Quantification for Antimalarial Medicines

A Workbook

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About RPM Plus

The Rational Pharmaceutical Management Plus (RPM Plus) Program, funded by the U.S. Agency for International Development (cooperative agreement HRN-A-00-00-00016-00), works in more than 20 developing countries to provide technical assistance to strengthen drug and health commodity management systems. The program offers technical guidance and assists in strategy development and program implementation both in improving the availability of health commodities—pharmaceuticals, vaccines, supplies, and basic medical equipment—of assured quality for maternal and child health, HIV/AIDS, infectious diseases, and family planning and in promoting the appropriate use of health commodities in the public and private sectors.

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ACRONYMS

ACT	artemisinin-based combination therapy
CMS	Central Medical Store
kg	kilogram
mg	milligram
SP	sulfadoxine/pyrimethamine
USD	U.S. dollar
WHO	World Health Organization

EXPLANATION OF TERMS USED

Term	Explanation
Total consumption in a period	A measure of how much has been used (dispensed or distributed) during a specific defined period
Average monthly consumption	A measure of the average amount of stock used (dispensed or distributed) per month over a period of at least one year, adjusted to consider consumption that would have occurred during stock-out periods
Supply pipeline	The number of supply points at each level and the stock level at each point required to avoid stock-outs
Procurement lead time	The time between the placement of an order for supplies receipt of those supplies at the medical store (or dispensary, depends on the level)
Procurement period	The number of months between orders
Stock on order	Any stocks that have been ordered but have not yet arrived
Safety stock	An amount of stock that is kept in reserve, calculated as the average amount needed to cover a lead time period, to ensure against stock-out in the case of sudden changes in demand or supplier performance problems (also known as *buffer stock*)
Adjusting for losses and program growth	Some items will be lost due to damage, spoilage, expiration, and theft. If losses are not considered in quantification and procurement, stock-outs are likely.
Stock on hand	The amount of stock available for distribution

BACKGROUND

Quantification is an exercise that involves obtaining a forecast of supply needs (also known as a *need estimation*) and balancing it against a budget. Malaria programs, like other programs, need to conduct regular quantification exercises to ensure an uninterrupted supply and to fully cover estimated malaria treatment and prevention requirements. Conducting a proper quantification can help to avoid shortages and wastage due to excess stock. In this way, it contributes to the attainment of a key Abuja target to ensure access to treatment with effective therapies within 24 hours of onset of symptoms.

This quantification workbook is a tool designed to assist national malaria programs with the development of reliable forecasts of their medicine needs. The intended users are both national and district level pharmacy staff.

It will focus on the two main methods for conducting quantification: the consumption based method and the morbidity method.[1] For new malaria programs, the adjusted-consumption method is unlikely to be relevant because new programs have no actual data, and that method requires that estimates be made based on what is consumed in a comparable location.

[1] There are four methods for quantification: the consumption method, the morbidity method, the adjusted consumption method, and the service-level adjustment method.

QUANTIFICATION WORKBOOK FOR NATIONAL LEVEL FORECASTING OF ANTIMALARIAL MEDICINES

Order Prepared (Date) _____

INSTRUCTIONS

The workbook is designed to take pharmacy staff through the quantification process step by step.

Each step to be completed requires either data to be collected or a calculation to be performed.

The exercise requires retrospective data—that is, data from a period in the past, usually the past 12 months. For calculations to be done in subsequent years, the information generated in this workbook can be used to complete future exercises.

When instructed to round up or down to the nearest whole number, follow this convention: if the decimal place is 0.5 or higher, round up (for example, for 6.7 round up to 7) and if decimal place is less than 0.5 round down (for example, for 3.3 round down to 3).

When instructed to round up or down to 2 decimal places, follow this convention: if the third decimal place is 0.005 or higher, round up (for example, for 1.008 round up to 1.01) and if the third decimal place is less than 0.005 round down (for example, for 0.033 round down to 0.03).

CONSUMPTION-BASED QUANTIFICATION

The consumption method uses the existing consumption of the antimalarial medicines concerned to forecast future needs. This method is appropriate for antimalarials that are already in circulation and for which past consumption data exists.

In the consumption method, a list is prepared of all antimalarials eligible for procurement, and the most accurate inventory records of past consumption are used to calculate the quantities needed for each drug. Consumption during a recent period of 6 to 12 months is adjusted for stock-outs to obtain the average monthly consumption. Then the average monthly consumption is multiplied by the number of months to be covered by procurement, and safety stock levels (in months) are also multiplied by the average monthly consumption. These two figures are added to get the gross needs during the period, with the stock on hand and any stock on order subtracted from the gross estimate, to derive the quantity to purchase.

The anticipated unit cost for each drug (not the last unit cost) is multiplied by the number of units to be purchased to obtain the expected purchase value for the entire quantity. All purchase values for individual drugs are added to obtain the total expected procurement cost. If this cost is greater than the budget, adjustments will need to be made.

Box 1 outlines the data needed for carrying out the consumption method.

Box 1. Data Needed for the Consumption Method

- Reliable inventory records of consumption (national level or from a range of standard facilities)
- Estimation of time out of stock
- Records of existing pipelines
- Supplier lead time
- Estimations of buffer stock
- Estimations of wastage (losses due to expiry, pilferage, and so forth)
- Projected unit drug costs
- Procurement lead time
- Shelf life of drugs
- Stocks on hand and on order

This section will present two different approaches to conducting consumption-based quantification. If national level consumption data are available, follow steps outlined in the first subsection, "Quantifying Needs for Antimalarials Using the Consumption Method/Using National Level Consumption Data." If central level data are incomplete but some data exist for some standard facilities or districts, start with the second subsection "Quantifying Needs for Antimalarials Using the Consumption Method/Using Subnational Level Consumption Data."

Several assumptions must be made in order to perform a consumption-based quantification. These are discussed on page 24.

Quantifying Needs for Antimalarials Using the Consumption Method

Using National Level Consumption Data

Table 1 provides a summary of calculations used in consumption-based quantification.

