemination meetings.

During the dissemination process, partners should be consulted regarding procurement quantities, desired arrival dates, and available funding for commodities. Supply plans should then be revised, as needed, following these meetings.

## **Section 7: Tuberculosis Commodity Category**

### **Context**

The MOH has been committed to providing anti-tuberculosis treatment to the people of Ghana through the National TB Control Programme (NTP) since 1994. TB treatment is offered in public healthcare facilities and accredited private health facilities throughout the country. In accordance with the Stop TB Strategy, efforts have been made during the last few years to increase case detection, improve the general management of TB, and reduce the emergence of drug-resistant TB. These efforts include improving access to quality-assured diagnostics and medicines, reaching out to high-risk groups, engaging all care providers, expanding community-based directly observed treatment short-course (DOTS) throughout the country, and strengthening partnerships at the community level.

Fixed-dose combination (FDC) therapy for first-line TB treatment was introduced in 2006 to reduce the pill burden for patients and to improve patients' adherence to regimens. FDC therapy also has the added advantage of promoting adherence by prescribers to standardized regimens and reducing the risk of patients receiving non-standardized regimens because of stockouts. Medicines used in the TB programme are procured to meet the quality assurance standards set by the WHO for finished pharmaceutical products. Most medicines for first line TB treatment are available as patient kits and are currently supplied through the Stop TB Partnership Global Drug Facility. Single drug formulations are also procured for patients that develop adverse reactions to standardized FDC anti-TB medicines and may require individualized regimens that exclude the offending drug.

## First Line TB Treatment Regimens

Treatment regimens for TB in Ghana are divided into four categories. Category I + III is used to treat all new adult cases, including those who are smear positive, smear negative, and those with extra pulmonary TB. Category II is the treatment for all adult retreatment cases. Paediatric TB (new case) is used to treat all children (any person below 15 years) weighing 5 to 30 kg who are newly diagnosed with TB. Paediatric TB (retreatment) is used to treat TB in children previously treated for TB. Table 5 outlines the current treatment regimen for each category. Because national and WHO standard treatment guidelines may be revised over time, the quantification team should verify the current recommended regimens, as well as those available as patient kits or otherwise, before each quantification exercise.

**Table 5. Current Treatment Regimen**

Conditions	Standard Regimen	
	Intensive Phase	Continuation Phase
Category I+III (new adults)	2(RHZE 150/75/400/275mg)	4(RH 150/75mg)
Category II (adult retreatment)	3(RHZE 150/75/400/275mg) + 2(S 1g)	5(RHE 150/75/275mg)
Paediatric TB (new case) 5-20 kg	2(RHZ 60/30/150mg) + 2RH 60/60mg+ (E 100mg)	4(RH 60/30mg) + 4(RH 60/60mg)
Paediatric TB (new case) 21-30 kg	2(RHZE 150/75/400/275mg) + RH 60/60mg)	4(RH 150/75mg) + 4(RH 60/60mg)
Paediatric TB (retreatment) 5-20 kg	3(RHZ 60/30/4150mg) + 3(RH 60/60mg) + 3(E 100mg)+ 2(S 1g)	5(RH 60/30mg) + 5(RH 60/60mg) + 5 (E 100mg)
Paediatric TB (retreatment) 21-30 kg	3(RHZE 150/75/400/275mg + 3(RH 60/60mg) + 2(S 1g)	5(RH 150/75mg) + 5(RH 60/60mg) + 5 (E 400mg)

The numbers preceding the medicines are the number of months of patient treatment.

- RHZE indicates FDC tablet containing rifampicin (R), isoniazid (H), pyrazinamide (Z), and ethambutol (E)
- RH indicates FDC tablet containing rifampicin (R) and isoniazid
- S indicates streptomycin 1g vial
- RHE indicates FDC tablet containing rifampicin (R), isoniazid (H), ethambutol (E)
- RHZ indicates FDC tablet containing rifampicin (R), isoniazid (H), pyrazinamide (Z)
- E indicates tablet containing ethambutol.

## Supply Chain for Anti-TB Medicines

The NTP currently sources anti-TB medicines through the Stop TB Partnership Global Drug Facility (GDF). After annual anti-TB drug requirements are determined, the Supplies, Stores and Drug Management Division of GHS manages the procurement process, in collaboration with GDF. The lead time for the procurement approval processes and payment for the commodities is three months. In addition, shipments typically arrive about six months after payment for the delivery, leading to a total of nine months lead time. After the medicines are imported into Ghana, they are

required to pass the FDA's quality inspection process. This can require an additional 6–12 weeks. Because the source of supply of anti-TB medicines and/or supplier lead times could change over time, this information should always be verified and updated, as necessary.

The CMS store distributes anti-TB medicines to the 10 RMSs and three teaching hospital medical stores, based on orders received. At the regional level, RMSs process orders from SDPs and provide supply to district hospitals and health facilities, including both public and accredited private facilities.

### **Scope of Quantification**

- *Timeframe:* National quantification of anti-TB commodities must be conducted annually and reviewed semi-annually. During each quantification exercise, a three-year forecast of commodity requirements is generated and a two-year supply plan is produced, which is updated once a quarter.
- *Sector:* The quantification team will conduct the quantification exercise for all public and accredited private facilities nationwide that receive products from the public sector.
- *Medicines:* Medicines to be quantified for will be based on current STGs, National TB treatment protocols, and the National Essential Medicines List. STGs and National TB treatment protocols may be revised over time; therefore, recommended regimens and protocols should be verified prior to each quantification exercise. Below are examples of anti-TB medicines that are currently in use and may be included in the quantification exercise:
  - Category I + III Kit
  - Category II Kit
  - rifampicin/isoniazid 150/75mg
  - rifampicin/isoniazid/pyrazinamide/ethambutol 150/75/400/275mg
  - ethambutol 400mg
  - pyrazinamide 400mg
  - isoniazid 300mg
  - rifampicin/isoniazid/pyrazinamide 60/30/150mg
  - rifampicin/isoniazid 60/30mg
  - rifampicin/isoniazid 60/60mg
  - ethambutol 100mg
  - isoniazid 100mg
  - streptomycin 1g
  - pyridoxine 100mg
  - pyridoxine 50mg.

### **Quantification Workshop—Participation and Schedule**

Participants for the workshop should include representatives from the National Tuberculosis Control Programme; GHS; RMS; Ministry of Health; the national quantification team; CMS; Office

of the Chief Pharmacist; National Public Health Reference Laboratory and Clinical Laboratory Unit-GHS (quantification of laboratory supplies); implementing, development, or donor partners (e.g., WHO, USAID), and any individual or organization that may be providing technical assistance for the quantification; as well as clinical practitioners experienced in TB case management.

The quantification workshop usually occurs over four working days, with the first two days dedicated to building forecasting assumptions. All participants should, therefore, be present for the first two days of the workshop, during which time they will discuss and reach consensus on forecast assumptions. During the final two days, the forecasts and supply plans will be developed, using the assumptions agreed to earlier in the week. Participation for this final period is required from at least the representatives from the GHS, MOH, and the team responsible for quantification. If an external organization is providing technical assistance for quantification, their representatives should also be present for the final period. The focus of the final two days is on calculating forecast consumption and building a supply plan. The continued presence of procurement and supply chain professionals will, therefore, be necessary.

The objectives of the quantification workshop may include the following:

- Organize and analyse data needed for preparing forecasts and supply plans for the tuberculosis programme.
- Develop, by consensus, key assumptions for building consumption-based, services-based, and demographic-based forecasts; and for building the supply plan.
- Develop commodity forecasts and two-year supply plans.

### **Data Sources for Forecast Development**

To be prepared to develop forecasts during the quantification exercise, members of the quantification team will collect the following data, prior to the date of the quantification exercise:

- consumption-based forecast: Regional Quarterly TB Medicines Reports (TB coordinators report) for the most recent two full years; SDP-level consumption data; aggregated consumption data obtained from the regional report; Requisition and Issue form (RMS reports); monthly issues data from CMS; all 10 RMSs and teaching hospital medical stores for the most recent full two years; and the year-to-date issues data for the current year
- services-based forecast: data on tuberculosis cases for the most recent four full years and the year-to-date data for the current year, obtained from the DHIMS and NTP annual reports
- demographic-based forecast: the most recent Ghana National Census data for total population estimates and population growth rates; the most current WHO Global Tuberculosis Control Report; MICS data; and DHIMS data.

High-quality data may not be available for some data categories listed in the previous section. In this case, the quantification team will collect and analyse the data that is available for completeness and quality, highlighting any gaps in data for the participants of the quantification exercise to consider when developing assumptions. Prior to the quantification exercise, team members will also develop handouts for each forecasting type, that describe the proposed approach, data available, and assumptions required for each type of forecast.

### **Key Considerations in Consumption-Based Forecast Development**

Availability of consumption data enhances the NTP's ability to accurately forecast needs and to monitor the stock status of these medicines on a long-term basis. Consumption data can be obtained from the Regional Quarterly TB Medicines Reports, which are submitted to the NTP; Regional Report, Requisition and Issue Form submitted to the CMS; and data from DHIMS. These reports capture aggregated consumption data from facilities within the various regions that offer TB treatment services.

When collecting consumption data, the quantification team should also collect issues data from the CMS, teaching hospital medical stores, and all RMSs. To aid in data collection, staff may generate an Excel template and provide it to the CMS, all RMSs, and teaching hospital medical stores in order to request the required data items for the last full two years and also for the current year-to-date. These required data items may include monthly issues data and total number of stockout days for each product, for each month. Having both historical consumption data and issues data will help the quantification team develop the forecast consumption and supply plan during the quantification exercise.

### **Key Considerations in Services-Based Forecast Development**

To monitor programme activities, service statistics data are collected by the NTP through its quarterly case notification reports, generated at SDP level. The quantification team can use this data, which is typically captured in the NTP annual report, to develop a services-based forecast. The service statistics data will enable the team to make assumptions for the number of cases to be treated, per year, during the quantification period. It will further assist the team in dividing the cases into percentages of cases per treatment category.

*Additional assumptions:* The team will need to make additional assumptions, including, but not limited to, the following:

- percentage of patients expected to require single drug formulations because of adverse drug reactions
- percentage of adult patients expected to weigh between 30–39kg, 40–54kgs, and 55kgs or more
- percentage of paediatric cases to be treated as new and retreatment cases
- percentage of paediatric new TB cases weighing between 5–20kg and 21–30kg
- percentage of paediatric retreatment TB cases weighing between 5–20kg and 21–30kg
- percentage of children who will require isoniazid preventive treatment (IPT)
- percentage of patients who will require pyridoxine
- programme plans and initiatives that may affect future case notification and treatment
- expected level of adherence to STGs.