1. Prepare the list of antimalarials to be quantified.

Get a copy of the most recent standard treatment guidelines for malaria, the essential medicines list, or both. Prepare the list of medicines to be quantified. The compiled list should then be sorted into the order that will best facilitate data collection and distributed to those officials and facilities that will enter consumption data.

2. Determine the period to be reviewed for consumption.

If the procurement is to cover a 12-month period, the consumption data for the past 12 months should be reviewed (if a full year's useful data are available).

A 12-month review may also be used for a procurement covering 6 months, but if significant seasonal variations exist, using the same 6-month period from the preceding year may be preferable. A short review period, such as 3 months, is inadequate to plan a procurement to cover 12 months, unless the 3 months reviewed reflect a steady state of consumption for the entire year.

3. Enter data on consumption for each antimalarial for the review period.

For each drug on the list, enter the following—

- The strength, unit, and pack size for each dosage unit
- The total quantity used during the review period, in basic units (for example, for artesunate 50 mg tablets, enter the total annual consumption in tablets rather than packs). *To obtain the quantity of dosage units, multiply the total number of packs consumed by the pack size.*

- The number of days in the review period that the drug was out of stock. (If the number of days out of stock cannot be determined with accuracy, the estimated number of months out of stock during the period can be entered.)

- The lead time for the last procurement (or the average lead times from the last several procurements)

Using the most accurate and current records available is important. The likely sources for consumption and lead-time data are the following—

- Stock records and distribution reports from a central distribution point
- Stock records and reports from regional or district warehouses
- Invoices from suppliers
- Dispensing records from health facilities

If projected pricing data are available at this stage, it may save time to enter prices while entering consumption data (Step 11).

4. Calculate the average monthly consumption.

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

There are two ways to account for stock-outs when computing average monthly consumption. The recommended method is illustrated in Box 2 as Formula 1. Enter the total consumption and divide it by the number of months in the review period minus the result of the following calculation: the total number of days out of stock in the same period divided by 30.5 to convert to months. For example, consider the entry for artesunate 50 mg tablets in Table 1. The total consumption for a 6-month review period was 89,000 capsules. The drug was out of stock for 34 days in the 6-month period. Therefore the average monthly consumption is—

$CA = 89{,}000 \div [6 - (34 \div 30.5)]$, or $89{,}000 \div 4.8852 = 18{,}218$

An alternative method, which is simpler but less precise, is shown as Formula 2 in Box 2. It uses the estimated number of months out of stock for adjusting consumption, omitting the step of converting days to months. Using the same drug from Table1, the drug was in stock for about five of the six months, leaving about one month out of stock. Therefore, the average monthly consumption is—

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

5. Calculate the projected average monthly consumption for expected changes in consumption pattern.

Using the example of artesunate 50 mg tablets from Table 1, if use is expected to increase by 5 percent in the coming year, adjusting the average monthly consumption by 5 percent would be reasonable. This adjustment would raise the expected monthly need by 911 tablets, bringing the total to 19,129 tablets.

Some changes in consumption may be independent of trends in overall patient use, such as malaria seasonality or a potential spike in an epidemic malaria. If such changes are anticipated, increasing estimates for the antimalarials by an appropriate factor would be sensible.

If the antimalarial treatment policy is expected to change soon and a new first-line treatment will replace an older drug by a substantial proportion, the estimate for the older drug should be reduced the amount of which depends on whether a nationwide or phased approach to implementation is being applied. If major efforts are under way to alter prescribing patterns, a reasonable approach would be to anticipate at least some success by reducing the expected need for affected drugs by a small percentage. When there is a turnover in prescribing staff, the new prescribers may have different ways of treating common conditions that would substantially affect drug needs in some therapeutic categories. If such changes can be anticipated, adjusting the forecasts is wise to avoid spending resources on drugs that will not be as popular as in the past.

6. Enter data for existing stocks and stocks on order.

Determine the quantity of stock (in packs) already in stock and the quantity on order, and enter these figures in Table 1. The first may be obtained from the Central Medical Store (CMS) and the latter from the CMS or the procurement unit at the Ministry of Health.

7. Calculate the safety stock needed for each drug.

Safety (buffer) stock is needed to prevent stock-outs High levels of safety stock increase inventory holding costs and should be avoided. In some supply systems, the safety stock is set for each item at a fixed quantity or a fixed number of months' worth of consumption. However, the preferred method is to calculate the safety stock based on the projected average monthly consumption and the expected lead time (see Formula 3 in Box 2)[2]. The projected average monthly consumption from Step 5 is multiplied by the average lead time. This safety stock level should avoid stock-outs, assuming that the item is reordered when only the safety stock remains, the supplier delivers within the projected lead time, and consumption is no greater than average.

[2] The number of months of safety stock held should never be less than the *lead time*, which is the number of months between placing an order and receiving the supplies (for CMSs, lead time may be three months, whereas for lower level facilities it may be one month).

Using this formula, the safety stock for artesunate 50 mg tablets in the example is 19, 129 × 3 months = 57,387.

Adjusting the safety stock may be necessary to cover variations in consumption or lead time. There are several options for adjusting safety stock levels. The simplest method multiplies the basic safety stock by an adjustment factor. For example, an adjustment factor of 1.5 would increase the safety stock of artesunate 50 mg tablets in Table 1 to 86,081 capsules. If this sort of adjustment is done for all items, the cost of safety stock will increase substantially; therefore, adjustments should be made only when there is true uncertainty about the lead time or consumption.

8. Calculate the quantity of each drug required in the next procurement period.

The suggested formula for calculating the quantity to order is shown as Formula 5 in Box 2. The calculation is done in three main steps. First, the projected average monthly consumption is multiplied by the sum of the lead time and the procurement period, yielding the total needs before considering safety stock, stock on hand, or stock on order. Next, the quantity needed for safety stock is added. Finally, the quantity of stock on hand and the stock on order are added together, and then subtracted from the previous total. Using the example of artesunate 50 mg tablets from Table 1, the quantity to order is—

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

9. Adjust for losses.

To avoid stock-outs, adjusting quantification estimates to allow for losses is necessary. Review the records at the CMS (or dispensary, depending on the level) to determine the percentage loss. If the supply system averaged 10 percent per year in losses, add 10 percent to the suggested quantity to order.

When this adjustment is applied to artesunate 50 mg tablets, the allowance would add 9,055 tablets to the estimate from Step 8, bringing the total purchase quantity to 99,603 tablets.

Since the artesunate tablets are purchased in packs of 24 tablets, 4,151 packs should be ordered.

10. Compile decentralized quantifications (if applicable).

In a decentralized quantification, staff at each facility or storage point enter their own consumption quantities and stock-out information, and the estimates of the individual facilities are totaled and compiled on the master quantification list.

11. Estimate costs for each drug and total costs.

To estimate procurement costs, multiply the quantities estimated for each drug by the most accurate prediction of the expected next purchase price (not the last purchase price).

Once the expected price has been entered for each drug, multiply the price by the estimated quantity needed to obtain the total procurement value for each drug. Table 1 uses the package price as the basis for making these projections, but in many cases, using the basic unit price is preferable, because there is more flexibility in combining information from different sources to arrive at an average. The basic unit price is also preferable if it is unclear what package sizes will be ordered or if projections are based on average international prices from a source such as the *International Drug Price Indicator Guide* (MSH, 2004) or the *Sources and Prices of Selected Products fir the Prevention, Diagnosis and Treatment if Malaria* (WHO/RBM/UNICEF/PSI/MSH, 2004).

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

12. Compare total costs with budget and make adjustments.

If the total expected procurement cost exceeds the available budget, there are really only two choices: either obtain more funds or reduce the number or quantities, or both, of the medicines ordered.

Box 2. Formulae for Consumption-Based Calculations

Formula Number	Objective of Formula	Calculations
1	Adjusted average monthly consumption (preferred)	$C_A = C_T \div [R_M – (D_{OS} \div 30.5)]$
2	Adjusted average monthly consumption (alternative)	$C_A = C_T \div (R_M – M_{OS})$
3	Projected average monthly consumption	$C_P = C_A + (C_A \times A_U)$
4	Basic safety stock requirements	$C_P \times LT$
5	Quantity to order	$Q_O = C_P \times (LT + PP) + SS – (S_I + S_O)$

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

Table 1. Calculation Using the Consumption-Based Method

Drug	Strength	BU	Pack Size	Total Consumption in Period (BU)	Days Out of Stock	Adjusted Average Monthly Consumption (BU)	Projected Average Monthly Utilization (BU)	Stock on Hand (BU)	Stock on Order (BU)	Safety Stock Level (BU)	Suggested Quantity to Order (BU)	Adjusted Order Quantity for (Losses 10%)	Order Quantity (Packs)	Probable Pack Price (USD)	Value of Proposed Order (USD)
Artesunate	50 mg	tablet	100	89,000	34	*18218*	*19129*	81,000	58,000	*57,387*	*90,548*	*99,603*	*997*	11.2	*11,166.40*
Amodiaquine	200 mg	tablet	1,000	59,500	0	*9917*	*10413*	32,000	42,000	*31,238*	*50,950*	*56,045*	*57*	15	*855.00*
Quinine Injection	300 mg/ml	ampoule	100	3,879	0	*647*	*679*	111	7,600	*2,036*	*435*	*478*	*5*	8.3	*41.50*

Note: A blank table for entering data is available in Annex 2.

Using Subnational Level Consumption Data

If central level consumption data are inadequate but some data exist for some standard facilities, use the following methodology to calculate the need for antimalarials using the consumption method.

For each type of health facility, a number of "standard" facilities are identified: representative workload, acceptable drug supply, rational prescription, and consumption.

This method starts from existing consumption of the antimalarial medicines concerned in these standard facilities and uses this information to forecast future needs. The types of data needed are identical to those needed for the previous method; however, these data are obtained for each standard facility instead of the national level.

1. Prepare the list of antimalarials to be quantified.

Get a copy of the most recent standard treatment guidelines, essential medicines list, or both. The compiled list should then be sorted into the order that will best facilitate data collection and distributed to those officials and facilities that will enter consumption data.

2. Determine the period of time to be reviewed for consumption

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

3. Identify a range of standard facilities.

For each type of health facility, a number of standard facilities are identified which adequately represent other facilities in terms of workload, acceptable drug supply, rational prescription and consumption.

Table 2. Standard Facilities

Referral/District Hospital	Health Center	Dispensary/Health Post

4. Enter data on consumption for each antimalarial for the review period for each standard facility.

For each drug on the list, enter the following on the master table 3—

- The strength, unit, and pack size for each dosage unit
- The total quantity used during the review period, in basic units (for example, for artesunate 50 mg tablets, enter the total annual consumption in tablets rather than packs). To obtain the quantity of dosage units, multiply the total number of packs consumed by the pack size.
- The number of days in the review period that the drug was out of stock. (If number of days out of stock cannot be determined with accuracy, the estimated number of months out of stock during the period can be entered.)
- The lead time for the last procurement (or the average from the last several procurements)

Using the most accurate and current records available is important. The likely sources for consumption and lead-time data are the following—

- Stock records and distribution reports from a central distribution point
- Stock records and reports from regional or district warehouses
- Invoices from suppliers
- Dispensing records from health facilities

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

Use a different table for each type of standard facility.

5. Calculate the average monthly consumption.

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

There are two ways to account for stock-outs when computing average monthly consumption. The recommended method is illustrated in Box 2 as Formula 1. Enter the total consumption and divide it by the number of months in the review period minus the result of this calculation: the total number of days out of stock in the same period divided by 30.5 to convert to months.

An alternative method, which is simpler but less precise, is shown as Formula 2 in Box 2. It uses the estimated number of months out of stock for adjusting consumption, omitting the step of converting days to months.

6. Calculate the projected average monthly consumption for expected changes in consumption pattern

Using the example of artesunate 50 mg tablets from Table 3 if use is expected to increase by 5 percent in the coming year, adjusting the average monthly consumption by 5 percent would be reasonable. This adjustment would raise the expected monthly need by 911 tablets, bringing the total to 19,129 tablets.