### **Key Considerations in Demographic-Based Forecast Development**

All assumptions made while developing the services-based forecast can also be applied by the team to develop the demographic-based forecast. The difference between the two forecasts is the starting point. For the services-based forecast, the starting point is the total number of reported cases. For the demographic-based forecast, the starting point is the total population of Ghana.

In developing a morbidity- or demographic-based forecast, the quantification team can develop estimates for the number of TB cases expected to be treated during the forecast period. STGs can then be applied to these estimates to calculate the product quantities required.

Site-level service statistics can also be utilized to determine the division of cases by treatment regimen. Programme targets can be used to predict the number of cases likely to be treated during the quantification period.

## **Data Sources for Building the Supply Plan**

To produce the supply plan for anti-TB commodities, the quantification team will obtain the following data prior to the workshop:

- quantities of SOH: team members will obtain data from all 10 RMSs, teaching hospital medical stores, and CMS, as of the end of the last month preceding the quantification exercise. These will be added together to calculate an aggregate SOH for each commodity. If SOH at the facility level are available, they can also be included.
- quantities on order: stakeholders will provide information on quantities of all products currently on order, regardless of the funding source.
- programme maximum and minimum stock levels: the quantification team will develop assumptions regarding the desired stock levels to be maintained nationally, in terms of MOS.

During the workshop, consensus will need to be reached among the major organizational stakeholders on the desired minimum and maximum stock levels for the central, regional, and facility levels. If the maximum and minimum stock requirements are already established, the team will review them all and update, as necessary. Refer to *Section 1, Step 3: Supply Planning* for the methodology for developing new maximum and minimum levels and for confirming the appropriateness of the maximum and minimum levels now in use.

## **Supply Plan Development**

Utilizing the assumptions agreed-to by the workshop participants during the first two days of the workshop, and the methodology described in this manual, the forecast quantities will be calculated utilizing Excel and/or Quantimed. If Quantimed is used, a brief capacity-building session may be required for participants earlier during the workshop. Following the calculation of the forecast consumption, the supply plan will be developed with PipeLine software. The team will input the following information into PipeLine: calculated forecast consumption; SOH at CMS, and at each RMS; quantities on order with expected shipment dates; and maximum, minimum, and desired stock levels. Additionally, data on current product shipment lead times, percentage of total cost required for freight costs, and percentage product wastage will be taken into account when developing the detailed supply plan.

## **Dissemination**

As stated in *Section 2: Using the Results of the Quantification*, the quantification team should ensure that the report summarizing the quantification results is prepared within six weeks of the quantification exercise. A debriefing meeting, with initial results, should be scheduled within two weeks of the quantification exercise. A dissemination meeting with all major organizational stakeholders should be held within six weeks of the quantification exercise. The specific timing will depend on stakeholder availability and on the completion of the summary report. Individual meetings may be

required with certain stakeholders to inform them of the quantification results if they are not able to attend the larger dissemination meetings. Major stakeholders include the National Tuberculosis Control Programme; MOH; GHS; and other implementing, development, and donor partners—e.g., USAID, GFATM, and WHO. Please reference *Section 2: Using the Results of the Quantification* for a description of the content to be included in the dissemination meetings.

During the dissemination process, partners should be consulted regarding procurement quantities, desired arrival dates, and available funding for commodities. Supply plans should then be revised, as needed, following these meetings.

## **Section 8: Nutrition Commodity Category**

### **Context**

Undernutrition manifests itself in the form of stunting, wasting, underweight, and micronutrient deficiencies. In Ghana, an estimated 28 percent of children under the age of 5 are stunted; 13.9 percent underweight and 8.5 percent wasted; with 2.2 percent of the children severely wasting. Micronutrient deficiencies, particularly anaemia, is high in Ghana; it is reported at 78 percent in children under 5 years of age and 67 percent in women of fertile age (GDHS 2008). The prevalence of acute malnutrition remains high and contributes significantly to morbidity and mortality of children under 5. GHS has adopted the Community-Based Management of Acute Malnutrition (CMAM) approach to manage both severe acute (SAM) and moderate acute (MAM) malnourished children under 5. CMAM includes inpatient care (IPC) for managing SAM with medical complications, and for all infants under six months with SAM; outpatient care (OPC) for the management of SAM without medical complications; and community outreach for active case-finding and referral and follow-up of problem cases and management of MAM.

In conjunction with the CMAM approach, the Ghana MOH and GHS utilize a Nutrition Assessment, Counselling, and Support (NACS) approach to integrate nutrition into policies, programmes, and health delivery systems. The NACS approach is particularly critical in helping to address the severe impact of diseases, such as HIV and AIDS and tuberculosis, on the nutritional status of individuals, families, and communities in the country. NACS for PLHIV and TB clients can improve nutritional status, ensure adequate food intake, and enhance the quality of life. NACS interventions enable care providers to counsel clients on how to improve diet, manage symptoms, and avoid infections.

Additionally, the nutrition department of the GHS has a vitamin A programme to address vitamin A deficiency, which contributes significantly to child mortality. Vitamin A supplementation is an evidence-based, high-impact intervention that reduces child mortality and supports the attainment of Millennium Development Goal 4. The nutrition department provides vitamin A supplements to children and postpartum women.

### **Scope of Quantification**

- *Timeframe:* National quantification of nutrition commodities must be conducted annually and reviewed semi-annually. During each quantification, a three-year forecast of commodity requirements may be generated and a two-year supply plan produced and updated once a quarter.

- *Sector:* Staff will conduct the quantification exercise for all facilities nationwide that receive products from the public sector, in support of the CMAM; NACS; and vitamin A programmes. This includes commodities that are distributed in the community.
- *Commodities:* Commodities to be included in the quantification will be based on the current STGs, the national essential medicines list, guidelines on management of SAM in children under 5 and on nutritional care and support for people living with HIV and AIDS and/or TB, or other relevant national nutritional policies and guidelines. Following are some examples of commodities that are currently in use and may be included in the quantification exercise:

### **CMAM Programme**

- ReSoMal, 42g sachet/1L/CAR-100
- F75 therapeutic diet, sachet 102.5g/CAR-120
- F100 therapeutic diet, sachet 114g/CAR-90
- Ready-to-use therapeutic food (RUTF), sachet 92g/CAR-150
- Combined mineral vitamin mix as an adjunct to locally prepared ReSoMal, F75 and F100.

### **NACS Programme**

- RUTF, sachet 92g/CAR-150
- Fortified blended flour.

### **Vitamin A Programme**

- Vitamin A 100,000 IU
- Vitamin A 200,000 IU.

## **Workshop for Nutrition Health Category Quantification—Participation and Schedule**

Workshop participants should include representatives from the MOH: Procurement Unit, GHS: Family Health Division-Reproductive & Child Health and Nutrition; Regional Nutrition Officers; RMS; partners; teaching hospitals; Christian Health Association of Ghana (CHAG); Institutional Care Division (ICD); as well as any organization providing technical assistance for the quantification; and clinical practitioners experienced in nutritional status assessment and management.

The objectives of the quantification workshop may include the following:

- Organize and analyse data needed for preparing forecasts and supply plans for the commodities for the CMAM, NACS, and vitamin A programmes.
- Develop, by consensus, key assumptions for building consumption-based, services-based, and demographic-based forecasts; and for building the supply plan.
- Develop three-year commodity forecasts and two-year supply plans.



## **Data Sources for Nutrition Health Category Forecast Development**

Quantification team members will collect the following data prior to the date of the quantification exercise:

- consumption-based CMAM forecast: service delivery point (SDP) level consumption data from the LMIS for the most recent two full years prior to the quantification; regional quarterly reporting forms—from the Nutrition Department and/or Family Health Division of the GHS; and monthly issues data from CMS and all 10 RMSs for the most recent two full years prior to the quantification and the year-to-date issues data for the current year
- consumption-based NACS forecast: SDP-level consumption data for the most recent two full years; Specialized Food Products Monthly Consumption Reports (MCR) for the most recent two full years; monthly issues data from CMS and all 10 RMSs for the most recent two full years and the year-to-date issues data for the current year
- consumption-based vitamin A forecast: SDP-level consumption data for the most recent two full years; monthly issues data from CMS and all 10 RMSs for the most recent two full years and the year-to-date issues data for the current year
- services-based CMAM and NACS forecast: data on SAM and MAM cases for the most recent four full years prior to the quantification and the year-to-date data for the current year, obtained from DHIMS data, CMAM annual reports, and the NACS annual reports
- demographic-based forecast: the most recent Ghana National Census data for total population estimates and population growth rates; MICS data; Ghana Demographic and Health Survey (GDHS); CMAM Annual Reports; and DHIMS and nutrition surveillance data.

High-quality data may not be available for some data categories listed. In this case, the quantification team will collect and analyse the data that is available for completeness and quality, highlighting any gaps in data for the participants of the quantification exercise to consider when developing assumptions. Prior to the quantification exercise, team members will also develop handouts for each forecasting type, describing the proposed approach, data available, and assumptions required for each type of forecast.

### **Key Considerations in Consumption-Based Forecast Development**

SDP-level consumption data should be available from the LMIS and/or from the regional quarterly reporting forms. Issues data collected from the CMS and RMSs will help the quantification team to confirm the integrity of SDP-level consumption data, and the issues data can be used as a proxy for the SDP-level consumption data, if required, due to significant data quality issues. Also, for the NACS programme, SDP-level commodity managers should complete the Specialized Food Products Monthly Consumption Report and submit it once a month to the RMSs. If all facilities consistently follow this reporting process, data should be available for preparing the NACS consumption-based forecast.

### **Key Considerations in Services-Based Forecast Development**

Patient caseload data, divided by age and nutritional status, including estimates of commodity quantities being provided to patients, will support the development of a services-based forecast. Data sources include DHIMS data, CMAM annual reports, and NACS annual reports. Services-based forecasting would not be used for the vitamin A programme because the vitamin A

programme is a vitamin supplementation programme, not a programme that focuses on the treatment of a particular health condition.

### **Key Considerations in Demographic-Based Forecast Development**

Using the listed data sources, quantification team members will be able to collect data on the prevalence of SAM and MAM among the population of children under-5 years—currently estimated to be 13.3 percent of total population—in the target districts. Using this data, team members may estimate caseloads of SAM and MAM patients. During the quantification exercise, the team can then determine the quantities of commodities needed by applying standard treatment protocols, while also estimating a buffer commodity quantity; the team may develop their own spreadsheet for forecasting or can use the UNICEF Excel template. Assumptions to be agreed-to during the quantification exercise include the number of additional districts, if any, in which the programme will be scaled up to during the quantification period.

To support of the vitamin A programme, the quantification team members will also be able to use the listed data sources to estimate the numbers of children aged 6–11 months and 12–59 months, as well as estimate the number of postpartum women, including the number of women giving birth in facilities. The demographic-based forecasting methodology will use the vitamin A programme's coverage targets, including child welfare clinics, national immunization campaigns, and postpartum women; the dosages of vitamin A will be in accordance with the STGs. The quantification team can develop their own spreadsheet for forecasting or use the UNICEF Excel template.