Some changes in consumption may be independent of trends in overall patient use, such as malaria seasonality or a potential spike in an epidemic of malaria. If such changes are anticipated, increasing estimates for the antimalarials by an appropriate factor would be sensible.

If the antimalarial treatment policy is expected to change soon and a new first-line treatment will replace an older drug by a substantial proportion, the estimate for the older drug should be reduced. If major efforts are under way to alter prescribing patterns, a reasonable approach would be to anticipate at least some success by reducing the expected need for affected drugs by a small percentage. When there is a turnover in prescribing staff, the new prescribers may have different ways of treating common conditions that would substantially affect drug needs in some therapeutic categories. If such changes can be anticipated, adjusting the forecasts is wise to avoid spending resources on drugs that will not be as popular as in the past.

7. Calculate the safety stock needed for each drug.

Safety (buffer) stock is needed to prevent stock-outs, although high levels of safety stock increase inventory holding costs and should be avoided. In some supply systems, the safety stock is set for each item at a fixed quantity or a fixed number of months' worth of consumption. However, the preferred method is to calculate the safety stock based on the projected average monthly consumption and the expected lead time (see Formula 3 in Box 2).3

The projected average monthly consumption from Step 6 is multiplied by the average lead time. This safety stock level should avoid stock-outs, assuming that the item is reordered when only the safety stock remains, the supplier delivers within the projected lead time, and consumption is no greater than average.

[3] The number of months of safety stock held should never be less than the *lead time*, which is the number of months between placing an order and receiving the supplies (for CMSs, lead time may be three months, whereas for lower level facilities it may be one month).

Using this formula, the safety stock for artesunate 50 mg tablets in the example (Table 3) is 19, 129 × 3 months = 57,387.

Adjusting the safety stock may be necessary to cover variations in consumption or lead time. There are several options for adjusting safety stock levels. The simplest method multiplies the basic safety stock by an adjustment factor. For example, an adjustment factor of 1.5 would increase the safety stock of artesunate 50 mg tablets in Table 3 to 86,081 capsules. If this sort of adjustment is done for all items, the cost of safety stock will increase substantially; therefore, adjustments should be made only when there is true uncertainty about the lead time or consumption.

8. Calculate the suggested quantity of each drug required in the next procurement period for each level of health facility.

The suggested formula for calculating the quantity to order is shown as Formula 5 in Box 2. The projected average monthly consumption is multiplied by the sum of the lead time and the procurement period, yielding the suggested quantity needed.

Using the example of artesunate 50 mg tablets from Table 3, the quantity to order is—

QO = 19,129 × (3 + 6) + 57,387 = 229,548

9. Calculate standard quantities per 1,000 treatment episodes or cases per standard type of health facility.

For each level of health facility (referral hospital, health center, health post) the projected average monthly consumption is converted to standard quantities per 1,000 treatment episodes. This conversion is made by determining the number of treatment episodes of uncomplicated malaria in each type of health facility.

In the example in Table 3 (standard referral hospital), the total number of cases (treatment episodes) of uncomplicated malaria is 5,000. Therefore the quantity per 1,000 treatment episodes is as follows—

(229,548 × 1000) ÷ 5000 = 183,639

10. Calculate the suggested quantity to order.

This calculation is made in two steps. First, calculate the total quantities needed for each level of health facility by multiplying the standard quantities of each drug per 1,000 treatment episodes or cases per standard type of health facility by the total number of cases or episodes in each type of health facility. Next, total the quantities needed for each type or level of health facility to obtain the national level quantity needed to order.

11. Calculate the quantity of each drug required in the next procurement period.

Determine the quantity of stock (in packs) already in stock and the quantity on order. The first may be obtained from the CMS or regional medical stores, and the latter from the CMS or the procurement unit at the Ministry of Health.

The suggested national level quantity to order is adjusted for existing stocks by adding together the existing stock and the stocks on order and subtracting this figure from the national level quantity to yield the quantity of each drug required in the next procurement period.

12. Adjust for losses.

To avoid stock-outs, adjusting quantification estimates to allow for losses is necessary. Review the records at the CMS (or dispensary, depending on the level) to determine the percentage loss. If the supply system averaged 10 percent per year in losses, add 10 percent to the suggested quantity to order.

When this adjustment is applied to artesunate 50 mg tablets in Table 3, the allowance would add 9,055 tablets to the estimate from Step 11, bringing the total purchase quantity to 99,603 tablets.

Since the artesunate tablets are purchased in packs of 24 tablets, 4,151 packs should be ordered.

13. Estimate costs for each drug and total costs.

To estimate procurement costs, multiply the quantities estimated for each drug by the most accurate prediction of the expected next purchase price (not the purchase price).

Once the expected price has been entered for each drug, multiply the price by the estimated quantity needed to obtain the total procurement value for each drug. Table 3 uses the package price as the basis for making these projections, but in many cases, using the basic unit price is preferable, because there is more flexibility in combining information from different sources to arrive at an average. The basic unit price is also preferable if it is unclear what package sizes will be ordered or if projections are based on average international prices from a source such as the *International Drug Price Indicator Guide* (MSH, 2004) or the RBM *Sources and Prices of Antimalarial Drugs* (WHO, 2004).

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

14. Compare total costs with budget and make adjustments.

If the total expected procurement cost exceeds the available budget, there are really only two choices: either obtain more funds or reduce the number or quantities, or both, of the medicines ordered.

Table 3. Calculation Using the Consumption Method in Standard Facilities

Data from Standard Facilities									
Type of standard facility	**Drug**	**Strength**	**BU**	**Total Consumption in Period (BU)**	**Days Out of Stock**	**Adjusted Average Monthly Consumption (BU)**	**Projected Average Monthly Utilization (BU)**	**Total number of facilities of each type**	**Total projected average monthly utilization**
Referral	Artesunate	50 mg	tablet	50,000	34	10235	10747	6	64480
	Amodiaquine	200 mg	tablet	39,000	0	6500	6825	6	40950
	Quinine Injection	300 mg/ml	ampoule	1,050	0	175	184	6	1103
HC	Artesunate	50 mg	tablet	44,000	30	8771	9210	24	221035
	Amodiaquine	200 mg	tablet	30,000	10	5289	5553	24	133283
	Quinine Injection	300 mg/ml	ampoule	600	5	103	108	24	2591
HP	Artesunate	50 mg	tablet	20,000	20	3742	3929	36	141460
	Amodiaquine	200 mg	tablet	15,000	5	2570	2699	36	97154
	Quinine Injection	300 mg/ml	ampoule	0	0	0	0	36	0

Total Consumption Calculated from Standard Facility Data Above										
Drug	**Pack Size**	**Total National Average Monthly Consumption[4]**	**Stock on Hand (BU)**	**Stock on Order (BU)**	**Safety Stock Level (BU)**	**Suggested Quantity to Order (BU)**	**Adjusted Order Quantity for Losses (10%)**	**Order Quantity (Packs)**	**Probable Pack Price (USD)**	**Value of Proposed Order (USD)**
Artesunate	100	426,975	81,000	58,000	32,240	3,736,017	4,109,619	41,097	11.2	460,286.40
Amodiaquine	1,000	271,388	32,000	42,000	20,475	2,388,965	2,627,861	2,628	15	39,420.00
Quinine Injection	100	3,693	111	7,600	551	26,080	28,688	287	8.3	2,382.10

Note: A blank table for entering data is available in Annex 2.

[4] Add consumption from Referral, HC, and HP facilities for each medicine.

Assumptions Using the Consumption Method

1. Consumption patterns

- Assume that consumption patterns will remain the same or will increase by an estimated factor.

2. Public health facility use

- Make an estimation of the current and operational coverage of public health facilities per year. Estimate current health facility use and make assumptions on the proportion increase in use in the future because of the availability of better antimalarial medicines (related to Assumption 1 above).

3. Assumed losses due to loss, expiration, or diversion

- Estimate or assume a percentage of losses or diversions to the private or other sector.
- Estimate or assume losses because of expiration. This factor is particularly relevant for (artemisinin-based combination therapies) ACTs because they have a short shelf life.

4. Lead times, safety stock

- Estimate the lead time needed from placing of an order to a supplier to receipt and transport to the peripheral areas.
- Estimate amount of safety stock needed.

5. Existing pipelines, stocks on order

- Obtain data on existing pipelines and stocks on order to adjust need. These data may be estimates if accurate data are not available.

6. Cost of antimalarial medications and commodities

- Estimate the cost of antimalarial estimated using the *International Drug Price Indicator Guide* or Roll Back Malaria guide to prices of antimalarials.

7. **Diagnostic criteria** for uncomplicated malaria remain the same.

8. **Population and age groups**

    - Assume population increases as predicted and that population will remain stable until the target year.

    - Make population adjustments for age groups. Often these age groups do not correspond with age dosage categories and assumptions must be made.

MORBIDITY-BASED QUANTIFICATION

This method is appropriate for calculating needs for new therapies and for other situations where accurate consumption data are not available.

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

Two sets of data are needed: (1) the number of episodes of uncomplicated and severe malaria treated by the type(s) of facilities for which drug requirements are to be estimated (incidence) and (2) the average standard treatment schedules for each form of malaria (based on either average current practices or "ideal" treatment guidelines). Most health problems have at least two alternative treatments (first- and second-line treatments), and a percentage must be assigned based on how frequently each regimen is used. Then, the expected incidence (number of treatment episodes) must be estimated.

The quantification formula involves multiplying the quantity of each drug included in standard treatments for each health problem by the number of treatment episodes expected for the health problem. The expected total need for each drug is the sum of the estimates from all treatment regimens in which the drug is included. Then the estimates are adjusted to fill the supply pipeline, allowing for losses to theft and wastage. Finally, the expected cost is calculated based on the expected purchase price of each drug, and estimates are reconciled with available funds. Adjustments may also be required to fill the supply pipeline, to account for losses, and in most cases, to reconcile the quantities needed with the funds available.

Box 3. Data Needed for the Morbidity Method

- Data on population according to age groups
- Accurate data on patient attendances at health facilities
- Estimations (assumptions) on % change in attendance
- Actual or projected incidence of uncomplicated, severe malaria and pregnancies for IPT
- Standard treatments (ideal, actual)
- Data on percentage treatment failures to first line drug
- Projected drug costs
- Procurement lead time
- Shelf life of drug/s

Quantifying Needs for First-Line Antimalarials Using the Morbidity Method

1. Establish the list of drugs to be quantified.

Use the standard treatment guidelines for malaria to compile this list.

Several assumptions must be made in order to perform a morbidity-based quantification. These are discussed on page 32.

2. Establish standard or average treatments.

There are two basic options for developing standard treatments: *average actual treatments* or *ideal standard treatments*. The components are the same, but there is an important difference between the approaches: *average* regimens are based on observed or reported practices and are more likely to predict what will actually happen, whereas *ideal* regimens define what should happen if prescribers follow the ideal guidelines.

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

In most quantification exercises, it is necessary to develop (or modify) the treatment guidelines. Ideal standard treatment guidelines should be developed by expert committees (with expert assistance, if needed). Unless reliable information on drug utilization and prescribing patterns is available, a special study may be needed to determine average actual treatment patterns; this study can be combined with one to determine morbidity patterns and incidence of health problems (see Step 3).

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

- The percentage of treatment episodes in which the drug will be prescribed
- The name of each drug and strength, with separate treatments listed for each age and weight level, as appropriate
- The basic unit
- The number of basic units in each average dose for each age and weight band
- The average number of doses of each drug per day
- The average number of days of treatment for each drug per episode in each age or weight band

These components are combined to project the quantity of each drug needed for each treatment episode (QE) in each standard treatment regimen. This projection is made by multiplying the basic units per dose (DCU) by the number of doses per day (ND). This result is multiplied by the length of treatment per episode, in days (LD). The entire formula is—

$QE = DCU \times ND \times LD$

In the example from Table 4 two different drug products are prescribed for malaria. For different age groups, the drugs are the same, but the dose and dosage form differ. The quantity of artesunate tablets needed to treat malaria in patients under one year old is calculated as—

$Q_E = 0.5 \times 2 \times 3 = 3$

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

For each regimen, the proportion of patients with each disease who will be treated with each different therapy is estimated.