### **Data Sources for Building the Supply Plan for the Nutrition Health Category Programme**

To produce the supply plan for the nutrition-related commodities, the quantification team will obtain the following data prior to the workshop:

- Quantities of SOH: The quantification team will obtain data from all 10 RMSs and the CMS, as of the end of the last month preceding the quantification exercise. These will be totalled to calculate an aggregate SOH for each commodity. If stock on hand at the facility level are available, they can also be included.
- Quantities on order: Stakeholders will provide information on quantities of all products currently on order, regardless of the funding source.
- Programme maximum and minimum stock levels: The quantification team will develop assumptions about the desired stock levels to be maintained nationally, in terms of MOS. Consensus will need to be reached among major organizational stakeholders during the workshop on the desired maximum and minimum stock levels for the central, regional, and facility levels. If the maximum and minimum stock requirements are already established, the team will review them and update, as necessary. Refer to *Section 1, Step 3: Supply Planning* for the methodology for developing new maximum and minimum levels and for confirming the appropriateness of the maximum and minimum levels now in use.

### **Supply Plan Development for the Nutrition Health Category Programmes**

Utilizing the assumptions agreed-to by the workshop participants during the first two days of the workshop, and the methodology described in these guidelines, the forecast quantities will be calculated utilizing Excel and/or Quantimed. If Quantimed is used, a brief capacity-building session may be required for participants earlier during the workshop. Following the calculation of the

forecast consumption, the supply plan will be developed using PipeLine software. The team will input the following information into PipeLine: calculated forecast consumption; SOH at CMS and at each RMS; quantities on order with expected shipment dates; and maximum, minimum, and desired stock levels. Additionally, data on current product shipment lead times, percentage of total cost required for freight costs, and percentage product wastage will be taken into account in developing the detailed supply plan.

## **Dissemination**

As stated in *Section 2: Using the Results of the Quantification*, the quantification team should ensure that the report summarizing the quantification results is prepared within six weeks of the quantification exercise. A debriefing meeting with initial results should be scheduled within two weeks of the quantification exercise. A dissemination meeting with all major organizational stakeholders should be held within six weeks of the quantification exercise. The specific timing will depend on stakeholder availability and on the completion of the summary report. Individual meetings may be required with certain stakeholders to inform them of the quantification results if they are not able to attend the larger dissemination meetings. Major stakeholders include the MOH, GHS, and implementing, development and donor partners (e.g., UNICEF and USAID). Please reference *Section 2: Using the Results of the Quantification* for a description of the content to be included in the dissemination meetings.

During the dissemination process, partners should be consulted regarding procurement quantities, desired arrival dates, and available funding for commodities. Supply plans should then be revised, as needed, following these meetings.

## **Section 9: Immunization Commodity Category**

### **Context**

The Expanded Programme on Immunization (EPI) of the Ghana Health Service is responsible for providing immunization services in Ghana, especially for children and pregnant women. The programme is under the Disease Control and Prevention Department of the Public Health Division of the Ghana Health Service.

The mission of EPI is to promote and provide comprehensive immunization services, to reduce morbidity and mortality from vaccine-preventable diseases; and, in doing so, contribute to the overall health systems strengthening and poverty reduction strategy of the government of Ghana. Its vision is to protect every child in Ghana against vaccine preventable childhood diseases and, also, to provide protection for the affected population during an outbreak of a vaccine-preventable epidemic.

The EPI currently vaccinates children against 12 vaccine preventable diseases: tuberculosis, polio, diphtheria, pertussis, tetanus, diseases due to hemophilus influenza type B; hepatitis B; measles; and yellow fever, pneumonia, and diarrhoea from rotavirus and rubella. The programme also vaccinates pregnant women against tetanus. New vaccines will be introduced into the programme as and when they become available; and when the diseases assume public health importance, based on available national demographic data.

## Scope of Quantification

- *Timeframe:* National quantification of EPI commodities must be conducted annually and reviewed semi-annually. During each quantification, a four-year forecast of commodity requirements that align with the comprehensive multi-year plan (CMYP) may be generated and a two-year supply plan produced and updated once a quarter.
- *Sector:* The quantification team will conduct the quantification exercise for all facilities nationwide that immunize children and pregnant women against vaccine-preventable diseases, and will immunize the entire population during outbreaks. This includes commodities that are distributed in the community during mass immunization campaigns—e.g., National Immunization Days (NIDs) for polio and Supplementary Immunization Activities (SIAs).
- *Commodities:* Commodities to be included in the quantification will be based on the current Standard Treatment Guidelines, the National Essential Medicines List, National EPI policy, EPI field guides, or other relevant national EPI policies and guidelines. Considerations may be given to non-drug consumables that accompany the vaccines. Following are some examples of commodities that are currently in use and may be included in the quantification exercise:
  - oral polio vaccine
  - bacillus Calmette-Guérin (BCG) vaccine
  - measles vaccine
  - yellow fever vaccine
  - diphtheria pertussis tetanus (DPT)+hemophilus influenza type B+ hepatitis B (pentavalent vaccine)
  - pneumococcal conjugate vaccine (PCV 13)
  - rotavirus vaccine
  - rubella+measles vaccine (MR)
  - human papillomavirus vaccine (HPV)
  - tetanus+diphtheria for pregnant women vaccine (TD)
  - meningococcal vaccine (e.g., W-135, MenAfriVac)
  - BCG syringes+needles (0.05ml)
  - auto disable syringe (AD) syringes+needles (0.5ml)
  - syringes and needles for reconstitution (2ml, 5ml)
  - safety boxes (5 Lts).

## Workshop for EPI Quantification—Participation and Schedule

Participants for the workshop should include representatives from the Ministry of Health procurement unit, GHS-SSDM, EPI programme, regional EPI coordinators, cold chain managers, deputy director public health, implementing or development partners (e.g., WHO and UNICEF), any organization providing technical assistance for the quantification, as well as clinical practitioners.

The quantification workshop usually occurs during three working days, with the first two days dedicated to building forecasting assumptions.

The objectives of the quantification workshop may include the following:

- Organize and analyse data needed for preparing forecasts and supply plans for EPI commodities.
- Develop, by consensus, key assumptions for building consumption-based, services-based, and demographic-based forecasts and for building the supply plan.
- Develop four-year commodity forecasts and two-year supply plans.

### **Data Sources for Forecast Development**

To be prepared to develop forecasts during the quantification exercise, the quantification team will collect the following data, prior to the date of the quantification exercise:

- consumption-based forecast: SDP-level consumption data from the DHIMS or the district vaccine data management tool (DVD-MT) for the most recent two full years; and monthly issues data from the national and regional cold rooms for the most recent two full years; and the year-to-date issues data for the current year
- services-based forecast: data on EPI services for the most recent four full years, and the year-to-date data for the current year, obtained from DHIMS and EPI annual reports
- demographic-based forecast: the most recent Ghana National Census data for total population estimates and population growth rates; MICS data; GDHS; and DHIMS data.

High-quality data may not be available for some data categories listed. In this case, the quantification team will collect and analyse the data that is available for completeness and quality—highlighting any gaps in data for the participants of the quantification exercise to consider when developing assumptions. Prior to the quantification exercise, the quantification team will also develop handouts for each forecasting type, describing the proposed approach, data available, and assumptions required for each type of forecast.

### **Key Considerations in Consumption-Based Forecast Development**

SDP-level consumption data should be available from the DHIMS, monthly immunization reporting form, or the district vaccine data management tool (DVD-MT). Issues data collected from the national, regional, and district cold rooms will help the quantification team confirm the integrity of SDP-level consumption data; the issues data can be used as a proxy for the SDP-level consumption data, if required because of significant data-quality issues. The wastage rate for various vaccines should be considered.

### **Key Considerations in Services-Based Forecast Development**

Service statistics data for EPI services can be obtained from DHIMS; and districts, regional, and national EPI annual reports. The quantification team can use this data in developing a services-based forecast. The service statistics data will enable the team to make assumptions for the number of immunizations to be provided, per year, during the quantification period, for the various vaccines being quantified. Planned routine and mass immunizations should be considered when developing a forecast.

## **Key Considerations in Demographic-Based Forecast Development**

For the demographic-based forecast, the starting point is the total population of Ghana. In developing a morbidity- or demographic-based forecast, the quantification team can develop estimates for the number of vaccinations expected to be provided—routinely and through mass immunizations—during the forecast period. To calculate the product quantities required, STGs and/or national immunization schedules for each vaccine can then be applied to these estimates. Site-level service statistics and programme targets can also be used in predicting the number of vaccinations likely to be provided during the quantification period.

The quantification team can use the UNICEF vaccines and immunizations logistics forecasting tool to develop the forecasts. This tool assists in managing the process to forecast vaccine requirements, safe injections equipment, and cold chain and ambient storage capacities.

## **Data Sources for Building the Supply Plan**

To produce the supply plan for EPI commodities, the quantification team will obtain the following data prior to the workshop:

- Quantities of SOH: Team members will obtain data from the national and regional cold rooms, as of the end of the last month preceding the quantification exercise. These will be added together to calculate an aggregate SOH for each commodity. If SOH at the facility level are available, they can also be taken into account.
- Quantities on order: Stakeholders will provide information on quantities of all vaccines currently on order, regardless of the funding source.
- Programme minimum and maximum stock levels: The quantification team will develop assumptions regarding the desired stock levels to be maintained nationally, in terms of MOS. During the workshop, consensus will need to be reached among major organizational stakeholders on the desired minimum and maximum stock levels for the central, regional, and facility levels. If the maximum and minimum stock requirements are already established, the team will review them and update, as necessary. Refer to *Section 1, Step 3: Supply Planning* for the methodology for developing new maximum and minimum levels and for confirming the appropriateness of the maximum and minimum levels now in use.
- Information on current cold chain storage capacity, The Updated Cold Chain Inventory

## **Supply Plan Development**

Utilizing the assumptions agreed-to by workshop participants during the first two days of the workshop, and the methodology described in these guidelines, the forecast quantities will be estimated by utilizing a self-developed Excel spreadsheet, the UNICEF Excel forecasting tool, and/or Quantimed. If Quantimed is used, a brief capacity-building session may be required for participants earlier during the workshop. Following the calculation of the forecast consumption, the supply plan will be developed using PipeLine software. The team will input the following information into PipeLine: calculated forecast consumption; SOH at the central- and regional-levels; quantities on order with expected shipment dates; and maximum, minimum, and desired stock levels. Additionally, data on current product shipment lead times, percentage of total cost required for freight costs, and percentage product wastage will be taken into account in developing the detailed supply plan.