If there are major differences in the way common problems are treated by different levels of prescribers, it may be useful to estimate how many (or what percentage of) treatment episodes of each disease will be managed by each category of prescriber and then specify separate treatment regimens common for each prescriber category.

3. Collect morbidity data.

This step estimates the expected number of treatment episodes for the various levels of malaria severity. A treatment episode is "a patient contact for which a standard course of drug treatment is required" (WHO/DAP 1988, 6.1). Table 4 shows one way to organize morbidity data and to estimate the number of treatment episodes.

Information from the regular health information system on morbidity patterns and treatment episodes can be used. In many cases, however, this information is not available, and a special study may be needed in sentinel facilities, from which data can then (with caution) be extrapolated. The study can take two forms: a retrospective review of records in selected facilities (if those records are relatively accessible, complete, and accurate), or a prospective study in a sample of health facilities. The study must be completed prior to actually starting the quantification. There are some key issues in conducting these studies—

- Both the number of contacts and the number of treatment episodes must be obtained in the study of sample facilities.

- Only patient contacts that normally result in drug treatment should be counted, separate from those that do not.

- The sample data should specify the frequency of each malaria problem (uncomplicated, severe) in terms of a common denominator, such as 1,000 inpatients or 1,000 outpatient visits (for example, the number of cases of uncomplicated malaria per 1,000 outpatient contacts).

- Separate frequencies must be developed for all age groups specified in the standard treatment guidelines. Table 4 shows one format for doing this.

- It may be impossible to separate curative from noncurative contacts in a retrospective review of records. Even for curative contacts, not all patients who come to facilities with health problems receive drug therapy (although the vast majority do if drugs are in stock). If this aspect is considered important, the proportion of cases that will be treated with drugs can be estimated.

- If discrete types of prescribers (such as doctors versus paramedical staff) use different treatment regimens, the number of treatment episodes must be compiled separately for each prescriber type.

- The sample data should also specify the number of patient contacts per total population in the area served by the sample facilities. For example, if the total population in the sample area was 3.9 million, and there were 3,123,408 patient contacts per year (as in Table 4), on average there were 0.8 patient contacts per inhabitant.

- The sample data should also specify the use as a percentage of the total population. For example, when estimating requirements for the public sector, the use of the public sector in an area may only be 50 percent. In this case, the total quantity needed will 50 percent of the total morbidity.

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

4. Calculate the number of treatment episodes.

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

First, divide the estimated total number of patient contacts for the past year by 1,000, so that the denominators of contacts and treatment frequency are the same. (The frequency of treatment episodes is usually expressed in treatment episodes per 1,000 contacts.) Next

multiply the expected total number of contacts in thousands (NC) by the expected frequency of the problem (F) to obtain the number of treatment episodes (ET) based on last year's data. The second step must be done separately for each discrete age range used in the process. For multiple levels of treatment, the number of treatment episodes at each level must also be estimated.

The number of treatment episodes in the target population must be extrapolated using population figures from the last census. These figures should match the age groups for each treatment schedule, if possible. If the figures for population do not match, extrapolate using the percentage populations in each age band.

Determine the annual population growth rate from the last census. Project the population in the target year by multiplying the growth rate by the last accurate population figure. Remember that this is a cumulative calculation: If the population in 2003 (census year) was 5 million and the population growth rate is 2.5 percent per annum, the population in the target year (2006) will be—

- In 2004, the population was 5,000,000 × 102.5 = 5,125,000
- In 2005, the population was 5,125,000 × 102.5 = 5,253,125
- In 2006, the population will be 5,253,125 × 102.5 = 5,384,454

N.B: Populations are always rounded upward to the next whole number (because there cannot be half a person).

The Table 4 example shows 3,123,408 contacts, separated into four categories. Since the frequency of health problems is estimated per 1,000 contacts, the total number of contacts is divided by 1,000, yielding 3,123.4 groups of 1,000 contacts.

Next, the number of treatment episodes must be adjusted for expected changes in patient use; in Table 4, a 5 percent increase is expected. Therefore, the estimated number of treatment episodes for each age group and each health problem is multiplied by 1.05.

5. Calculate the quantity of drugs needed.

For each level of disease severity, the projected number of treatment episodes from Step 4 (ET) is multiplied by the quantity of basic units (QE) specified in the guidelines for each age group (and each level of disease severity). This result is then multiplied by the percentage of cases that are expected to be treated (PT). The full formula is—

$QT = ET \times QE \times PT$

6. Adjust for filling the pipeline and current stock position.

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

If applicable, determine the quantity of stock (in packs) already in stock and the quantity on order. The first may be obtained from the CMS and the latter from the CMS or the procurement unit at the Ministry of Health. Make adjustments for lead time if necessary, as described in the consumption method, to finalize the preliminary estimates.

7. Adjust quantities for expected losses.

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

8. Estimate costs for each drug and total costs.

With adjustments made to cover needs for additional health problems, losses, and filling the pipeline (if necessary), the total estimated quantity can be divided by the purchase pack size to determine the number of packs to be ordered.

For example, in Table 4, 1,432,520 are the estimated need.

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

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

9. Compare total costs with budget and make adjustments.

Reduce the estimated quantities, the number of drugs, or both to conform with budget realities, if necessary.