## Dissemination

As stated in *Section 2: Using the Results of the Quantification*, the quantification team should ensure that the report summarizing the quantification results is prepared within six weeks of the quantification exercise. A debriefing meeting with initial results should be scheduled within two weeks of the quantification exercise. A dissemination meeting with all major organizational stakeholders should be held within six weeks of the quantification exercise. The specific timing will depend on stakeholder availability and the completion of the summary report. Individual meetings may be required with certain stakeholders to inform them of the quantification results, if they are not able to attend the larger dissemination meetings. Major stakeholders include the EPI programme; MOH; GHS; and implementing, development and donor partners (e.g., UNICEF and WHO). Please reference *Section 2: Using the Results of the Quantification*, for a description of the content to be included in the dissemination meetings.

During the dissemination process, partners should be consulted regarding procurement quantities, desired arrival dates, and available funding for commodities. Supply plans should then be revised, as needed, following these meetings.





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## Appendix A

# Alternative Approach to Adjusting Data for Forecasting Purposes

The following table provides alternative formulas for adjusting consumption data as needed for stockouts, seasonality, and other factors affecting commodity requirements. The sources for these formulas are MSH's *Managing Drug Supply* and the *Manual for Quantification of Malaria Commodities* (2011).

Formulas for Consumption-Based Calculations		
Formula Number	Objective of Formula	Equations
1	Option 1: Adjusted average monthly consumption	$C_A = C_T / [R_M - (D_{OS}/30.5)]$
2	Option 2: Adjusted average monthly consumption	$C_A = C_T / (R_M - M_{OS})$
3	Projected average monthly consumption (use with options 1 and 2)	$C_P = C_A + (C_A \times A_U)$
4	Option 3: Adjusted consumption in a review period	$C_R = [(R_P + T_{OS}) \times C_T] / R_P$
5	Projected consumption in a review period (use with option 3)	$C_r = C_R + (C_R \times A_U)$
6	Projected consumption in a review period (use with options 1 and 2)	$C_r = C_P \times R_P$

CA = Average monthly consumption, adjusted for stockouts

CT = Total consumption during review period in basic units

RM = Review period in months

DOS = Number of days an item was out of stock during the review period

MOS = Estimated number of months an item was out of stock during the review period

CP = Projected average monthly consumption

AU = Use adjustment

CR = Adjusted consumption in a review period (monthly, quarterly, annually)

Cr = Projected consumption in a review period

RP = Review period (monthly, quarterly, annually)

TOS = Time out of stock (if the review period is in days, use days out of stock; if in months, use months out of stock)

Note: RP and TOS should be expressed in the same units. If RP is given in months, TOS should be in months also.

## Appendix B

# Software Programmes for Quantification of Health Commodities

Different software tools facilitate the completion of the forecasting step: collection, organization, and analysis of the forecasting data and assumptions and using data to calculate the quantity of each product needed. These tools include Quantimed, Clinton HIV and AIDS Initiative (CHAI)-developed tools, and Excel spreadsheets. The PipeLine software is used for calculating consumption-based forecasts. Regardless of the forecast method used, PipeLine is also used for the supply planning step: aggregating the total commodity requirements and costs, determining funding needs and gaps, and planning timing of procurements and shipment delivery schedules.

### Forecasting Tools

The following software tools are examples of tools that can be used to assist in completing the forecasting step of the quantification. Additional tools, specific to particular commodity categories, may also be available.

#### Quantimed

Quantimed is a tool developed by Management Sciences for Health. Quantimed calculates the forecast quantities and costs of medicines and medical supplies needed to provide services for health programmes. Quantimed offers three methods for forecasting medicines and medical supplies: consumption, proxy consumption, and morbidity. Quantimed can be used to forecast needs for a single health facility, a national programme, or a group of geographic or administrative areas; and for a variety of medicines or medical supplies, including antiretrovirals and drugs to treat opportunistic and sexually transmitted infections, malaria (bed nets and drugs), and tuberculosis drugs. Quantimed can be obtained by emailing [quantimed@msh.org](mailto:quantimed@msh.org).

#### CHAI Forecasting Tools (adult and paediatric ARVs and lab supplies)

The Clinton Foundation's HIV and AIDS Initiative has developed Excel spreadsheets for forecasting adult and paediatric ARVs and for laboratory commodities. These spreadsheets utilize services data and demographic data for ARVs, and demographic data for laboratory supplies. Access to these tools can be obtained by emailing [procurement@clintonfoundation.org](mailto:procurement@clintonfoundation.org).

## NetCALC 2.0

NetCALC is a user-friendly tool that supports management of a comprehensive insecticide-treated net (ITN) strategy and assists in forecasting long-lasting insecticide-treated bed net (LLIN) requirements. The tool estimates the achieved levels of LLIN coverage; quantity of LLINs needed initially and as replacements, in order to achieve and maintain coverage targets; and projects the distribution capacity required in order to sustain target coverage levels.

## UNICEF CMAM Forecasting Tool

This tool, in the form of a Microsoft Excel workbook, uses a demographic-based approach and service statistics to forecast CMAM commodity supply requirements. The tool can be accessed at *UNICEF – Global Nutrition Cluster – CMAM and Selective Feeding Programmes* ([http://www.unicef.org/nutritioncluster/index\\_cmam.html](http://www.unicef.org/nutritioncluster/index_cmam.html)).

## Excel Spreadsheets for Forecasting

Forecasts can be conducted using Excel spreadsheets. Spreadsheets will vary from user to user, but they can be formatted to follow the steps in quantification outlined in this guide.

## Supply Planning and Pipeline Monitoring Tools

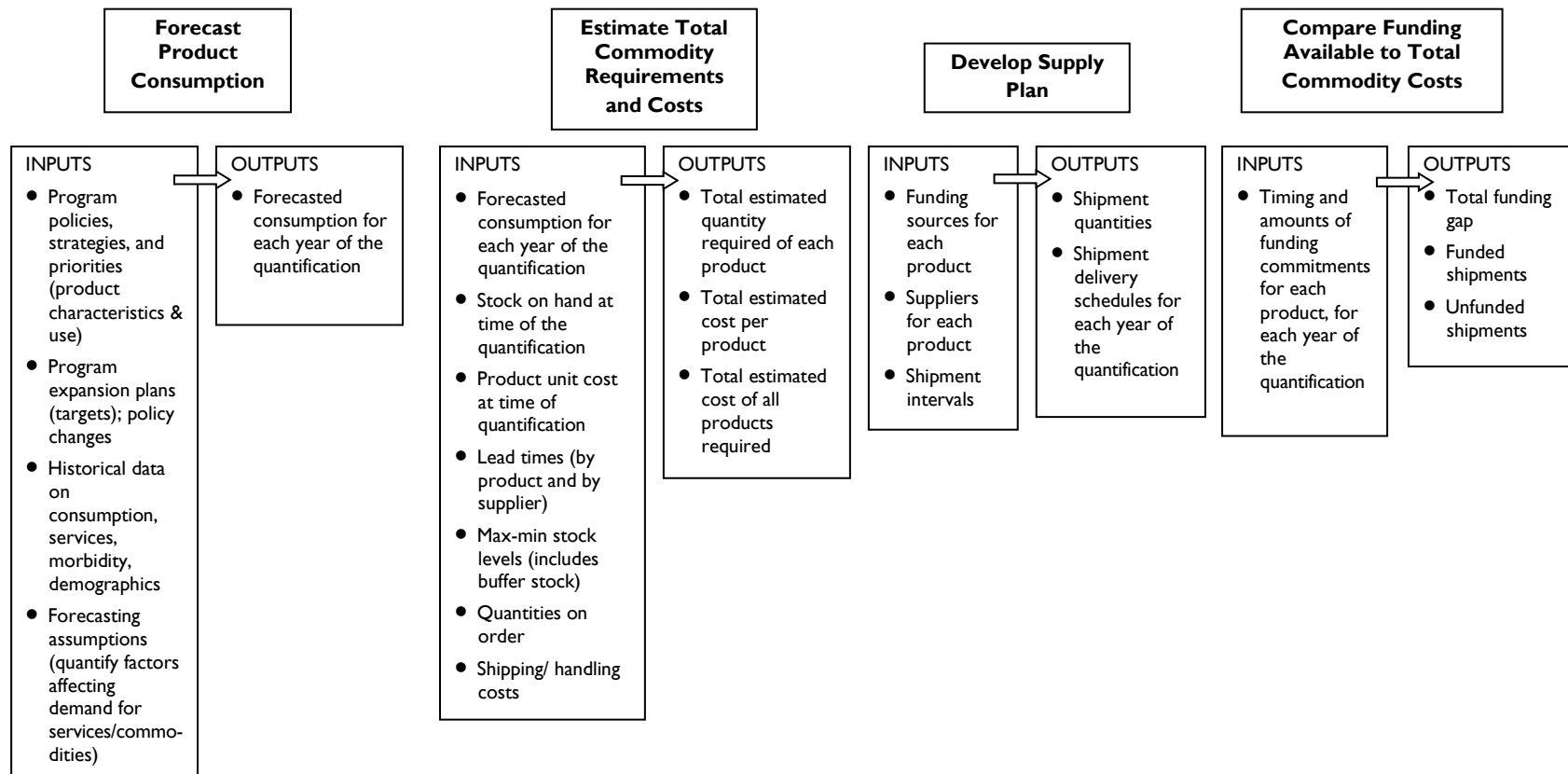
### PipeLine software

The PipeLine software for pipeline monitoring and procurement planning helps programme managers enter and track critical forecasting data, ensure timely procurement and delivery of products, and maintain stock levels between established maximum and minimum levels at the programme or national level to prevent stockouts and overstocking. PipeLine is a central-level tool that helps users plan optimal procurement and delivery schedules for health commodities and monitor the status of shipments. Policymakers, product suppliers, and donors can generate reports, monitor the status of shipments, and use the software as a key tool in programme planning. PipeLine can be used for any type of health commodity.

The PipeLine software and user's manual can be accessed through the USAID | DELIVER PROJECT's website at [www.deliver.jsi.com](http://www.deliver.jsi.com).

## Appendix C

# Flow of Data in Quantification







## Appendix D

# Instructions for Exporting Monthly Forecast Data from Quantimed into an xml File (for Subsequent Import into PipeLine)

Check to see if version has two buttons on the right-hand side above the script “Export Monthly Totals to Excel File,” as in figure D1.