Table 4. Calculation Using the Morbidity Method

Problem	Severity	Age Group	Episodes per 1,000 Contacts	Past Year Estimated Number of Episodes	Projected Number of Episodes	No. of Regimen	% Cases Treated with Regimen	% Utlization	Drug Product	Basic Unit	Basic Unit per Dose	Doses per Day	Number of Days	Basic Units per Episode	Total Basic Units Needed
Malaria	1	5-11m	364	1,136,921	1,193,767	1	80%	50%	Artesunate 50mg	Tablet	0.5	2	3	3	1,432,520
							80%	50%	Amodiaquine 200mg	Tablet	0.5	1	3	1.5	-
								50%							-
		1-6y	1004	3,135,902	3,292,697		80%	50%	Artesunate 50mg	Tablet	1	2	3	6	7,902,472
							80%	50%	Amodiaquine 200mg	Tablet	1	1	3	3	-
								50%							-
		7-13y	2264	7,071,396	7,424,965		80%	50%	Artesunate 50mg	Tablet	2	2	3	12	35,639,834
							80%	50%	Amodiaquine 200mg	Tablet	2	1	3	6	-
								50%							-
		>13y	3206	10,013,646	10,514,328		80%	50%	Artesunate 50mg	Tablet	4	2	3	24	100,937,552
							80%	50%	Amodiaquine 200mg	Tablet	4	1	3	12	-
								50%							-
(Uncomplicated	2	<3	25	78,085	81,989		20%	50%	Artemether/lumefantrine 20/120mg	Tablet	1	2	3	6	49,194
req 2nd line tx)								50%						0	-
		3-9y	36	112,443	118,065		20%	50%	Artemether/lumefantrine 20/120mg	Tablet	2	2	3	12	141,678
								50%						0	-
		9-14y	65	203,022	213,173		20%	50%	Artemether/lumefantrine 20/120mg	Tablet	3	2	3	18	383,711
								50%						0	-
		>14y	72	224,885	236,130		20%	50%	Artemether/lumefantrine 20/120mg	Tablet	4	2	3	24	566,711

Problem	Severity	Age Group	Episodes per 1,000 Contacts	Past Year Estimated Number of Episodes	Projected Number of Episodes	No. of Regimen	% Cases Treated with Regimen	% Utlization	Drug Product	Basic Unit	Basic Unit per Dose	Doses per Day	Number of Days	Basic Units per Episode	Total Basic Units Needed
								50%							-
Severe Malaria	3	5-11m	6	2,652	2,785		20%	50%	Quinine injection 300 mg/mL	mL	0.5	3	1	1.5	418
								50%	Quinine 300 mg	Tablet	0.5	3	6	9	2,506
		1-6y	20	5,305	5,570		20%	50%	Quinine injection 300 mg/mL	mL	1	3	1	3	1,671
								50%	Quinine 300 mg	Tablet	1	3	6	18	10,026
		7-13y	15	7,099	7,454		20%	50%	Quinine injection 300 mg/mL	mL	1.5	3	1	4.5	3,354
								50%	Quinine 300 mg	Tablet	1.5	3	6	27	20,126
		>13y	10	8,978	9,427		20%	50%	Quinine injection 300 mg/mL	mL	2	3	1	6	5,656
									Quinine 300 mg	Tablet	2	3	6	36	33,937

Note: A blank table for entering data is available in Annex 2.

Assumptions Using the Morbidity Method

General Assumptions

1. Incidence of fevers that are treated as malaria

- In most countries, estimated the incidence of malaria using incidences of fever.
- Note that fever estimates for sub-Saharan Africa based on Demographic Health Surveys are likely to be an underestimate since most household surveys occur in dry season and are not based on childhood fevers.
- Note also that where reported cases of malaria are used to estimate the number of malarial fevers, the estimate is likely to be low due to underreporting or diagnostic failure. In addition, it is based on the public sector where only a small percentage people seek treatment for malaria.

2. Population and age groups

- Assume population increases as predicted and that population will remain stable until the target year
- Make population adjustments for age groups must be made. Often these age groups do not correspond with age dosage categories and assumptions must be made.

3. Public health facility utilization

- Estimate the proportion of people that go to the public sector that have malaria.
- Estimate the current and operational coverage of public health facilities per year. Need to estimate current health facility utilization and make assumptions on the proportion increase in utilization in the future due to the availability of better antimalarial medicines

4. Assumed losses due to loss, expiration or diversion.

- Estimate or assume a percentage of losses or diversions to the private or other sector
- Estimate or assume losses because of expiration. This factor is particularly true of ACTs as they have a short shelf life.

5. Lead times, safety stock

- Estimate the lead time needed from placing of an order to a supplier to receipt and transport to the peripheral areas.
- Estimate amount of safety stock needed.

6. Existing pipelines, stocks on order

- Obtain data on existing pipelines and stocks on order to adjust need. These data may be estimates if accurate data are not available.

7. Cost of antimalarial medications and commodities

- Estimate the cost of antimalarial estimated using International Drug Price indicator guide or Roll Back Malaria guide to prices of antimalarials.

Calculating for the Number of Second-Line and Severe Malaria Treatments Needed

1. Treatment failures

- Adequate data on treatment failures will not be available yet, so make assumptions on the percentage of failures.

- Estimate the proportion of fevers and malaria cases that go on to develop severe malaria.

Quantification for Intermittent Preventive Treatment for Pregnant Women

1. Number of pregnant women

- Estimate the population of pregnant women through crude birth rates adjusted for maternal mortality.

2. Prenatal clinic attendance

- Estimate for prenatal clinic attendance and adjust for changing utilization.

3. Dosage

- Assume three tablets of sulfadoxine/pyrimethamine (SP) to pregnant women twice during pregnancy (WHO guidelines state that SP should be given *at least* twice).

- In areas where HIV prevalence rates among pregnant women are greater than 10percent, assume three tablets of SP given three times during pregnancy.

REFERENCES

MSH (Management Sciences for Health). 2004. *International Drug Price Indicator Guide*. Boston, MA: MSH

WHO (World Health Organization). Forthcoming. *Guidelines for the Treatment of Malaria.* Geneva: WHO

WHO/DAP(World Health Organization/Action Programme on Essential Drugs and Vaccines). 1988. *Estimating Drug Requirements: A Practical Manual.* Geneva: WHO/DAP.

WHO/RBM/UNICEF/PSI/MSH (World Health Organization/Roll Back Malaria/United Nations Children's Fund/Population Services International/Management Sciences for Health). 2004. *Sources and Prices of Selected Products for the Prevention, Diagnosis and Treatment of Malaria, September 2004.* Geneva: WHO.