**Figure D1**

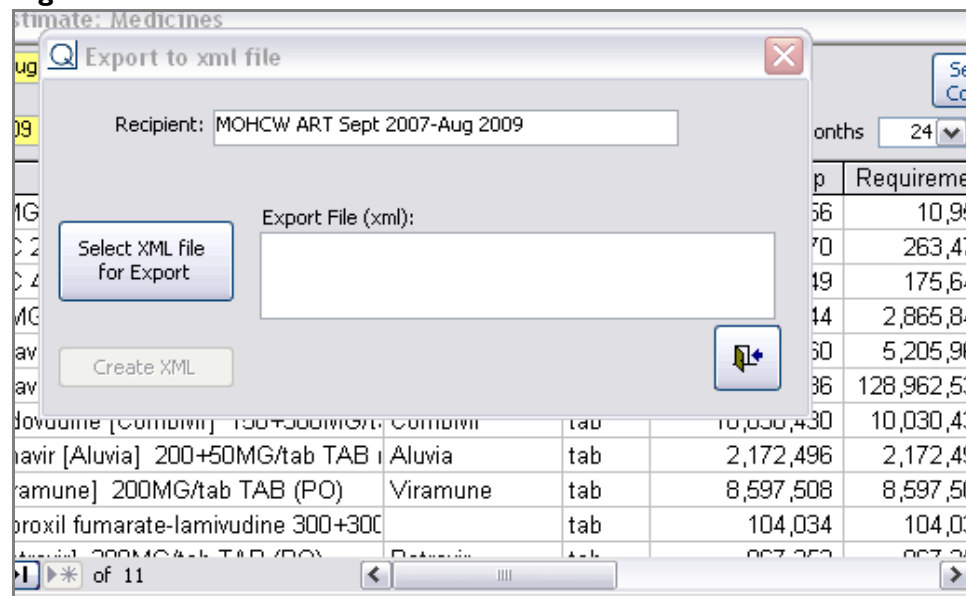
The screenshot shows the Quantimed software interface. At the top, there are dropdown menus for 'Price Type' (SCMS), 'PP Date' (9/1/2007), and 'Months' (24). Below these is a table with columns: Product, Added Name, Units, Qty Scaling-Up, and Requirement. The table lists several products including Abacavir, Didanosine, Efavirenz, Lamivudine-Stavudine, and Lopinavir-Ritonavir. To the right of the table are two buttons: 'Calculate Best Estimate of Requirement' and 'Export Monthly Totals to Excel File'. Below the table, there is a 'Currency' dropdown (US) and a 'Total Requirement Cost' field showing 28,032,133.28.

Product	Added Name	Units	Qty Scaling-Up	Requirement
Abacavir 300MG/tab TAB (PO)		tab	10,956	10,956
Didanosine EC 250MG/cap CBLIS (PO)		cap	263,470	263,470
Didanosine EC 400MG/cap CAP (PO)		cap	175,649	175,649
Efavirenz 600MG/tab TAB (PO)		tab	2,865,844	2,865,844
Lamivudine-Stavudine 150+30MG/tab TAB (PO)		tab	5,205,960	5,205,960
Lamivudine-Stavudine-Nevirapine 150+30+200MG/tab TAB (PO)		tab	128,962,536	128,962,536
Lamivudine-Zidovudine [Combivir] 150+300MG/tab TAB (PO)	Combivir	tab	10,030,430	10,030,430
Lopinavir-Ritonavir [Aluvia] 200+50MG/tab TAB (PO)	Aluvia	tab	2,172,496	2,172,496
Nevirapine [Viramune] 200MG/tab TAB (PO)	Viramune	tab	8,597,508	8,597,508
Tenofovir disoproxil fumarate-lamivudine 300+300MG/tab TAB (PO)		tab	104,034	104,034
Zidovudine [Retrovir] 200MG/tab TAB (PO)	Retrovir	tab	867,252	867,252

Make sure that the quantities displayed in the “Analysis and Reports>Scaling-up Morbidity-Based Estimate: Medicines” screen meets your required parameters for the Price Type, PP Date, and Months; and include all the Condition/Care Provided you want included in the calculation.

Click on the button marked “xml,” and the screen “Export to xml file” will appear (figure D2).

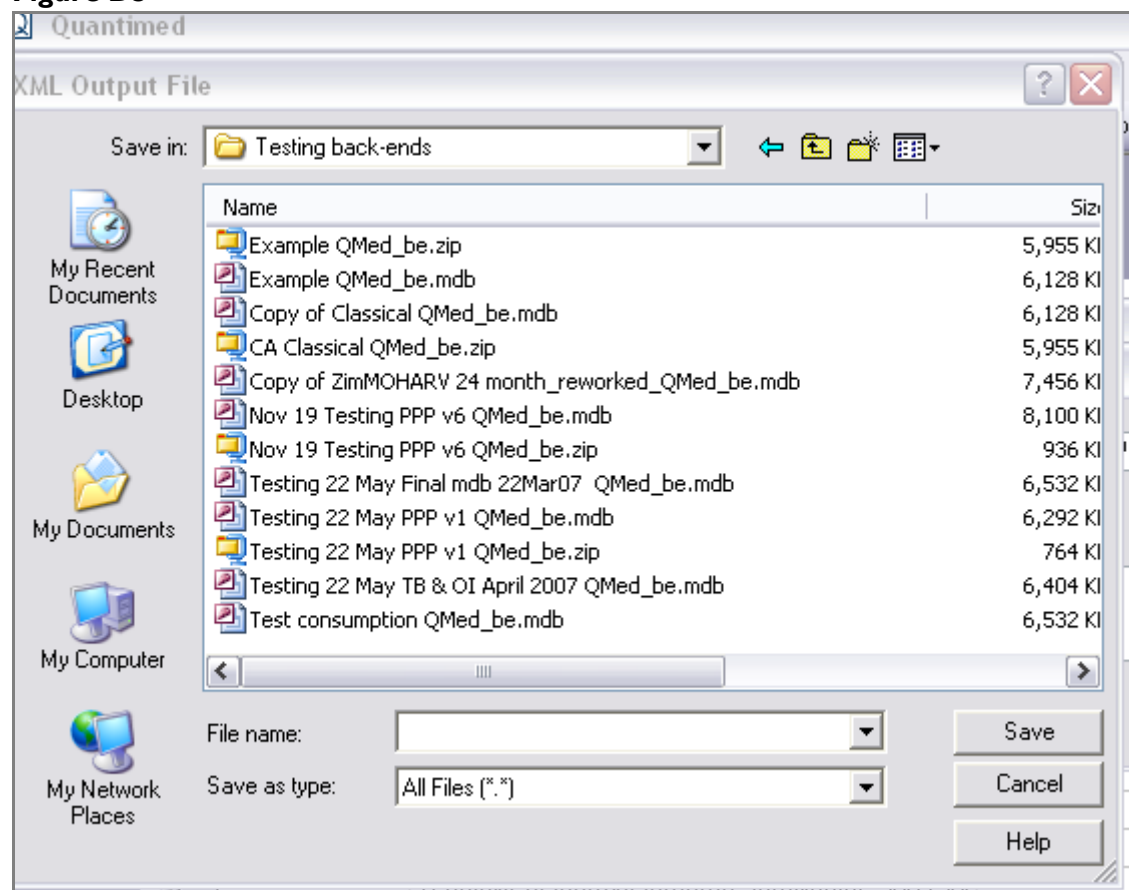
**Figure D2**



Note: The field “Recipient” should be displayed with the name of the active dataset.

Click the button “Select XML file for Export”; the box in figure D3 appears.

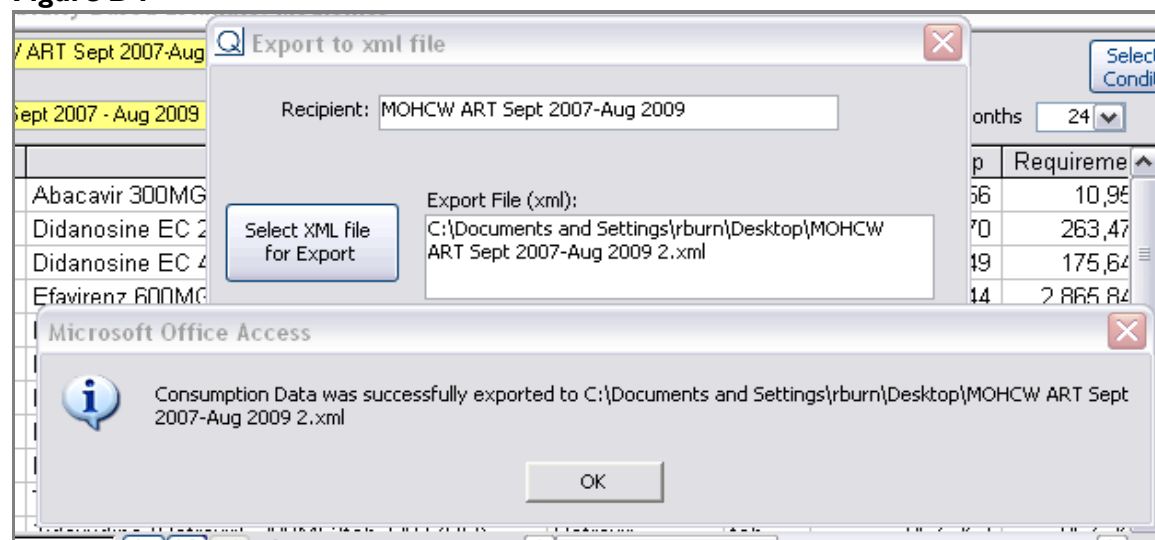
**Figure D3**



Select the folder to save the xml file in (could be the relevant folder under PipeLine) in the “Save in:” field; type a filename in the “File name” field; click “Save.” The default filename is the name of the dataset. Remember where this is saved so that when importing into PipeLine it can be found easily.

The full path and name for the xml file will appear in the previous screen (figure D2) and the button “Create XML” is now active. Click on this button. A confirmation screen (figure D4) will appear.

**Figure D4**



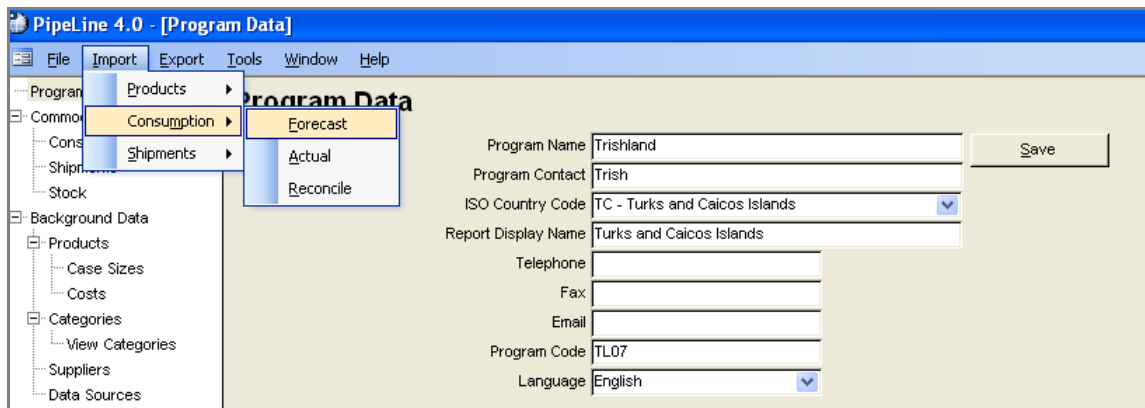
Click “OK”; you are returned to the “Analysis and Reports>Scaling-up Morbidity-Based Estimate: Medicines” screen and the xml file should be saved in the chosen location.

## Import Forecast Consumption Data from Quantimed into PipeLine 4.0

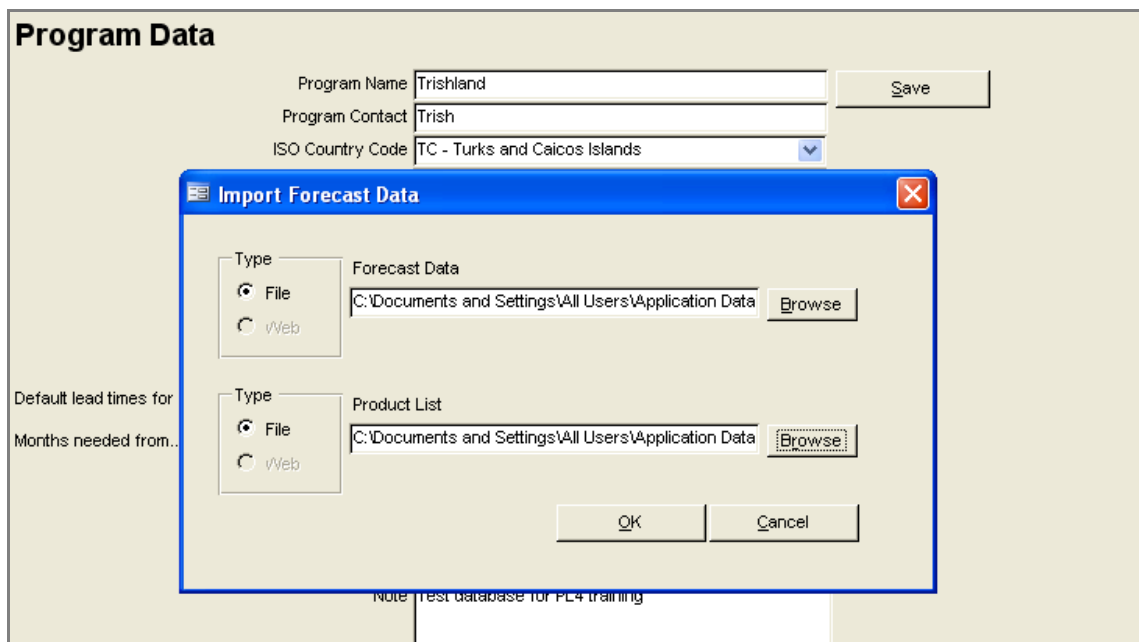
Generic instructions for importing forecast data can be found on pages A-2 through A-14 of the PipeLine 4.0 user’s manual.

To import consumption data from Quantimed, you will need to have two types of files for export. One will be the consumption data (actual or forecast) generated from Quantimed; the other will be a list of products (obtainable from the Supply Chain Management System project). Both these files should be generated in XML format; that is, they will have an extension “.xml.”

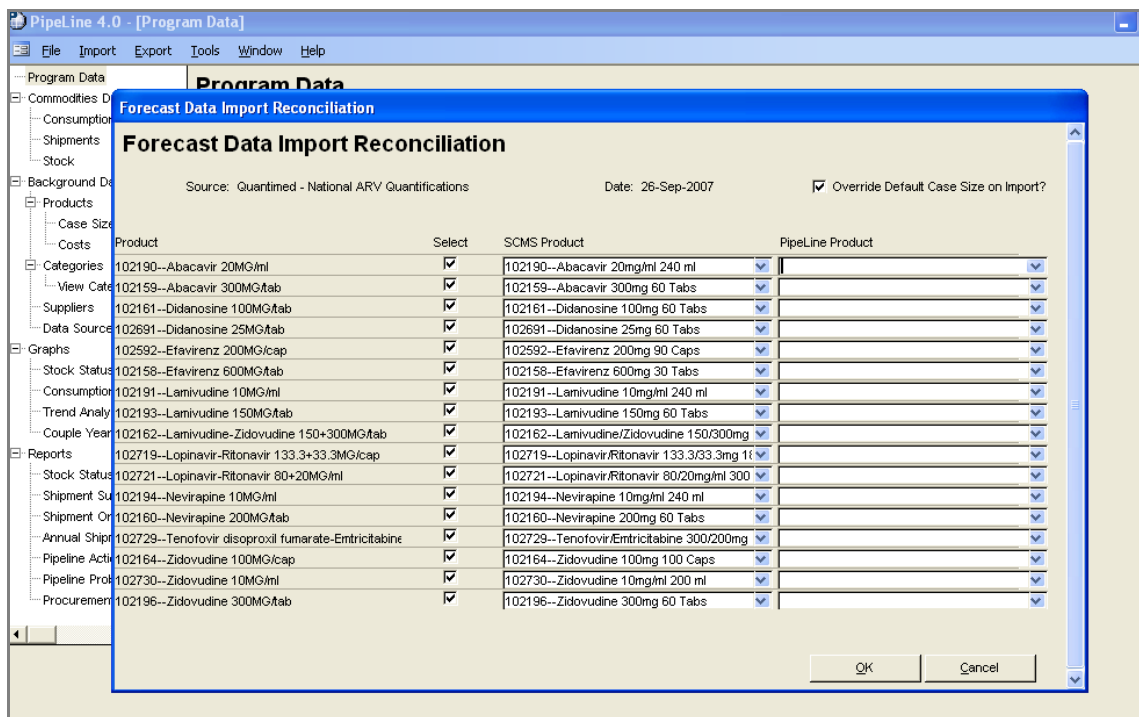
1. From the “Import” drop-down menu, select Consumption > Forecast.



2. Select the locations of your consumption data and product list .xml files, generated from Quantimed, in the “Import Forecast Data” dialogue box.



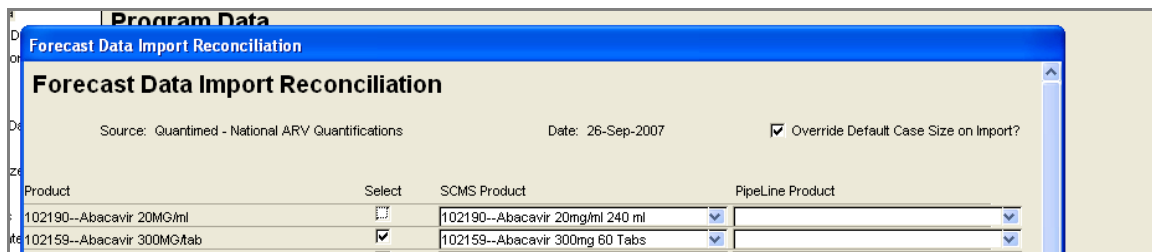
- When you select “OK,” the Forecast Import Reconciliation screen appears. If a product is already in PipeLine, it will appear in the “PipeLine Product” column on the right.



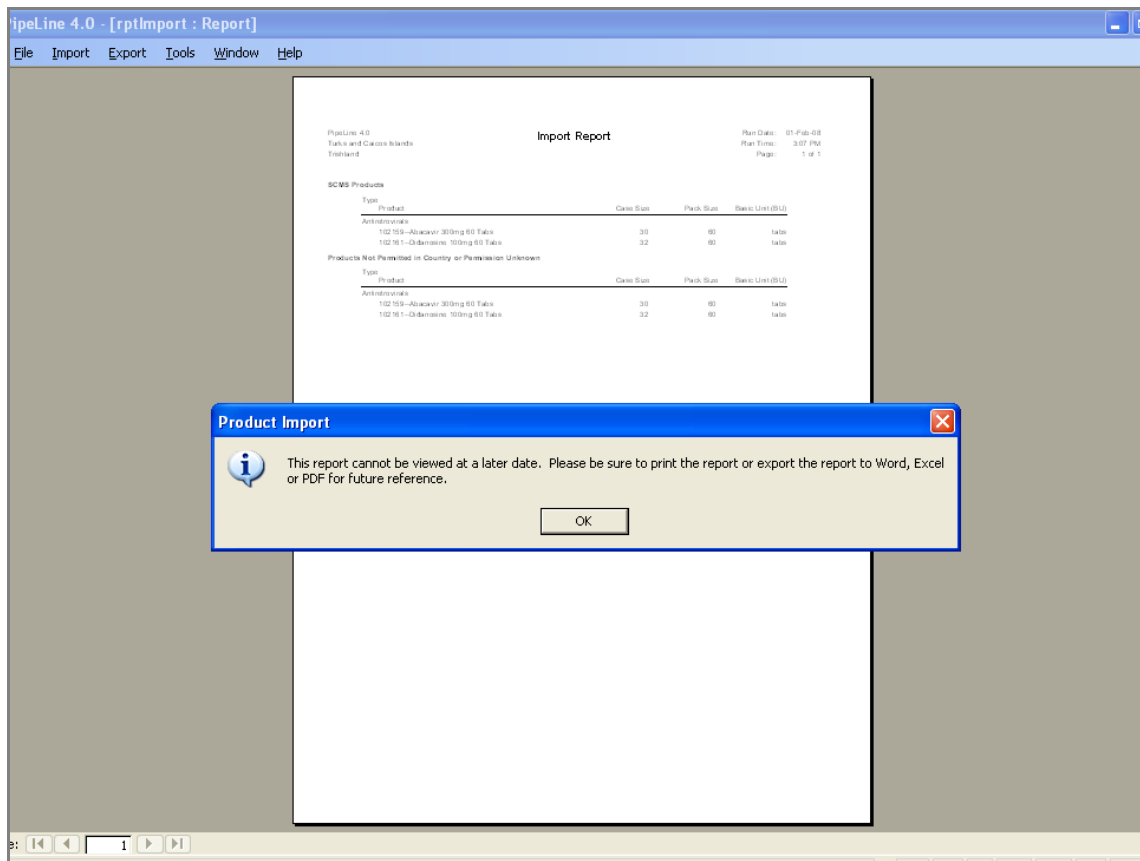
- In the Forecast Data Import Reconciliation screen, deselect any products whose forecast data you *do not wish to import*, by clicking on the checkmark in the select column. The checkmark will be removed when you click on it.

Product	Select	SCMS Product	PipeLine Product
102190--Abacavir 20MG/ml	<input type="checkbox"/>	102190--Abacavir 20mg/ml 240 ml	
102159--Abacavir 300MG/tab	<input checked="" type="checkbox"/>	102159--Abacavir 300mg 60 Tabs	
102161--Didanosine 100MG/tab	<input checked="" type="checkbox"/>	102161--Didanosine 100mg 60 Tabs	

Be sure the “Override Default Case Size on Import?” box is selected if you want to override the default case sizes already in your PipeLine database with the case sizes in the import file.