ANNEX 1. STANDARD DOSAGE SCHEDULES FOR ARTEMISININ-BASED COMBINATION THERAPIES

WHO (forthcoming) recommends that all countries changing their first-line antimalarial treatment policies should change to ACTs. The four combinations recommended for the first line treatment of uncomplicated malaria are—

- Artemether-lumefantrine
- Artesunate-SP
- Artesunate-amodiaquine
- Artesunate-mefloquine (for use in low transmission areas)

1. Artemether-lumefantrine combination

This ACT is currently available only as coformulated tablets contain 20 mg of artemether and 120 mg of lumefantrine. The total recommended treatment is a 6-dose regimen of artemether-lumefantrine 1.5/12 mg/kg twice daily for 3 days

Table A1-1. Dosing Schedule for Artemether-Lumefantrine

	Number of Tablets Recommended at Approximate Timing (Hours) of Dosing[a]					
Body weight	**0 h**	**8 h**	**24 h**	**36 h**	**48 h**	**60 h**
5–14 kg (<3 years)	1	1	1	1	1	1
15–24 kg (3–9 year)	2	2	2	2	2	2
25–34 kg (9–14 years)	3	3	3	3	3	3
>34 kg (>14 years)	4	4	4	4	4	4

[a] The regimen can be expressed more simply for ease of use at the program level as follows: the second dose on the first day should be given anytime between 8 and 12 hours after the first dose. Dosage on the second and third days is twice a day (morning and evening).

2. Artesunate-amodiaquine combination

This ACT is currently available as separate scored tablets containing 50 mg of artesunate and 153 mg base of amodiaquine, respectively. Coformulated tablets are under development but are not available at present. The total recommended treatment is 4 mg/kg of artesunate and 10 mg base/kg of amodiaquine given once daily for 3 days.

Table A1-2. Dosing Schedule for Artesunate-Amodiaquine

	Dose in mg (Number of Tablets)					
	Artesunate			Amodiaquine		
Age	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3
5–11 months	25 ($^1/_2$)	25	25	76 ($^1/_2$)	76	76
1–6 years	50 (1)	50	50	153 (1)	153	153
7–13 years	100 (2)	100	100	306 (2)	306	306
>13 years	200 (4)	200	200	612 (4)	612	612

3. Artesunate-SP combination

This ACT is currently available as separate scored tablets containing 50 mg of artesunate and tablets containing 500 mg of sulfadoxine and 25 mg of pyrimethamine.[5] The total recommended treatment is 4 mg/kg of artesunate given once daily for 3 days and a single administration of SP 1.25/25 mg base/kg on day 1.

Table A1-3. Dosing Schedule for Artesunate-SP

	Dose in mg (Number of Tablets)					
	Artesunate			SP		
Age	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3
5–11 months	25 ($^1/_2$)	25	25	250/12.5 ($^1/_2$)	—	—
1–6 years	50 (1)	50	50	500/25 (1)	—	—
7–13 years	100 (2)	100	100	1000/50 (2)	—	—
>13 years	200 (4)	200	200	1500/75 (3)	—	—

[5] A similar medicine with tablets containing 500 mg of sulfalene 25 mg of pyrimethamine is considered to be equivalent to SP.

4. Artesunate-mefloquine combination

This ACT is currently available as separate scored tablets containing 50 mg of artesunate and 250 mg base of mefloquine, respectively. Coformulated tablets are under development but are not available at present. The total recommended treatment is 4 mg/kg of artesunate given once daily for 3 days and 25 mg base/kg of mefloquine usually split over 2 or 3 days.

Table A1-4. Dosing Schedule for Artesunate-Mefloquine

	Dose in mg (Number of Tablets)					
	Artesunate			Mefloquine		
Age	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3
5–11 months	25 ($^1/_2$)	25	25	—	125 ($^1/_2$)	—
1–6 years	50 (1)	50	50	—	250 (1)	—
7–13 years	100 (2)	100	100	—	500 (2)	250 (1)
>13 years	200 (4)	200	200	—	1000 (4)	500 (2)

To reduce acute vomiting and optimize absorption, the 25 mg/kg dose is usually split and given either as 15 mg/kg (usually on the second day) followed by 10 mg/kg one day later, or as 8.3 mg/kg/day for 3 days. (Future coformulated products will contain this dose.)

ANNEX 2. BLANK TABLES FOR PERFORMING CONSUMPTION AND MORBIDITY QUANTIFICATION

Table A2-1. Calculation Using the Consumption-Based Method

Drug	Strength	BU	Pack Size	Total Consumption in Period (BU)	Days Out of Stock	Adjusted Average Monthly Consumption (BU)	Projected Average Monthly Utilization (BU)	Stock on Hand (BU)	Stock on Order (BU)	Safety Stock Level (BU)	Suggested Quantity to Order (BU)	Adjusted Order Quantity for (Losses 10%)	Order Quantity (Packs)	Probable Pack Price (USD)	Value of Proposed Order (USD)

Table A2-2. Calculation Using the Consumption Method in Standard Facilities

Data from Standard Facilities									
Type of Standard Facility	Drug	Strength	BU	Total Consumption in Period (BU)	Days Out of Stock	Adjusted Average Monthly Consumption (BU)	Projected Average Monthly Utilization (BU)	Total number of facilities of each type	Total projected average monthly utilization

Total Consumption Calculated from Standard Facility Data Above										
Drug	Pack Size	Total National Average Monthly Consumption[6]	Stock on Hand (BU)	Stock on Order (BU)	Safety Stock Level (BU)	Suggested Quantity to Order (BU)	Adjusted Order Quantity for Losses (10%)	Order Quantity (Packs)	Probable Pack Price (USD)	Value of Proposed Order (USD)

[6] Add consumption from each type of facility for each medicine.

Table A2-3. Calculation Using the Morbidity Method

Problem	Severity	Age Group	Episodes per 1,000 Contacts	Past Year Estimated Number of Episodes	Projected Number of Episodes	No. of Regimen	% Cases Treated with Regimen	% Utlization	Drug Product	Basic Unit	Basic Unit per Dose	Doses per Day	Number of Days	Basic Units per Episode	Total Basic Units Needed