- When you have successfully imported data, a report will be displayed confirming the data imported. This report is not saved anywhere; you should print it if you want a copy for your records.



## Appendix E

# Quantification Report Preparation Checklist

Quantification Report Preparation Checklist		
Quantification Criterion	Recommended Location for Documentation	Complete? (Yes/No)
<b>Scope and Purpose</b>		
The scope (e.g., health programmes, commodities) and purpose(s) of the quantification exercise are documented	<ul style="list-style-type: none"> <li>Quantification Report</li> </ul>	
<b>Forecast and Methodology</b>		
The methodology and data used to prepare the forecast(s) (e.g., demographic, dispensed-to-user, issues) are described in the report, including the rationale used for selecting data sources for the final forecast consumption	<ul style="list-style-type: none"> <li>Quantification Report</li> <li>Notes field in PipeLine Consumption Data screen</li> </ul>	
The forecast is validated using at least one other method of estimation, and the secondary method used for validation is described; if no validation is performed, the rationale is provided	<ul style="list-style-type: none"> <li>Quantification Report</li> </ul>	
An explanation is provided for any change in the forecast compared to historical data trends, over the previous six months or from the time of the last quantification exercise	<ul style="list-style-type: none"> <li>Quantification Report</li> <li>Notes field in PipeLine Consumption Data screen</li> </ul>	
Documentation is provided clearly stating which products, recipients, and funding sources are included in this quantification; forecasts ideally are prepared by staff for all recipients and products in the country (not only those funded by international donors)	<ul style="list-style-type: none"> <li>Quantification Report</li> </ul>	
<b>Documentation of Historical Data</b>		
Sources of data for historical consumption (based on issues, dispensed-to user quantities, or service statistics) are documented	<ul style="list-style-type: none"> <li>Quantification Report</li> <li>Notes field in PipeLine Consumption Data screen</li> </ul>	
Challenges that were encountered during collection of historical consumption data are documented.	<ul style="list-style-type: none"> <li>Quantification Report</li> </ul>	
Sources of data for beginning stock balances are documented	<ul style="list-style-type: none"> <li>Notes field in PipeLine Stock Data screen</li> </ul>	

<b>Quantification Report Preparation Checklist</b>		
<b>Quantification Criterion</b>	<b>Recommended Location for Documentation</b>	<b>Complete? (Yes/No)</b>
An explanation is provided for each loss or adjustment to stock levels in historical data	<ul style="list-style-type: none"> <li>Notes field in PipeLine Stock Data screen</li> </ul>	
<b>Supply Planning</b>		
The supply plan is prepared for two years beyond the submission date of the quantification. (The submission date of the quantification is the date it is submitted to major in-country and international stakeholders)	<ul style="list-style-type: none"> <li>Shipments in PipeLine</li> <li>Quantification Report</li> </ul>	
The rationale for the required maximum, minimum, and desired end of year stock (DEOYS) levels, and considerations for determining each of these levels (including storage capacity) are described	<ul style="list-style-type: none"> <li>Quantification Report</li> </ul>	
Shipments are appropriately planned to ensure reliable supply for each product (e.g., supply levels do not fall below minimum stock levels or rise above maximums)	<ul style="list-style-type: none"> <li>Shipments in PipeLine</li> <li>Quantification Report</li> </ul>	
Constraints in preparing the quantification results according to these criteria are documented	<ul style="list-style-type: none"> <li>Quantification Report</li> </ul>	
The first screen of each PipeLine database for this quantification exercise should contain the complete contact information for the person managing the database	<ul style="list-style-type: none"> <li>PipeLine Programme Info screen</li> </ul>	
<b>Commodity Security</b>		
Documentation describes the process for sharing the supply plan with stakeholders (including suppliers and/or donors in-country)	<ul style="list-style-type: none"> <li>Quantification Report</li> </ul>	
Documentation identifies which suppliers have agreed to the shipments proposed in the supply plan, and it identifies any remaining, expected supply gaps	<ul style="list-style-type: none"> <li>Quantification Report</li> </ul>	
Stock issues (overstock, shortage, or stockout) are identified for future years of the supply plan and are highlighted for suppliers	<ul style="list-style-type: none"> <li>Quantification Report</li> </ul>	
Documentation identifies next steps to be taken by the quantification team and others in-country in order to ensure effective execution of the supply plan and to enhance the quality of future quantification exercises in-country (e.g., address any gaps in consumption data, strengthen inventory management procedures)	<ul style="list-style-type: none"> <li>Quantification Report</li> </ul>	
Documentation lists the stakeholders to whom the supply plan was submitted and the corresponding dates of submission	<ul style="list-style-type: none"> <li>Quantification Report</li> </ul>	
The quantification and all related documentation are submitted to the management of the quantification team within one month of completion	<ul style="list-style-type: none"> <li>Quantification Report</li> </ul>	
<b>Documentation of Quantification Workshop</b>		
The agenda for each day of the quantification	<ul style="list-style-type: none"> <li>Quantification Report</li> </ul>	



<b>Quantification Report Preparation Checklist</b>		
<b>Quantification Criterion</b>	<b>Recommended Location for Documentation</b>	<b>Complete? (Yes/No)</b>
workshop is documented		
The names and job titles for all workshop participants are documented	<ul style="list-style-type: none"> <li>Quantification Report</li> </ul>	
The software applications which were used for development of the forecast and supply plan are documented	<ul style="list-style-type: none"> <li>Quantification Report</li> </ul>	



## Appendix F

# Sample Timeline for Developing, Reviewing, and Updating Forecast and Supply Plan

Activity	Two Months Before the Quantification Exercise	One Month Before the Exercise	Month of the Exercise	Every Three Months (e.g., March, June, September, December)
Establishment of annual cycle for national quantification activities	X			
Announcement of quantification process by the official(s) or office managing the process	X			
Selection of the quantification team members, their roles, and responsibilities	X			
Quantification team members review the past quantification process—forecasting methods, procurement, and supply history	X			
Programme managers and quantification team members define the objectives, coverage, and scope of the quantification	X			
Programme managers and quantification team members develop the list of products to be quantified, based on standard treatment guideline, essential medicines list, and national needs	X			
Roles and responsibilities are defined and allocated for each major stakeholder	X			
Quantification team members develop a work plan with timelines and realistic deadlines	X			
Quantification team members prepare lists and formats of data required (e.g., data collection tools)	X			

<b>Activity</b>	<b>Two Months Before the Quantification Exercise</b>	<b>One Month Before the Exercise</b>	<b>The Month of the Exercise</b>	<b>Every Three Months (e.g., March, June, September, December)</b>
Train (or re-train) quantification team members and/or other relevant stakeholders in quantification method(s) and in the collection, organization, and analysis of data		X		
Arrange and hold the quantification exercise/workshop			X	
Collect data from facilities on consumption, stock on hand, losses, and adjustments				X
Quantification team examines the available data—for accuracy and completeness				X
Update stock status for the quarter in the supply plan				X
Update status of planned or ordered shipments in supply plan, as needed				X
Update suppliers, prices, and any other data in the supply plan				X
Update forecasted consumption with actual consumption for the last quarter in the supply plan				X
Calculate quantities of products needed, using appropriate quantification methods			X	
Establish quantities of products as outputs of the exercise			X	
Establish or update streams of funding/donor support for procurement			X	
Review the just-concluded quantification exercise, with recommendations and plans to improve the process and resolve issues encountered			X	
Establish tracking system for post-quantification activities, including procurement and funding rearrangements	X	X	X	X

<b>Activity</b>	<b>Two Months Before the Quantification Exercise</b>	<b>One Month Before the Exercise</b>	<b>The Month of the Exercise</b>	<b>The Month After the Exercise</b>	<b>Six Months After the Exercise</b>
Conduct initial dissemination meeting, using preliminary results			X		
Complete the quantification report, summarizing the process and outcomes				X	
Conduct major dissemination meeting with stakeholders, using final quantification report				X	
Organize data from the last six months and verify prior assumptions					X
Conduct major review of previous forecast and supply plan					X
Adjust the planned deliveries in the supply plan, as needed					X



## Appendix G

# Sample Workshop Schedule

### Quantification of Malaria Commodities—Assumptions-Building Workshop Agenda

<b>DAY 1</b>	
<b>Time</b>	<b>Topic</b>
8:30 – 9:00	Welcome and introductions
9:00 – 9:30	Opening of the workshop, National Malaria Control Programme
9:30 – 10:00	Introduction to quantification
10:00 – 10:30	Scope of quantification exercise
10:30 – 10:45	BREAK
10:45 – 11:15	Introduction to forecasting
11:15 – 12:15	Consumption-based forecasting: methodology
12:15 – 1:00	Consumption-based forecasting: collecting, organizing, and analysing logistics data
1:00 – 2:00	LUNCH
2:00 – 3:30	Services-based forecasting: methodology and assumptions
3:30 – 3:45	BREAK
3:45 – 4:45	Services-based forecasting: assumptions
4:45 – 5:00	Wrap up
<b>DAY 2</b>	
8:30 – 9:00	Introduction to the day
9:00 – 10:45	Demographic-based forecasting: methodology
10:45 – 11:00	BREAK
11:00 – 1:00	Demographic-based forecasting: assumptions
1:00 – 2:00	LUNCH
2:00 – 3:30	RDTs and SP
3:30 – 3:45	BREAK
3:45 – 4:45	Supply plans: basics of supply plan creation
4:45 – 5:00	Wrap up
<b>DAY 3</b>	
8:30 – 9:00	Introduction to the day
9:00 – 10:30	Supply planning assumptions
10:30 – 11:00	BREAK

11:00 – 1:00	Next steps and conclusions
1:00	Wrap up



## Appendix H

# Sample Tables for HIV/AIDS Testing Schedule, Test Menu, and Test Platform and Equipment Used in the 2013 Ghana HIV Commodity Quantification Exercise

Testing Schedule

Tests	Pre ART		ART			Monitoring		ART Failure
	Baseline	Follow up 6 months	Initiation	1 mo.	Modification 3 mo.	Every 6 months	yearly	As needed
<b>Serology /PCR</b>	X	X(baby)						
<b>CD4</b>	X	X	X			X		X
<b>Chemistry</b>	X	X	X	X	X	X		
<b>Hematology</b>	X	X	X	X	X	X		
<b>Syphilis</b>	X							
<b>Hepatitis B</b>	X	X						
<b>FBS*</b>						X		
<b>Viral load</b>							X	X
<b>Drug Resistance</b>								X

## Test Menu

Serology	Hematology	Chemistry	CD4	PCR	Other tests
HIV Test	Full Blood Count	Creatinine	CD4	RNA PCR	Syphilis
		Glucose (Fasting)	CD4%	DNA PCR	Hepatitis B
		GOT/AST			
		GPT/ALT			
		Cholesterol Total			
		Urea			
		Electrolytes			

## Test Platform and Equipment

Platform	Equipment
CD4 Numeration	FACS Count
	FACS Caliber
Viral Load elucidation	COBAS Analyser –PCR
Haematology	Sysmex KX 21 N
	Sysmex XT 2000i
Chemistry	Flexor –E
	Junior Selectra
Syphilis	Rapid Test
Hepatitis	Rapid test

## Appendix I

# Sample Workshop Schedule Quantification of Family Planning Commodities

### Workshop Agenda

National Quantification Workshop for Family Planning Contraceptives – CPT August 2013					
Technical Assistance Provided by  <b>USAID   DELIVER PROJECT</b>	Day 1	Day 2	Day 3	Day 4	Day 5
	8:00 – 9:00 Registration; Goals, Objectives, Norms & Schedule	8:00 – 9:00 Preparation of Forecast for 2013 – 2016. Building Forecast assumptions and Demand Projection- <i>Group Work</i>	8:00 – 9:00 Requirements and Costs Estimation - by Programmes	8:00 – 9:00 Supply Planning for National Level - (GHS/MOH )	8:00 – 9:00 Funding Gap Analysis, Challenges and Recommendations
	9.00 – 11.00 Implementation of Feb 2013 CPT, Successes and Challenges – By Programmes	9.00 – 11.00 Preparation of Master Sheet for PipeLine Data entry into Pipeline	9.00 – 11.00 Requirements and Costs Estimation - by Programmes	9.00 – 11.00 Supply Planning for National Level - (GHS/MOH )	9.00 – 11.00 Preparation of National CPT Draft Memo (MOH /GHS/JSI)
	11.00 – 11.15 Tea Break	11.00 – 11.15 Tea Break	11.00 – 11.15 Tea Break	11.00 – 11.15 Tea Break	11.00 – 11.15 Tea Break

	11:15 – 13:30 Data Exercise – Validation and Adjustment (by Programme) (Organization of data on consumption, receipts, transfers, SOH, AMCs, losses, adjustments etc.)	11:15 – 13:15 Data Entry into PipeLine – <i>Group work</i>	11:15 – 13:15 Development of CPT Programme Report - By Programmes	11:15 – 13:15 Supply planning continued	11:15 – 13:15 Preparation of National Draft Memo continued
	13.30 – 14.30 Lunch	13.00 – 14.00 Lunch	13.00 – 14.00 Lunch	13.00 – 14.00 Lunch	13.00 – 14.00 Lunch
	<b>Day 1</b>	<b>Day 2</b>	<b>Day 3</b>	<b>Day 4</b>	<b>Day 5</b>
	14:30 – 16:30 Continue Data Exercise – Validation and Adjustment (Organization of data on consumption, receipts, transfers, SOH, AMCs, losses, adjustments etc.	14:00 – 15:00 Data entry into Pipeline - <i>Group work</i> continued	14:00 – 17:45 Completion of Programme Reports	14:00 – 17:45 CPTs, Requirements and Costs Estimation - (GHS/MOH )	14:00 – 16:00 Completion of Draft Zero Report
	16.45 – 17.45 Determination of forecast accuracy Preparation of Forecast for 2013 – 2016, Building Forecast Assumptions and Demand Projection – <i>Group Work</i>	15:00 - 17:45 Develop and complete Supply Plan			16:00 – 17:00 Next Steps Wrap Up & Departure
	17:45 – 18:00 Tea Break	17:45 – 18:00 Tea Break	17:45 – 18:00 Tea Break	17:45 – 18:00 Tea Break	17:00 – 17:15 Tea Break
	Wrap Up for Day 1	Wrap Up for Day 2	Wrap Up for Day 3	Wrap Up for Day 4	Departure

## Appendix J

# Sample Data Sources

### Forecast development for family planning commodities

Programme	Data used for forecasting	Justification	Data Source
Ministry of Health/Ghana Health Services (MOH/GHS)	Dispensed-to-user data	Indicator of real consumption	Regional level aggregated reports—Form B
	Distribution data (male and female condoms) for both family planning and HIV programmes	More reliable indicator because facility data is not reflective of national usage because it does not include the non-traditional and non-Ghana Health Service (GHS) outlets	Central Medical Store (CMS) records
Planned Parenthood Association of Ghana (PPAG)	Dispensed-to-user data from service delivery points (SDPs)	Most reliable indicator of demand through PPAG facilities	Programme logistics management information system (LMIS) reports (LK2)
Marie Stopes International - Ghana (MSIG)	Dispensed-to-user data	Most reliable indicator of client demand through MSIG	SDP and community outreach reports
EXP Social Marketing (EXP SM)	Distribution data		EXP SM distribution reports
Ghana Social Marketing Foundation (GSMF)	Sales data		GSMF sales reports
DKT International	Sales data		DKT International sales reports



## Appendix K

# Glossary of Key Logistics Terms

**budget.** Mobilizing resources and securing a budget line item for health commodities and logistics activities is extremely important to ensure that products are available and that the logistics system operates effectively. To determine the resources needed to scale up, supply chain managers first need to assess what the expected costs are at different levels of the logistics system. When determining supply chains costs, managers should consider the cost of storage, transportation, and management; and determine what share of these costs each group will cover—i.e., Ministry of Health, donors, nongovernmental organizations (NGOs), etc.

**consumption, dispensed, dispensed to user, usage data.** Data on the quantity of goods given to or used by customers.

**inventory management: storage and distribution.** After an item has been procured and received by the health system or programme, it must be transported to the service delivery level where the client will receive the products. During this process, the products must be stored until they are sent to the next lower level, or until the customer needs them. Almost all businesses store a quantity of stock for future customer needs.

**lead time.** The time between when new stock is ordered and when it is received and available for use. Goods should be available to customers at *the right time*—before the customer asks for the product. Lead time can be calculated within the entire in-country system, from arrival in port to the end user, between specific levels of the system, or even the procurement lead time from when a product is ordered with the manufacturer until it arrives in port.

When calculating lead time, it is especially important to include all the time up to when the stock is *available for use*. Stock that has been received, but not inspected, recorded, and put on the shelf, is not ready to be issued and is not available to be used. To satisfy the client's need, stock must be available for the customer when they request or need it.

**logistics management information systems (LMIS).** An LMIS collects data about commodities; this information is often used for activities, such as filling routine supply orders for health facilities. A *health management information systems* (HMIS) collects information on the total number of patients seen or diagnosed; data from an HMIS is not used as often as LMIS data—i.e., annually—and it is used for different purposes—i.e., for evaluating programme impact. Logisticians emphasize the use of logistics data for making decisions about activities within the logistics cycle.

**maximum-minimum inventory control system.** This control system is designed to ensure that the quantities in stock fall within an established range. Most successful inventory control systems used for managing health commodities are maximum-minimum systems of one type or another.

**monitoring and evaluation.** Routine monitoring and periodic evaluation of the pipeline and logistics system activities help demonstrate how well the system is performing, the areas that can be improved, as well as the system's impact on service provision.

**pipeline.** This is the entire chain of physical storage facilities and transportation links through which supplies move from the manufacturer to the user, including port facilities, central warehouse, regional warehouses, district warehouses, all service delivery points (SDPs), and transport vehicles, including community-based distribution networks.

Like a water pipeline, the logistics system has *tanks* and *physical pipes*—the warehouses and means of transportation—that store and move *water* (the product) to the *home* (the SDP).

Unlike a water pipeline, which is usually continuous, a health logistics pipeline requires transportation to move supplies periodically from one warehouse to another. In geographically diverse countries, supplies are moved in various ways, including small boats, buses, and even bicycles.

**policy.** Government regulations and procedures affect all elements of the logistics system. Many country governments have established policies on the selection of medical products—usually based on essential medicine lists—how items are procured (for example, international competitive bidding or using prequalified manufacturers); when items are distributed; where and how items are stored; and the quantities customers receive (often called *dispensing protocols*). Fiscal and budget policies are often some of the most influential policies affecting a logistics system, whether related to securing funding for product procurement; or to pay for critical infrastructure, such as storerooms and transportation. Health programme managers and other personnel dedicated to logistics can influence these policies, but they may face great challenges when trying to implement or change them. These managers and personnel should stay up-to-date on current policies and complete them, as specified.

**procurement.** After a supply plan has been developed as part of the quantification process, quantities of products must be procured. Health systems or programmes can procure from international, regional, or local sources of supply; or they can use a procurement agent for this logistics activity. In any case, procurement should follow a set of specific procedures that ensure an open and transparent process that supports the six rights.

**product selection.** In any health logistics system, health programmes must select products. In a health logistics system, a national formulary and therapeutics committee, pharmaceutical board, board of physicians, or other government-appointed group may be responsible for product selection. Most countries have developed essential medicine lists patterned on the World Health Organization (WHO) Model List. Products selected for use will impact the logistics system; therefore, the logistics requirements must be considered during the product selection.

**quantification.** After products have been selected, the required quantity and cost of each product must be determined. Quantification is the process of estimating the quantity and cost of the products required for a specific health programme (or service), and, to ensure an uninterrupted supply for the programme, determining when the products should be procured and distributed.

**service delivery point.** This is any facility where users receive supplies related to health services. SDPs are usually hospitals and health centres, but may also include mobile units, community-



based distributors, laboratories, and health posts. These facilities are called SDPs because services are provided and products are used or dispensed at these locations.

**shelf life:** The length of time a product can be stored under adequate conditions without affecting the usability, safety, purity, or potency.

**stock on hand:** Stored quantities of usable stock.

**stockout:** When a facility has no usable stock on hand of a particular product.

**supplies, commodities, goods, materials, products, and stock.** These items flow through a logistics system.

**users, clients, patients, and customers.** The people who receive or use supplies. The terms are used interchangeably throughout this handbook.

***Users*** is familiar to anyone who collects information about *new* or *continuing* users; for example, in family planning programmes. *Users* can also refer to people who use a product that is not given to a client or patient but is used for them, such as an HIV test kit or a laboratory reagent. In those examples, the counsellor or the lab technician is the *user* of the product.

***Clients*** usually refers to someone who receives a treatment or service. For example, they could be a family planning client and receive contraceptives; or they could be a client and receive a service, such as a test for malaria or tuberculosis.

***Patients*** is a term often associated with clinic patients receiving treatment for an illness, such as those in an antiretroviral therapy (ART) programme.

***Customers*** is a term typically used by the private sector; it helps reinforce the concept of *customer service*. In public health programmes, all users, clients, and patients are considered to be *customers* in the same way a commercial business thinks of its customers: the service provider, health centre, and laboratory are there to serve the customer. The concept of customer service can also be applied between levels of a logistics system—the regional or provincial warehouse is the customer of the central warehouse.

